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THE

CYCLOPÆDIA;

OR,

Universal Dictionary

OF

ARTS, SCIENCES, AND LITERATURE.

VOL. XXIX.

Printed by A. Strahan,
New-Street-Square, London.

THE

CYCLOPÆDIA;

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UNIVERSAL DICTIONARY

OF

Arts, Sciences, and Literature.

BY

ABRAHAM REES, D.D. F.R.S. F.L.S. *S. Amer. Soc.*

WITH THE ASSISTANCE OF

EMINENT PROFESSIONAL GENTLEMEN.



ILLUSTRATED WITH NUMEROUS ENGRAVINGS,

BY THE MOST DISTINGUISHED ARTISTS.

IN THIRTY-NINE VOLUMES.

VOL. XXIX.

LONDON:

PRINTED FOR LONGMAN, HURST, REES, ORME, & BROWN, PATERNOSTER-ROW,

F.C. AND J. RIVINGTON, A. STRAHAN, PAYNE AND FOSS, SCATCHERD AND LETTERMAN, J. CUTHELL, CLARKE AND SONS, LACKINGTON HUGHES HARDING MAVOR AND JONES, J. AND A. ARCH, CADELL AND DAVIES, S. BAGSTER, J. MAWMAN, JAMES BLACK AND SON, BLACK KINGSBURY PARBURY AND ALLEN, R. SCHOLEY, J. BOOTH, J. BOOKER, SUTTABY EVANCE AND FOX, BALDWIN CRADOCK AND JOY, SHERWOOD NEELY AND JONES, R. SAUNDERS, HURST ROBINSON AND CO., J. DICKINSON, J. PATERSON, E. WHITESIDE, WILSON AND SONS, AND BRODIE AND DOWDING.

1819.

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CYCLOPÆDIA:

OR, A NEW

UNIVERSAL DICTIONARY

OF

ARTS and SCIENCES.

PUNISHMENT.

PUNISHMENT, a penalty impoſed upon the commiſſion of ſome crime or offence againſt the laws.

It is eſſential to the nature of a law, that it import or decree a puniſhment to the tranſgreſſors of it.

Solon very juſtly aſſerted, that the two great ſtimulants of human action being hope and fear, a good government could not poſſibly exiſt without an equitable ſyſtem of rewards and puniſhments.

The forms and manners of puniſhment are various in various countries and ages, and for various crimes; as treaſon, felony, adultery, parricide, &c.

There was a time, ſays Beccaria, when all puniſhments were pecuniary. The crimes of the ſubjects were the inheritance of the prince, ſo that an injury done to ſociety was a favour to the crown, and the ſovereign and magiſtrates, thoſe guardians of the public ſecurity, were intereſted in the violation of the laws. Crimes were tried at that time in a court of exchequer, and the cauſe became a civil ſuit between the perſon accuſed and the crown. The magiſtrate then poſſeſſed powers that were not neceſſary for the public welfare, and the criminal ſuffered puniſhments different from thoſe which the neceſſity of example required. The judge was rather a collector for the crown, an agent for the treaſury, than a protector and miniſter of the laws.

Among the Romans, the *pecuniary* puniſhments were the *muleta* and *confiſcatio*. The *corporal* puniſhments were *capitis diminutio, aquæ et ignis interdictio, proſcriptio, deportatio, relegatio, furca, crux, carcer, culeus, equuleus, ſcalæ gemoniæ, damnatio ad gladium, ad metallum, flagellatio, talio*, &c. which ſee deſcribed under their reſpective articles.

Among us the principal *civil* puniſhments are, *fines, impriſonments, the ſtocks, pillory, burning in the hand, whipping, ducking-ſtool, hanging, beheading, quartering, burning, tranſportation*, &c.

The *eccleſiaſtical* puniſhments are, *cenſures, ſuſpenſions, deprivations, degradations, excommunications, anathemas, penances*, &c. The *military* puniſhments are, *being ſhot, running the gantelope, riding the wooden horſe, the bilboes*, &c.

Among the Turks, &c. *impaling, baſtinadoes* on the ſoles of the feet, &c. obtain. See EMPALEMENT, &c.

The right of puniſhing crimes againſt the law of nature, as murder and the like, is in a ſtate of mere nature veſted in every individual. Accordingly the firſt murderer, Cain, was ſo ſenſible of this, that we perceive him (Gen. iv. 14.) expreſſing his apprehenſions, that *whoever* would find him would ſlay him. In a ſtate of ſociety, this right is tranſferred from individuals to the ſovereign power; and thus men are prevented from being judges in their own cauſes, which is one of the evils that civil government was intended to remedy. The ſword of juſtice is now veſted by the conſent of the whole community in the magiſtrate alone. Every puniſhment which does not ariſe from abſolute neceſſity, ſays the great Monteſquieu, is tyrannical; and this propoſition is rendered more general by Beccaria, who obſerves, that every act of authority of one man over another, for which there is not an abſolute neceſſity, is tyrannical. Upon this principle, the ſovereign's right to puniſh crimes is founded; that is, upon the neceſſity of defending the public liberty, entruſted to his care, from the uſurpation of individuals; and puniſhments are juſt in proportion, as the liberty, preſerved by the ſovereign, is ſacred and valuable. It was neceſſity that forced men to give up a part of their liberty, and it is certain, that every individual would chuſe to put into the public ſtock the ſmalleſt portion poſſible; as much only as was ſufficient to engage others to defend it. The aggregate of theſe, the ſmalleſt portions poſſible, forms the right of puniſhing: all that extends beyond this is abuſe, and not juſtice. The laws only can determine

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the puniſhment of crimes; and the authority of making penal laws can only reſide with the legiſlator, who repreſents the whole ſociety, united by the ſocial compact. No magiſtrate, therefore, as he is one of the ſociety, can, with juſtice, inflict on any other member of the ſame ſociety, puniſhment that is not ordained by the laws, nor increaſe the puniſhment already determined by the laws. To the ſovereign repreſenting the ſociety itſelf, who makes general laws to bind the members, it does not belong to judge, whether any individual has violated the ſocial compact, or incurred the conſequent puniſhment. In this caſe, there are two parties, one repreſented by the ſovereign, who inſiſts upon the violation of the contract, and the other is the perſon accuſed, who denies it. It is neceſſary then, that there ſhould be a third perſon to decide this conteſt; that is to ſay, a judge or magiſtrate, from whoſe determination there ſhould be no appeal. Judges, in criminal caſes, ſays Beccaria, have no right to interpret the penal laws, becauſe they are not legiſlators. The lawful interpreter is the ſovereign, that is, the repreſentative of ſociety, and not the judge, whoſe office is only to examine, if a man have, or have not committed an action contrary to the laws. Many evils ariſe from the erring inſtability of arbitrary interpretation.

The lawfulneſs of puniſhing criminals, who are chargeable with offences againſt the laws of ſociety, that are only "mala prohibita" and not "mala in ſe," is founded upon this principle, that the law by which they ſuffer was made by their own conſent; it is a part of the original contract into which they entered, when firſt they engaged in ſociety; it was calculated for, and has long contributed to, their own ſecurity. This right, conferred by univerſal conſent, gives to the ſtate exactly the ſame power, and no more, over all its members, as each individual member had naturally over himſelf or others. Hence ſome have doubted how far a human legiſlature ought to inflict capital puniſhments for *poſitive* offences;—offences againſt the municipal law only, not againſt the law of nature; ſince no individual has, naturally, a power of inflicting death upon himſelf or others for actions in themſelves indifferent.

With regard to offences "mala in ſe," capital puniſhments are in ſome inſtances inflicted by the immediate command of God himſelf to all mankind, as in the caſe of murder, by the precept delivered to Noah, their common anceſtor and repreſentative (Gen. ix. 6.), "whoſo ſheddêth man's blood, by man ſhall his blood be ſhed." In other inſtances they are inflicted after the *example* of the Creator, in his poſitive code of laws for the regulation of the Jewiſh republic; as in the caſe of the crime againſt nature. But they are ſometimes inflicted without ſuch expreſs warrant or example, at the will and diſcretion of the human legiſlature, as for forgery, for theft, and ſometimes for offences of a lighter kind. None of theſe crimes are offences againſt natural, but only againſt ſocial, rights. The practice of inflicting capital puniſhments, for offences of human inſtitution, is thus juſtified by that great and good man, ſir Matthew Hale (1 Hal. P. C. 13.) "When offences grow enormous, frequent, and dangerous to a kingdom or ſtate, deſtructive or highly pernicious to civil ſocieties, and to the great inſecurity and danger of the kingdom or its inhabitants, ſevere puniſhment and even death itſelf is neceſſary to be annexed to laws in many caſes by the prudence of lawgivers." It is, therefore, as judge Blackſtone obſerves, the enormity, or dangerous tendency of the crime, that alone can warrant any earthly legiſlature in putting him to death that commits it. It is not its frequency only, or the difficulty of otherwiſe preventing it, that will excuſe our attempting to prevent it by a wanton effuſion of human blood. For, though the end of puniſhment is to deter men from offending, it can never follow from this circumſtance, that it is lawful to deter them at any rate and by any means; ſince there may be unlawful methods of enforcing obedience even to the juſteſt laws. Every humane legiſlator, as the learned judge remarks, will be therefore extremely cautious of eſtabliſhing laws that inflict the penalty of death, eſpecially for ſlight offences, or ſuch as are merely poſitive. Nor will it avail to allege that no lighter penalty will be effectual, becauſe experience has not taught us that capital puniſhments are more effectual. Was the vaſt territory of all the Ruſſias, it may be aſked, worſe regulated under the empreſs Elizabeth, than under her more ſanguinary predeceſſors? Or has it been ſince, under Catharine II., leſs civilized, leſs ſocial, and leſs ſecure? And yet we are aſſured, that neither of theſe illuſtrious princeſſes have, throughout their whole adminiſtration, inflicted the penalty of death; and the latter, upon full perſuaſion of its being uſeleſs, and even pernicious, iſſued orders for aboliſhing it entirely throughout her extenſive dominions. But if capital puniſhments, ſays Blackſtone, were proved by experience to be a ſure and effectual remedy, that would not prove the neceſſity (upon which the juſtice and propriety depend) of inflicting them upon all occaſions, when other expedients fail. This reaſoning would, as we may juſtly apprehend, extend much too far. Where the evil to be prevented is not adequate to the violence of the preventive, a ſovereign that thinks ſeriouſly can never reconcile laws that inflict death to the dictates of conſcience and humanity. To ſhed the blood of our fellow-creature, ſays the learned and humane judge, is a matter that requires the greateſt deliberation, and the fulleſt conviction of our own authority; for life is the immediate gift of God to man; which neither he can reſign, nor can it be taken from him, unleſs by the command or permiſſion of him who gave it; either expreſsly revealed or collected from the laws of nature or ſociety by clear and indiſputable demonſtration. Blackſtone, however, would not be underſtood to *deny* the right of the legiſlature in any country to enforce its own laws by the death of the tranſgreſſor, though ſome perſons of abilities have *doubted* it. To this claſs of perſons we may refer the ingenious writer already cited. The uſeleſs profuſion of puniſhments, which has never made man better, has induced Beccaria to enquire, whether the puniſhment of *death* be really juſt or uſeful in a well-governed ſtate? What right, he aſks, have men to cut the throats of their fellow-creatures? Certainly not that on which the ſovereignty and laws are founded. The laws are only the ſum of the ſmalleſt portions of the private liberty of each individual, and repreſent the general will, which is the aggregate of that of each individual. Did any one ever give to others the right of taking away his life? Is it poſſible, that in the ſmalleſt portions of the liberty of each, ſacrificed to the good of the public, can be contained the greateſt of all good, life? If it were ſo, how ſhall it be reconciled to the maxim which tells us, that a man has no right to kill himſelf? Which he certainly muſt have, if he could give it away to another. The puniſhment of death is not authorized by any right; for no ſuch right exiſts. The death of a citizen cannot be neceſſary, but in one caſe; when, though deprived of his liberty, he has ſuch power and connections as may endanger the ſecurity of the nation; when his exiſtence may produce a dangerous revolution in the eſtabliſhed form of government. But even in this caſe, it can only be neceſſary when a nation is on the verge of recovering or loſing its liberty; or in times of abſolute anarchy, when the diſorders themſelves hold the place of laws.

If the experience of all ages be not ſufficient to prove, that the puniſhment of death has never prevented determined men

men from injuring ſociety; if the example of the Romans; if twenty years reign of Elizabeth, empreſs of Ruſſia, in which ſhe gave the fathers of their country an example more illuſtrious than many conqueſts bought with blood; if, ſays Beccaria, all this be not ſufficient to perſuade mankind, who always ſuſpect the voice of reaſon, and who chuſe rather to be led by authority, let us conſult human nature in proof of this aſſertion.

It is not the intenſeneſs of the pain that has the greateſt effect on the mind, but its continuance; for our ſenſibility is more eaſily and more powerfully affected by weak but repeated impreſſions, than by a violent, but momentary, impulſe. The power of habit is univerſal over every ſenſible being. As it is by that we learn to ſpeak, to walk, and to ſatisfy our neceſſities, ſo the ideas of morality are ſtamped on our minds by repeated impreſſions. The death of a criminal is a terrible but momentary ſpectacle, and therefore a leſs efficacious method of deterring others, than the continued example of a man deprived of his liberty, condemned, as a beaſt of burthen, to repair, by his labour, the injury he has done to ſociety. "If I commit ſuch a crime," ſays the Spectator to himſelf, "I ſhall be reduced to that miſerable condition for the reſt of my life." A much more powerful preventive than the fear of death, which men always behold in diſtant obſcurity.

The terrors of death make ſo ſlight an impreſſion, that it has not force enough to withſtand the forgetfulneſs natural to mankind, even in the moſt eſſential things; eſpecially when aſſiſted by the paſſions. Violent impreſſions ſurpriſe us, but their effect is momentary; they are fit to produce thoſe revolutions which inſtantly transform a common man into a Lacedæmonian or a Perſian; but in a free and quiet government they ought to be rather frequent than ſtrong.

The execution of a criminal is, to the multitude, a ſpectacle, which in ſome excites compaſſion mixed with indignation. Theſe ſentiments occupy the mind much more than that ſalutary terror which the laws endeavour to inſpire; but in the contemplation of continued ſuffering, terror is the only, or at leaſt predominant ſenſation. The ſeverity of a puniſhment ſhould be juſt ſufficient to excite compaſſion in the ſpectators, as it is intended more for them than for the criminal.

A puniſhment, to be juſt, ſhould have only that degree of ſeverity which is ſufficient to deter others. Now there is no man, who, upon the leaſt reflection, would put in competition the total and perpetual loſs of his liberty, with the greateſt advantages he could poſſibly obtain in conſequence of a crime. Perpetual ſlavery, then, has in it all that is neceſſary to deter the moſt hardened and determined, as much as the puniſhment of death:—it has even more. There are many who can look upon death with intrepidity and firmneſs; ſome through fanaticiſm, and others through vanity, which attends us even to the grave; others from a deſperate reſolution, either to get rid of their miſery, or ceaſe to live: but fanaticiſm and vanity forſake the criminal in ſlavery, in chains and fetters, in an iron cage; and deſpair ſeems rather the beginning than the end of their miſery. The mind, by collecting itſelf and uniting all its force, can, for a moment, repel aſſailing grief; but its moſt vigorous efforts are inſufficient to reſiſt perpetual wretchedneſs.

In all nations, where death is uſed as a puniſhment, every example ſuppoſes a new crime committed. Whereas in perpetual ſlavery, every criminal affords a frequent and laſting example; and if it be neceſſary that men ſhould often be witneſſes of the power of the laws, criminals ſhould often be put to death; but this ſuppoſes a frequency of crimes; and from hence this puniſhment will ceaſe to have its effect, ſo that it muſt be uſeful and uſeleſs at the ſame time.

We ſhall be told, that perpetual ſlavery is as painful a puniſhment as death, and therefore as cruel. To which we anſwer, that if all the miſerable moments in the life of a ſlave were collected into one point, it would be a more cruel puniſhment than any other; but theſe are ſcattered through his whole life, whilſt the pain of death exerts all its force in a moment. There is alſo another advantage in the puniſhment of ſlavery, which is, that it is more terrible to the ſpectator than to the ſufferer himſelf; for the ſpectator conſiders the ſum of all his wretched moments, whilſt the ſufferer, by the miſery of the preſent, is prevented from thinking of the future. All evils are increaſed by the imagination, and the ſufferer finds reſources and conſolations, of which the ſpectators are ignorant; who judge by their own ſenſibility of what paſſes in a mind, by habit grown callous to misfortune.

He who foreſees that he muſt paſs a great number of years, even his whole life, in pain and ſlavery; a ſlave to thoſe laws by which he was protected; in ſight of his fellow citizens, with whom he lives in freedom and ſociety; makes an uſeful compariſon between thoſe evils, the uncertainty of his ſucceſs, and the ſhortneſs of the time in which he ſhall enjoy the fruits of his tranſgreſſion. The example of thoſe wretches continually before his eyes, makes a much greater impreſſion on him than a puniſhment, which, inſtead of correcting, makes him more obdurate.

The puniſhment of death is pernicious to ſociety, from the example of barbarity it affords. If the paſſions, or the neceſſity of war, have taught men to ſhed the blood of their fellow creatures, the laws, which are intended to moderate the ferocity of mankind, ſhould not increaſe it by examples of barbarity, the more horrible, as this puniſhment is uſually attended with formal pageantry. Is it not abſurd, that the laws, which deteſt and puniſh homicide, ſhould, in order to prevent murder, publicly commit murder themſelves? What are the true and moſt uſeful laws? Thoſe compacts and conditions which all would propoſe and obſerve, in thoſe moments when private intereſt is ſilent, or combined with that of the public. What are the natural ſentiments of every perſon concerning the puniſhment of death? We may read them in the contempt and indignation with which every one looks on the executioner, who is nevertheleſs an innocent executor of the public will; a good citizen, who contributes to the advantage of ſociety; the inſtrument of the general ſecurity within, as good ſoldiers are without. What then is the origin of this contradiction? Why is this ſentiment of mankind indelible, to the ſcandal of reaſon? It is, that in a ſecret corner of the mind, in which the original impreſſions of nature are ſtill preſerved, men diſcover a ſentiment which tells them, that their lives are not lawfully in the power of any one, but of that neceſſity only, which with its iron ſceptre rules the univerſe.

What muſt men think, when they ſee wiſe magiſtrates and grave miniſters of juſtice, with indifference and tranquillity, dragging a criminal to death, and whilſt a wretch trembles with agony, expecting the fatal ſtroke, the judge, who has condemned him, with the coldeſt inſenſibility, and perhaps with no ſmall gratification from the exertion of his authority, quits his tribunal to enjoy the comforts and pleaſures of life? They will ſay, 'Ah! thoſe cruel formalities of juſtice are a cloak to tyranny, they are a ſecret language, a ſolemn veil, intended to conceal the ſword by which we are ſacrificed to the infatiable idol of deſpotiſm. Murder, which they would repreſent to us as an horrible crime, we ſee practiſed by them without repugnance, or remorſe. Let us follow their example.

ample. A violent death appeared terrible in their deſcriptions, but we ſee that it is the affair of a moment. It will be ſtill leſs terrible to him, who, not expecting it, eſcapes almoſt all the pain.' Such is the fatal, though abſurd reaſoning of men who are diſpoſed to commit crimes; on whom, the abuſe of religion has more influence than religion itſelf.

How happy were mankind, ſays this author, if laws were now to be formed; now that we ſee on the thrones of Europe, benevolent monarchs, friends to the virtues of peace, to the arts and ſciences, fathers of their people, though crowned yet citizens; the increaſe of whoſe authority augments the happineſs of their ſubjects, by deſtroying that intermediate deſpotiſm, which intercepts the prayers of the people, to the throne. If theſe humane princes have ſuffered the old laws to ſubſiſt, it is doubtleſs becauſe they are deterred by the numberleſs obſtacles, which oppoſe the ſubverſion of errors eſtabliſhed by the ſanction of many ages; and therefore every wiſe citizen will wiſh for the increaſe of their authority.

It has long ſince been obſerved, ſays Voltaire, to whom the commentary on Beccaria's eſſay is attributed, that a man after he is hanged is good for nothing, and that puniſhments invented for the good of ſociety, ought to be uſeful to ſociety. It is evident, that a ſcore of ſtout robbers, condemned for life to ſome public work, would ſerve the ſtate in their puniſhment, and that hanging them is a benefit to nobody but the executioner.

There have been ſome judges, ſays this writer, who were paſſionately fond of ſpilling human blood; ſuch was Jefferies in England, and ſuch in France was the man whom they called *Coupe-tête*. Nature never intended ſuch men for magiſtrates, but for executioners.

As to the *end*, or final cauſe of human puniſhments, this is not to be conſidered as an atonement or expiation for the crime committed, but as a precaution againſt future offences of the ſame kind. This purpoſe is accompliſhed in three ways; either by the amendment of the offender himſelf, with a view to which all corporal puniſhments, fines, and temporary exile or impriſonment are inflicted; or by deterring others by the dread of his example from committing ſimilar offences, "ut pœna (as Cicero expreſſes it, pro Cluentio, 46) ad paucos, metus ad omnes perveniat;" or, laſtly, by depriving the party who offends and injures, of the power to do future miſchief, which is effected by either putting him to death, or condemning him to perpetual confinement, ſlavery, or exile. The method of inflicting puniſhment, however, ought always to be proportioned to the particular purpoſe it is meant to ſerve, and by no means to exceed it; and therefore the pains of death, and perpetual diſability by exile, ſlavery, or impriſonment, ought never to be inflicted, but when the offender appears incorrigible.

The *meaſure* of human puniſhments muſt be left to the arbitration of the legiſlature, which ſhould inflict ſuch penalties as are warranted by the laws of nature and ſociety, and ſuch as appear to be the beſt calculated to anſwer the end of precaution againſt future offences. Some have recommended, and highly extolled for its equity, the "lex talionis," or law of retaliation; but judge Blackſtone obſerves, that this can never be in all caſes an adequate or permanent rule of judgment. Although there cannot be any regular or determinate method of rating the quantity of puniſhments for crimes, by any one uniform rule, applicable to all caſes, and without ultimately referring to the will and diſcretion of the legiſlative power; yet there are ſome general principles, deduced from the nature and circumſtances of the crime, that may afford ſome aſſiſtance in allotting to it an adequate puniſhment. One circumſtance that ſerves in ſome meaſure to determine the nature and degree of puniſhment regards the object of it; for the more dignified in reſpect of rank, character, and influence, the object of an injury is, ſo much greater care ſhould be taken to prevent that injury, and of courſe under this aggravation the puniſhment ſhould be more ſevere. Accordingly treaſon in conſpiring the king's death, is by the Engliſh law puniſhed with greater rigour than even actually killing any private ſubject. Moreover, the violence of paſſion, or temptation may, in ſome caſes, alleviate a crime; ſuch is theft in caſe of hunger, contradiſtinguiſhed from the ſame crime committed through avarice, and to ſerve the purpoſes of luxury. Homicide, in conſequence of ſudden and violent reſentment, is leſs penal than upon cool deliberate malice. The age, education, and character of the offender; the repetition (or otherwiſe) of the offence; the time, the place, the company in which it was committed: all theſe, and a thouſand other incidents, may aggravate or extenuate the crime. Thus Demoſthenes (in his oration againſt Midias) finely works up the aggravations of the inſults he had received: "I was abuſed," ſays he, "by my enemy, in cold blood, out of malice, not by heat of wine, in the morning, publicly, before ſtrangers as well as citizens; and that in the temple, whither the duty of my office called me."

Farther, as puniſhments are chiefly intended for the prevention of future crimes, thoſe ſhould be moſt ſeverely puniſhed, which are the moſt deſtructive of the public ſafety and happineſs; and, among crimes of an equal malignity, thoſe which a man has the moſt frequent and eaſy opportunity of committing, which cannot be ſo eaſily guarded againſt as others, and which, therefore, the offender has the ſtrongeſt inducement to commit; according to Cicero's obſervation (Pro Sexto Roſcio, 40); "ea ſunt animadvertenda peccata maximé, quæ difficillimé præcaventur."

We may alſo obſerve, that puniſhments of unreaſonable ſeverity, eſpecially when indiſcriminately inflicted, have leſs effect in preventing crimes, and amending the manners of a people, than ſuch as are more mild or merciful in general, and yet properly intermixed with due diſtinctions of ſeverity. Crimes, ſays Beccaria, are more effectually prevented by the *certainty* than the *ſeverity* of puniſhment. The certainty of a ſmall puniſhment will make a ſtronger impreſſion, than the fear of one more ſevere, if attended with the hopes of eſcaping; for it is the nature of mankind to be terrified at the approach of the ſmalleſt inevitable evil, whilſt hope, the beſt gift of heaven, hath the power of diſpelling the apprehenſion of a greater; eſpecially if ſupported by examples of impunity, which weakneſs or avarice too frequently afford.

If puniſhments be very ſevere, men are naturally led to the perpetration of other crimes, to avoid the puniſhment due to the firſt. The countries and times moſt notorious for ſeverity of puniſhments, were always thoſe in which the moſt bloody and inhuman actions and the moſt atrocious crimes were committed; for the hand of the legiſlator and the aſſaſſin were directed by the ſame ſpirit of ferocity; which, on the throne, dictated laws of iron to ſlaves and ſavages, and, in private, inſtigated the ſubject to ſacrifice one tyrant to make room for another.

In proportion as puniſhments become more cruel, the minds of men, as a fluid riſes to the ſame height with that which ſurrounds it, grow hardened and inſenſible; and the force of the paſſions ſtill continuing, in the ſpace of an hundred years, the *wheel* terrifies no more than formerly the *priſon*. That a puniſhment may produce the effect required,

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it is ſufficient that the *evil* it occaſions ſhould exceed the *good* expected from the crime; including in the calculation the certainty of the puniſhment, and the privation of the expected advantage. All ſeverity beyond this is ſuperfluous, and therefore tyrannical.

There are yet two other conſequences of cruel puniſhments, which counteract the purpoſe of their inſtitution, which was, to prevent crimes. The *firſt* ariſes from the impoſſibility of eſtabliſhing an exact proportion between the crime and puniſhment, for though ingenious cruelty hath greatly multiplied the variety of torments, yet the human frame can ſuffer only to a certain degree, beyond which it is impoſſible to proceed, be the enormity of the crime ever ſo great. The *ſecond* conſequence is impunity. Human nature is limited no leſs in evil than in good. Exceſſive barbarity can never be more than temporary; it being impoſſible that it ſhould be ſupported by a permanent ſyſtem of legiſlation; for if the laws be too cruel they muſt be altered, or anarchy and impunity will ſucceed. The exceſſive ſeverity of laws (ſays Monteſquieu, Sp. of Laws, b. 6. c. 13.) hinders their execution; when the puniſhment ſurpaſſes all meaſure, the public will frequently, out of humanity, prefer impunity to it.

Thus alſo the ſtatute 1 Mar. ſt. 1. c. 1. recites in its preamble, "that the ſtate of every king conſiſts more aſſuredly in the love of the ſubject towards their prince, than in the dread of laws made with rigorous pains; and that laws made for the preſervation of the commonwealth without great penalties, are more often obeyed and kept, than laws made with extreme puniſhments." Happy had it been for the nation, ſays judge Blackſtone, if the ſubſequent practice of that deluded princeſs, in matters of religion, had been correſpondent to theſe ſentiments of herſelf and parliament, in matters of ſtate and government. It may be farther obſerved, that ſanguinary laws are a bad ſymptom of the diſtemper of any ſtate, or at leaſt of its weak conſtitution. The laws of the Roman kings, and the twelve tables of the *decemvirs*, were full of cruel puniſhments: the Porcian law, which exempted all citizens from ſentence of death, ſilently abrogated them all. At this period the republic flouriſhed: under the emperors ſevere puniſhments were revived; and then the empire fell.

We may further add, that it is abſurd and impolitic to apply the ſame puniſhment to crimes of different malignity. Beſides, a multitude of ſanguinary laws (beſides the doubt that may be entertained concerning the right of making them) proves likewiſe a manifeſt defect either in the wiſdom of the legiſlative, or the ſtrength of the executive power. Although it be much eaſier to extirpate than to amend mankind; yet that magiſtrate muſt be eſteemed both a weak and a cruel ſurgeon, who cuts off every limb, which through ignorance or indolence he will not attempt to cure. Beccaria therefore propoſes to form in every ſtate a ſcale of crimes, with a correſponding ſcale of puniſhments, deſcending from the greateſt to the leaſt; but if this idea be deemed romantic, a wiſe legiſlator will at leaſt mark the principal diviſions, and not aſſign penalties of the firſt degree to offences of an inferior rank. When men ſee no diſtinction made in the nature and gradations of puniſhment, the generality will be led to conclude, there is no diſtinction in the guilt. Much as we may be diſpoſed to admire and extol the excellence of the Engliſh law in a variety of reſpects, yet none can otherwiſe than regret the frequency of its capital puniſhments; inflicted by a multitude of ſucceſſive and independent ſtatutes, upon crimes very different in their natures; and we cannot forbear paying our tribute of reſpect to ſir Samuel Romilly, whoſe talents and character far exceed our praiſe, and other legiſlators, who are laudably exerting themſelves in ſimplifying and mitigating our penal code.

It is a melancholy truth, ſays judge Blackſtone, that among the variety of actions, which men are daily liable to commit, no leſs than 160 have been declared by act of parliament to be felonies without benefit of clergy; or in other words, to be worthy of inſtant death. So dreadful a liſt, inſtead of diminiſhing, increaſes the number of offenders. The injured, through compaſſion, will often forbear to proſecute: juries, through compaſſion, will ſometimes forget their oaths, and either acquit the guilty or mitigate the nature of the offence; and judges, through compaſſion, will reſpite one half of the convicts, and recommend them to the royal mercy. Among ſo many chances of eſcaping, the ready and hardened offender overlooks the multitude that ſuffer; he boldly engages in ſome deſperate attempt, to relieve his wants or ſupply his vices; and if, unexpectedly, the hand of juſtice overtakes him, he deems himſelf peculiarly unfortunate, in falling at laſt a ſacrifice to thoſe laws, which long impunity has taught him to contemn.

Beccaria, whoſe excellent eſſay we have often cited in this article, obſerves, that the more immediately after the commiſſion of a crime, a puniſhment is inflicted, the more juſt and uſeful it will be. It will be more juſt, becauſe it ſpares the criminal the cruel and ſuperfluous torment of uncertainty, which increaſes in proportion to the ſtrength of his imagination, and the ſenſe of his weakneſs; and becauſe the privation of liberty, being a puniſhment, ought to be inflicted before condemnation, but for as ſhort a time as poſſible. Impriſonment, he ſays, being only the means of ſecuring the perſon of the accuſed, until he be tried, condemned, or acquitted, ought not only to be of as ſhort duration, but attended with as little ſeverity as poſſible. The time ſhould be determined by the neceſſary preparation for the trial, and the right of priority in the oldeſt priſoners. The confinement ought not to be cloſer than is requiſite to prevent his flight, or his concealing the proofs of the crime; and the trial ſhould be conducted with all poſſible expedition. Can there be a more cruel contraſt than that between the indolence of a judge, and the painful anxiety of the accuſed; the comforts and pleaſures of an inſenſible magiſtrate, and the filth and miſery of the priſoner? In general, "The degree of the puniſhment, and the conſequences of a crime, ought to be ſo contrived, as to have the greateſt poſſible effect on others, with the leaſt poſſible pain to the delinquent." If there be any ſociety in which this is not a fundamental principle, it is an unlawful ſociety; for mankind, by their union, originally intended to ſubject themſelves to the leaſt evils poſſible.

An immediate puniſhment is more uſeful; becauſe the ſmaller interval of time between the puniſhment and the crime, the ſtronger and more laſting will be the aſſociation of the two ideas of *crime* and *puniſhment*; ſo that they may be conſidered, one as the cauſe, and the other as the unavoidable and neceſſary effect.

It is, then, of the greateſt importance, that the puniſhment ſhould ſucceed the crime as immediately as poſſible, if we intend, that in the rude minds of the multitude, the ſeducing picture of the advantage ariſing from the crime, ſhould inſtantly awake the attendant idea of puniſhment. Delaying the puniſhment ſerves only to ſeparate theſe two ideas; and thus affects the minds of the ſpectators rather as being a terrible ſight, than the neceſſary conſequence of a crime; the horror of which ſhould contribute to heighten the idea of the puniſhment.

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There is another excellent method of ſtrengthening this important connection between the ideas of crime and puniſhment; that is, to make the puniſhment as analogous as poſſible to the nature of the crime; in order that the puniſhment may lead the mind to conſider the crime in a different point of view, from that in which it was placed by the flattering idea of promiſed advantages. This ingenious writer cloſes his eſſay with the following general theorem, as the reſult of his previous reaſoning. "That a puniſhment may not be an act of violence, of one or of many againſt a private member of ſociety, it ſhould be public, immediate, and neceſſary; the leaſt poſſible in the caſe given; proportioned to the crime, and determined by the laws." Monteſq. Sp. of Laws. Beccaria's Eſſay on Crimes and Puniſhments. Blackſt. Com. vol. iv.

A valuable work, compriſing the ſubject of this article, was preſented to the public in the year 1811 by M. Dumont of Geneva. It was formed of detached materials, furniſhed by the papers of Mr. Jeremiah Bentham, and the whole is executed with ſuch judgment in the arrangement of the matter, and ſo much livelineſs and elegance as to the ſtyle of the compoſition, that M. Dumont appears more like an original author than an editor. This work would have afforded us many inſtructive and intereſting extracts, if our limits had allowed our making that uſe of it, which it deſerves. This, however, is the leſs neceſſary, as the reader may have acceſs to the original treatiſe, *viz.* "Theorie des Péines et des Recompenſes; par M. Jeremie Bentham, Juriſconſulte Anglois; redigée in François d'apres les Manuſcrits, par M. Et. Dumont de Génevè," 2 vol. 8vo. à Londres, 1811: or to the ample analyſis of it in the Edinburgh Review, N° 43. A brief account of its contents may, however, be gratifying to our readers. This work conſiſts of two great parts or branches; the theory of penal legiſlation, and the theory of remunerative legiſlation. The firſt contains in a ſyſtematical form all the principles that ſerve to regulate the choice of different modes of puniſhment and the apportionment of puniſhments to crimes. In the ſecond are exhibited the principles upon which the lawgiver ought to proceed, when he holds out inducements either alone or attended with correſponding penalties, to influence the conduct of his ſubjects. The firſt book explains the general principles of the ſyſtem, and opens with definitions and claſſifications.

Puniſhment, in its moſt general ſenſe, is the infliction of ſome evil upon an individual, with an intention that he ſhould ſuffer this evil, and with a reference to ſome act done or omitted. Puniſhment, in its legal ſenſe, is the infliction of ſome evil, according to judicial forms, upon an individual convicted of ſome act forbidden by law, and with the intention of preventing the recurrence of ſuch acts. Puniſhments, as well as crimes, are diviſible into four claſſes, as they affect the *perſon*, the *property*, the *reputation*, or the *condition* of thoſe upon whom they are inflicted. Thoſe which affect the perſon, or corporal puniſhments, are ſubdivided into various ſpecies; they may be ſimply or complexly afflictive, or reſtrictive, or active (*e. g.* compulſory labour) or capital. The other three claſſes are all privative, affecting the delinquent with loſs or degradation. Hence ariſes another general claſſification of puniſhments, by dividing them into corporal and privative.

From this definition it appears, that the object of all puniſhment is the prevention of the offence in future, either by the ſame delinquent or by other perſons in ſimilar circumſtances. The firſt end is accompliſhed in three ways; by taking from the offender the phyſical power of committing the offence; by taking away the deſire; or by deterring him. The other, and principal object of the infliction, that of reſtraining others, can only be effected as far as the puniſhment is concerned, by the threat which it holds out of ſimilar infliction. Theſe objects, as they form the only juſt motives, conſtitute alſo the only juſtification of puniſhments. Although the direct and primary object of puniſhment is prevention, the civil magiſtrate, having provided for that object, has another duty to perform, which is to provide as far as poſſible for the reparation of the injury ſuſtained through the crime committed.

The *expence* or *coſt* of any puniſhment is, in the language of this ſyſtem, the whole evil of every kind occaſioned by it, including the ſuffering of the delinquent, the loſs of his labour or life to the ſtate, the pecuniary coſt of his puniſhment; and, in ſhort, every thing endured, paid, or foregone, in order to obtain the double preventive which the puniſhment is intended to adminiſter. The *gain* or *profit* of the puniſhment conſiſts in this preventive, or in the tendency of the puniſhment to ſecure it. A puniſhment may be termed frugal or economical which produces the deſired effect with as little ſuffering as poſſible; and it may be termed coſtly or prodigal, when the ſame effect might have been produced by a ſmaller degree of ſuffering. The *real value* is diſtinguiſhed from the *apparent value*, of the ſuffering; the former being the actual amount of that which is inflicted; the latter, the portion of it which is exhibited, or otherwiſe made known to, and underſtood by the public. The expence of a puniſhment is equivalent to the real amount; the profit is in proportion to the apparent amount only; and hence are deduced theſe important maxims: 1. That, *cæteris paribus*, a puniſhment eaſily comprehended, is preferable to one of difficult apprehenſion: 2. That one which takes hold of the memory, is preferable to one eaſily forgotten: 3. That one which is as great or greater in apparent than in real amount, is preferable to one which is really greater than it appears to be:—the exceſs of real amount being in truth ſo much thrown away, ſo far as regards the principal object, of general example.

The next ſubject of diſcuſſion comprehends the principles that ought to regulate the extent of puniſhment, for the prevention of crimes. Theſe are contained in the following propoſitions. 1. The evil of the puniſhment muſt exceed the advantage ariſing from the crime; ſo that, generally ſpeaking, the ſtronger the temptation to commit any crime, the more ſevere ought to be the puniſhment, ſubject to exceptions in extreme caſes. 2. When the criminal act evidently indicates a habit or practice, the puniſhment ſhould be proportioned, not to the gain derived from a ſingle offence, but to the probable amount of profit flowing from a courſe of ſuch conduct. 3. An addition muſt be made to the puniſhment, in order to compenſate its want of certainty and proximity. 4. In caſes where a temptation offers for the commiſſion of different crimes, a more ſevere puniſhment ſhould be denounced againſt the greater crime. 5. The more pernicious any crime is, the more ſafely may a ſevere puniſhment be ventured upon, for the chance of preventing it. 6. The nominal amount of puniſhment for the ſame crime, muſt often be varied at the diſcretion of the judge, according to the circumſtances of the delinquent, in order to preſerve the real amount of ſuffering.

The qualities of puniſhment, the conſideration of which naturally ſucceeds that of the meaſure or quantity, are ſuch as follow: it ſhould be *diviſible; invariable*, or *certain* or *equal; commenſurable* with others; *analogous* to the crime; *exemplary; economical; remiſſible;* that it ſhould reſtrain the offender from doing harm; conduce to his *reformation;* yield a *profit*, in the ordinary ſenſe of the word; be *ſimple* in its deſcription;

deſcription; and ſo far *popular* as to ſhock none of the eſtabliſhed feelings or prejudices of the community. Theſe qualities are, for the moſt part, underſtood as ſoon as they are mentioned. Some of them, however, undergo a more ample diſcuſſion than others. This is the caſe with reſpect to the qualities of *analogy* and *popularity*. One of the ſources of analogy ſpecified by Mr. Bentham is that of employing the ſame inſtrument or operation in the puniſhment, as the delinquent did in the crime, as, *e. gr.* burning an incendiary who had committed any aggravated act of *arſon*, by which lives were ſacrificed as well as property. Another method is that of inflicting on the delinquent the ſame injury which he offered to the innocent perſon. A third conſiſts in ſubjecting to puniſhment the part of the body with which the offender committed the crime. A fourth, in affecting the face with ſome diſfigurement ſimilar to diſguiſing, where part of the offence was the uſe of a diſguiſe. Other analogies alſo are enumerated. In diſcuſſing the *popularity* of puniſhment, the author adverts to the prevalence of falſe feelings and prejudices, and he reduces the errors proceeding from theſe cauſes to four heads; as they conſiſt in miſtaken notions of *liberty*, *decency*, *religion*, and *humanity*. The author allows, however, that a lawgiver ſhould, for a time at leaſt, frame his inſtitutions ſo as to humour even the caprices and errors of his people, when he finds them too deeply rooted and widely ſpread, to be overcome or diſregarded. To any ſpeculative arguments, founded upon falſe views of thoſe different ſubjects, of courſe no regard ſhould be paid;—as to thoſe fanatics in politics, religion, or ſentiment, who would have no impriſonment becauſe it violates liberty, or aboliſh capital puniſhments becauſe they encroach upon the province of the Deity, or becauſe they are painful to the feelings.

The author mentions four caſes, in which puniſhment is wholly inept, and ought not to be inflicted; *viz.* where the crime being either imaginary, or unfit for legiſlative interference, may be ſaid not to exiſt, and the puniſhment would be *unfounded*: where the puniſhment would be wholly *inefficacious* on the delinquent, or others in the ſame circumſtances, as in the caſe of idiots: where the means being ſufficient to accompliſh the end in view, puniſhment would be *ſuperfluous*: where more evil being likely to reſult from puniſhing the particular offenders than from letting them eſcape, the infliction would be too *coſtly*, as in the caſe of an extenſive mutiny or rebellion.

We have already ſtated, that the author divides puniſhments into two great claſſes, *corporal* and *privative*; that he again ſubdivides corporal puniſhments into five kinds, and privative into three. 1. The *firſt* claſs of corporal puniſhments conſiſts of puniſhments *ſimply afflictive*, denoting thoſe which cauſe bodily ſuffering, with little attendant injury; and even thoſe moſt ſimple, as the laſh, are accompanied with a certain diſgrace by their public exhibition, which is an eſſential part of the proceſs. Of the various kinds of ſimple infliction, our author gives the preference to the laſh, under certain modifications. 2. The *ſecond* claſs conſiſts of puniſhments *complexly afflictive*, or thoſe in which the mere bodily ſuffering is attended with, or followed by, ſome other loſs, either of perſonal comfort or reputation. Theſe are ſubdivided into three kinds, comprehending thoſe that are inflicted by *deforming* the perſon, which is done either by *diſcolouring*, *e. gr.* burning in the hand; or *diſfiguring*, *e. gr.* ſlitting the noſe, or cutting the ear; by *diſabling* a limb or organ, without deſtroying it; by *mutilating* or deſtroying the part. The *third* claſs comprehends *reſtrictive* puniſhments, which prevent the offender from doing or enjoying ſomething agreeable or uſeful to him. The *reſtrictions* thus impoſed are of two kinds; *ſimple* prohibitions, and reſtraints upon *loco-motion*. The former are ſo limited in their application, that we need not particularly ſpecify them; but the latter are divided into five kinds; *viz.* *impriſonment*, in the ordinary ſenſe of the word; *quaſi-impriſonment*, or confinement within the diſtrict to which the offender belongs: *relegation*, or confinement to ſome other diſtrict within the dominions of the ſtate: *local interdiction*, or baniſhment from a particular diſtrict: *baniſhment* from the territories of the ſtate, either indefinitely, or to ſome ſpecific foreign part. *Impriſonment*, according to our author's ſtatement, in order to be effectual, ought to place the offender, for a limited time, under the moſt complete reſtraint, inſtead of being long and ſlight. Mr. Bentham enlarges in the enumeration of the evils comprehended under this mode of ſuffering, of which ſome belong *inſeparably* and neceſſarily to it; others ſuch as are *acceſſary*, but moſt frequently accompany it; and others again ſuch as ariſe from *abuſes* of it. With impriſonment, he ſays, in certain caſes, and always for a very limited time, may moſt advantageouſly be joined *ſolitude*, *darkneſs*, and *regimen*. Our author, having expoſed the abſurd ſyſtem of "priſon-fees," infers from his general principles that there ought to be three kinds of priſon, adapted to the ſeveral purpoſes of *ſimple* detention, *penitentiary* confinement, and *perpetual* impriſonment. The firſt being only applicable to the caſe of inſolvent debtors guilty of imprudence or extravagance, and of accuſed perſons kept for trial, ſhould have no accompaniment whatever of rigour. The leading principle in diſtinguiſhing the two others is, that the ſubjects of the former are to enter again into ſociety; while thoſe of the latter, being for ever excluded from it, the exemplary nature of their ſufferings ſhould be the principal object of attention. The names of the three priſons, for theſe ſeparate purpoſes, ſhould be different, as well as their external appearance; and every thing which can ſeize hold of the imagination, without awakening ſympathy, ſhould be preſented, both in the conſtruction of the perpetual priſon, and in the ſituation of its inhabitants. 4. The *fourth* claſs of puniſhments comprehends thoſe that are termed *active* or *laborious*. Puniſhments of this claſs, when examined by the rules already premiſed, are found to unite the greateſt number of advantages with the feweſt defects. In the diſcuſſion of this ſubject, the author directs our attention to what may be called the extreme caſe of miſmanagement in this kind of puniſhments. Here he alludes to Botany Bay. The tranſportation of convicts to America, which preceded the preſent plan, with ſeveral diſadvantages of great moment, was, upon the whole, infinitely preferable. It was groſsly unequal, inaſmuch as it became ſervitude with exile to the poor, while it was only ſimple relegation to thoſe who could pay for their paſſage. It was defective too in preventive power, the opportunities of eſcape being neceſſarily great. In both theſe particulars, the deportation now practiſed has the manifeſt advantage. All the convicts are equally under reſtraint, and their eſcape is much more difficult; but in every other point of view, it is either as bad, or a great deal worſe. It is as little as poſſible exemplary: the diſproportion between the real and apparent ſuffering,—the exceſs of the former,—is in truth a maximum. The community in this country ſee a convict ſent on a long voyage, to a fertile country, lying in a fine climate. This is the example. The reality is, that the miſerable wretch, after rotting in the hulks for a year or two, is crammed with ſome hundreds of his fellows into a floating priſon, or, it may be, a peſt-houſe, in which, if he ſurvives the riſks of famine, peſtilence, mutiny, fire, ſhipwreck, and exploſion, he is conveyed, through the in-

fliction of a ten months' voyage, to a life of alternate ſlavery and rebellion, where guilty or cruel exceſs ſucceeds exquiſite ſuffering, without varying the uniform miſery, or changing the prevalent character of the body; and all this paſſes at the oppoſite extremity of the earth's diameter, from whence it operates no more in any manner of way upon the inhabitants of England, than if it were paſſing in the moon. The tendency of diſcipline in the colony to reform the convicts, ſuppoſing them to have arrived there, may eaſily be eſtimated. They are not ſeparated from their companions in guilt; they have no better examples before them, no eyes to watch them. The partial hiſtorian of the riſing ſettlement, himſelf the chief magiſtrate, (Mr. Collins,) has ſupplied us with the details; and, in ſpite of his inclination to ſee every thing in the faireſt light, he has painted, if the pages of a journal for ſixteen years may be ſaid to paint, by far the blackeſt picture ever yet exhibited of human ſociety. His book is a catalogue of crimes; it would be a record of convictions, but that perjury ſo univerſally prevails as to enſure the eſcape of all who are not taken in the fact. The vice at the root of all the reſt, a rage for ſpirits approaching to frenzy, can neither be cured, nor deprived of gratification. Far from improving by their reſidence there, it was only at the firſt eſtabliſhment that any remiſſion of unfavourable ſymptoms appeared. As ſoon as the firſt convicts had finiſhed their period of ſervitude, their liberty brought along with it an influx of diſorder and contamination, which each ſucceeding year ſeems to increaſe. If this ſyſtem, then, prevents the delinquent from repeating his crimes, it is only by transferring the ſcene of them to a diſtant ſettlement, where it foſters and augments them; and although, with reference to one part of the empire, this may be termed prevention, the legiſlator, whoſe care ſhould embrace the whole, has no right to give it ſuch a name. As to the pecuniary expence, by which ſo much evil is purchaſed, we find it in the parliamentary reports eſtimated at above a million in about ten years, or about thirty-eight pounds for each convict, beſides the value of his labour. Laſt of all, the puniſhment inflicted is perfectly different from the one to which the ſentence of the law has condemned the convict. Not to mention the detention before tranſportation, and the arrival ſometimes when the term of puniſhment has nearly expired, the power of returning at its expiration is poſſeſſed by few men, and no women; while of the voyage ſome idea may be formed, from the average mortality between 1787 and 1795, being above one in ten; and from a jail fever, always a probable occurrence, on one occaſion, in 1799, having carried off one hundred in three. If, in ſuch a caſe, we could look to the ſettlement as a colonial ſpeculation, we ſhould find its gains in a ſimilar proportion; but this eſtimate would be as ſuperfluous after what has been ſaid, as it would be foreign to the deſign of this inquiry.

In the work before us we have a general ſketch of the author's plan of improvement upon this ſyſtem, together with a view of its connection with the principles which he has unfolded, and of the prodigious advantages accruing from it. The "Panopticon" is diſtinguiſhed by three leading properties. From the form of the building, and the diſpoſition of the cells, the inſpector can ſee each priſoner at all times, without being ſeen by them, and can direct them without leaving his poſt: the management of the eſtabliſhment is carried on by contract, the government paying a fixed price for the whole expences of each convict, and the contractor having the whole profit, as he has the entire charge and regulation, of the work to be performed, but allowing a certain proportion of the gain to the convict: the contractor inſures the lives and ſafe cuſtody of the convicts; he is allowed yearly a certain ſum for the deaths, as calculated from the common tables, and he pays the ſame ſum for each death which actually does happen, and for every eſcape which takes place. If we miſtake not, Mr. Bentham, by his contract with government, further engaged to pay ſo much for each priſoner who, after his diſcharge, ſhould afterwards be convicted of any offence. The entire publicity of his accounts was another condition, and one upon which he himſelf inſiſted. The Panopticon was to be open at all times to every magiſtrate, and at certain hours to the public generally.

The moſt ſtriking points of the compariſon between both ſyſtems, as they are preſented to us by the anonymous author of the article on the ſubject in the Edinburgh Review, are ſuch as follow. The puniſhment is in the higheſt degree exemplary; it is all ſeen and underſtood; it appears much greater than it really is; the comforts of the convicts, in their intercourſe with each other according to their improvement, and in the ſtate of induſtry, and cleanlineſs, and wholeſome regimen, for which they have exchanged their ordinary habits, being, however real, by no means ſuch as ſtrike the multitude of ſpectators, who only ſee confinement, compulſory labour, and ignominy. The reforming effects of the plan are equally manifeſt: the labour, to which they are in part allured by a fixed allowance of profit; the perfect temperance in which they live; the facility afforded of ſeparating them into claſſes, according to their habits and behaviour; the means of eaſy inſtruction, both religious and other, which they give; all furniſh as good a chance of reclaiming thoſe unhappy perſons who are not hardened in guilt, as from any ſuch diſcipline can reaſonably be expected. The preventive powers of the Panopticon are complete, while the convict remains in it; and although a relapſe after liberation can only be guarded againſt by reformation, a contrivance is added to this eſtabliſhment, admirably calculated to provide againſt the firſt dangers of the diſcharge: the convict is transferred to another place of mitigated confinement, where he is rather under inſpection than in cuſtody, and from whence he is gradually allowed wholly to withdraw. With reſpect to the coſt of the plan, we may form ſome eſtimate of it from the terms of Mr. Bentham's contract. Each convict was to coſt government 13*l.* 10*s.*, including 1*l.* 10*s.* for the proportion of the expences of building and ground. He was to provide a fund for indemnifying the parties injured; to allow the convicts one quarter of the profits of their labour; and, after the firſt trial, to make a reduction in the charge. Practical men, well verſed in ſuch matters, had no doubt that a very conſiderable reduction might have been ſpeedily afforded; and that, in a few years, the profits would entirely defray the expences of the eſtabliſhment to the ſtate. While all manner of delays and difficulties were thrown in the way of this experiment; while wits and jobbers, or, as they termed themſelves, matter-of-fact men, averſe to theories, and deprecating novelties, were employed in running it down; trials were made in America of penitentiary houſes upon ſimilar principles, though in a much leſs perfect ſhape, and without ſome of Mr. Bentham's chief improvements. We have the moſt irrefragable teſtimony borne to their ſucceſs, by the intereſting narratives of the duc de Rochefoucault Liancourt and captain Turnbull; the one a perſon eminently ſkilled in the ſubject of priſons; the other a mere practical obſerver, imbued with no knowledge beyond that of the naval profeſſion. Both theſe very different witneſſes concur in their ſtatement of the ſalutary conſequences of the plan; and if we wiſhed to find a perfect contraſt to the melancholy

melancholy narratives of Mr. Collins, we could certainly nowhere ſo well be ſuited as in the deſcriptions which the French and Engliſh travellers have given us of the convicts in New York and Philadelphia.

5. Capital puniſhments compoſe the *fifth* claſs. This claſs conſiſts either of *ſimply* inflicting death with the leaſt poſſible degree of ſuffering, or in accompanying the deſtruction of life with *torments*. The latter method, at one period univerſally prevalent, and ſtill known in moſt countries, is happily almoſt aboliſhed in the two moſt civilized nations. In France, the Code Napoleon allowed it only in the caſes of parricide, and attempts againſt the ſovereign's life, where the addition made to the puniſhment of death is cutting off the right hand. In England, it is only in the caſe of high treaſon that ſuch augmentations are allowed: the puniſhment of the law is no doubt barbarous in the extreme, but in practice it is always remitted. All ſuch cruelties have the effect of inſpiring pity in the ſpectators towards the criminal, and of rendering criminals more hardened and ſavage.

The ingenious author of the critique on Mr. Bentham's theory, to whoſe analyſis of the work we are ſo much indebted in the compilation of this article, agrees with him in his objections to Beccaria, who maintains that a puniſhment of longer duration is more terrible to the ſpectator. Clearly there is none ſo dreadful as death. M. Dumont adds, that its apparent ſuffering is greater than its real, which applies only to the pains of it. On the other hand, it exceeds all others in ſome material defects; not only is it expenſive, and beginning to become unpopular; it is quite irremiſſible, and it is in the higheſt degree unequal, and incapable of diviſion or apportionment. A very ſatisfactory ſtatement is given under this head, of the evil tendency of frequent executions, of the kind of reaſoning by which offenders at the moment of temptation get rid of the fear of death, and eſpecially of the wide difference between encountering certain deſtruction, and yielding to impulſes which may lead to it. The evils ariſing from its being irremiſſible are alſo ably expounded; yet we think the author has neglected to conſider how much of its horror conſiſts in this quality. It is manifeſt that no other puniſhment can utterly exclude hope. In comparing capital with other puniſhments, our author is diſpoſed to give the latter the preference, almoſt to the excluſion of the former; chiefly becauſe, however exemplary to men in general the infliction of death may be, and how deep ſoever the impreſſion it makes on their minds, it has not the ſame terrors for the claſs of men moſt likely to commit the worſt offences, violent ſpirits and hardened delinquents. That its range ſhould be extremely limited, we are willing to admit; but we differ from him in the poſition, that for this claſs of men, perpetual confinement to hard labour would have more terrors than death. The total extinction of life, without chance of eſcape, pardon, or mitigation, ought ſtill to be denounced againſt the worſt offences; and, by being confined to theſe, will unqueſtionably become doubly terrible. The evils ariſing collaterally from the abuſe of this puniſhment, are ſo ably pointed out by ſir Samuel Romilly, that our author abridges a part of the treatiſe before us, by referring to his tract.

The other great diviſion of puniſhments in Mr. Bentham's theory, conſiſts more peculiarly in *privation*. Theſe may be arranged in three claſſes, as they impoſe a forfeiture of *reputation*, of *property*, or of *condition*. 1. Puniſhments which affect a man's reputation conſiſt of appeals to public opinion, and are thoſe meaſures which the lawgiver takes with reſpect to him, for directing that opinion againſt him. The lawgiver may inflict puniſhments of this kind, or rather may expoſe the offender to have them inflicted, either by ſimply *denouncing*, with the authority belonging to his functions, that certain acts ſhall be deemed infamous, or by treating the particular offender *judicially* in a certain way. The latter is the mode uſed in modern times; and it is practiſed in different ways; by *publication* of the offence;—by judicial *admonition*;—by inflicting *puniſhments* of the other claſſes, corporal as well as privative, the immediate object of which is not the deſtruction of reputation;—by inflicting what may be termed *quaſi-corporal* puniſhments, the ſole object of which is infamy;—by *degradation*, or depriving the offender of his rank, natural or conventional;—by *diſcrediting* him, or preventing his teſtimony from being received. 2. The deſcription of puniſhments affecting property conſiſts of thoſe which are *pecuniary*, and which are *quaſi-pecuniary*, as confiſcation of lands, &c. 3. The forfeiture of condition, or *ſtatus*, though a claſs of great extent, theoretically ſpeaking, is in practice reduced within narrow limits. Marriage may be diſſolved; children may be baſtardized; blood may be corrupted; the different kinds of truſt may be taken away; a perſon may be reduced to ſlavery; a community may be deprived of its rights and privileges. Outlawry may alſo be referred to this head.

There are other kinds of infliction, which every ſound principle teaches us to avoid where it is poſſible, and to diminiſh as much as poſſible, where, from the defects of all human contrivances, they inevitably mingle themſelves with the legitimate modes of puniſhment. Our author's ſyſtem arranges them in two claſſes; thoſe which are *miſplaced*, or which fall upon other perſons than the offender; and thoſe which are *complicated*, or preſent neither to the legiſlator, the judge, the party, nor the public, any fixed and definite idea. Thoſe puniſhments that are miſplaced, in the proper uſe of the term, or which the legiſlator enacts with the intention of puniſhing another perſon than the offender, either along with him, or in his place, conſiſt of four kinds; *viz. vicarious*, where the offender eſcapes;—*tranſitive*, where an innocent perſon is purpoſely puniſhed who is connected with the offender;—*collective*, where a body of innocent perſons ſuffer, in the preſumption of the guilty being among them;—and *fortuitous*, where an innocent perſon ſuffers as well as the offender, though unconnected with him. The only inſtance of *vicarious* puniſhments is that inflicted upon the families and creditors of ſuicides by the law of England. This, like all other abſurd and unjuſt laws, is evaded, in almoſt every inſtance, by perjury, and the exerciſe of diſcretion in a ſovereign. The example given of *tranſitive* puniſhment is the corruption of blood, the abſurdity of which is ably expoſed. The chief inſtances of *collective* puniſhments are thoſe in which corporations are puniſhed for the faults of certain individual corporations; a proceeding which can never be juſtified. The well-known examples of *fortuitous* puniſhments are taken from the law of England. The moſt notable is the forfeiture and eſcheat of freehold property, in caſes of attainder of treaſon and felony, where the confiſcation relates back to the commiſſion of the offence, and all meſne conveyances are avoided; ſo that a man may commit a ſecret crime, and ſell his eſtate to an ignorant and innocent purchaſer, in whoſe hands the crown or the lord afterwards ſeizes the eſtate upon the vendor's attainder; and as his goods and chattels are forfeited upon conviction, the only fund of compenſation is gone alſo. Deodands are another inſtance of ſimilar injuſtice; and the puniſhment of incapacitating a perſon from giving evidence, is manifeſtly one which may

ſtrike more injurioufly at parties wholly unconnected with the offender, than at himſelf; beſides, that it is by no means inflicted merely with the view of putting courts of juſtice on their guard againſt admitting a bad witneſs; for it is often the puniſhment of crimes which have no peculiar connection with violation of truth.

Among the evils of complicated puniſhments, we may reckon, beſides outlawry and incapacitation of giving evidence, *excommunication* and *felony*. Some groſs abuſes having occurred in the infliction of the puniſhment of excommunication, ſeveral diſtinguiſhed perſons have undertaken to ſubſtitute other procedure in its place; and ſir W. Scott brought a bill into parliament with this view, ſo that the evil is done away. The puniſhment of perſons as felons, comprehends a number of inflictions very different from each other, ſo that our author conſiders the puniſhing as a felon to be a vague and indefinite term. This comprehends two deſcriptions of puniſhment; the one capital, with forfeiture of lands and chattels; the other not capital, but conſiſting in forfeiture of chattels, and the form of burning in the hand; to which, by ſpecial enactment, impriſonment, tranſportation, or indeed any other puniſhment, may be ſuperadded. It muſt be acknowledged, that a much ſimpler and better manner of ſtating the puniſhment due to an offence would be, to tell at once of what it is to be compoſed; and inſtead of enacting that certain offences are felonies, which ſpecifies nothing, to prohibit them, and ſtate the preciſe inflictions which ſhall follow the commiſſion of them. For the general character and high commendation of the work, which has furniſhed the preceding materials, we refer to the Edinb. Rev. N° 43. p. 1—31.

Punishment, in *Theology*. It has been diſputed among divines, whether the puniſhment of the wicked in a future world be ſtrictly eternal or not. For the arguments on both ſides of the queſtion, ſee Hell.

PUNITORY Interest, in the *Civil Law*, ſuch intereſt of money, as is due for the delay of payment, breach of promiſe, &c.

PUNK, in *Natural Hiſtory*, the inward part of the excreſcence or exuberance of an oak. It is uſed by the Indians in Virginia for medicinal burning, as the Eaſt Indians uſe moxa. Phil. Tranſ. No. 454. ſect. 1.

PUNN. See Pun.

PUNO, in *Geography*, a town of Peru, now annexed to the viceroyalty of La Plata or Buenos Ayres, and capital of a diſtrict of the ſame name, called alſo Paucarcolla (not *Paucarcotta*, as it is miſprinted in that article). It is a rich and populous town, ſituated on the W. ſide of the lake Titicaca, and containing ſome illuſtrious families, as well as a beautiful church for the Spaniards, and another for the Indians, who weave great quantities of coarſe cloth, with which they ſupply the neighbouring countries. S. lat. 16° 20′. W. long. 70° 26′.

PUNT, in *Sea Language*, a ſort of oblong flat-bottomed boat, with a ſquare head and ſtern, whoſe floor reſembles the platform of a floating ſtage; and uſed by ſhip-wrights for breaming, caulking, or repairing a ſhip's bottom. It is alſo uſed in ſome canals.

PUNTA, in *Geography*, a town of South America, in the audience of Quito, and juriſdiction of Guayaquil.

Punta, *La*, a town of Mexico, in the province of New Biſcay; 40 miles N.N.E. of Durango.

Punta is alſo an epithet, diſtinguiſhing ſeveral capes, which are too numerous to be here recited; and this is the leſs neceſſary, as the principal of them occur under other appropriate titles.

Punta *Entornada*, a town on the N. coaſt of Spain. N. lat. 43° 34′. W. long. 5° 30′.

Punta *del Guda*, a ſea-port and capital of St. Michael, one of the Azores, defended by a caſtle.

Punta *de Tordera*, a town and cape of Spain, on the coaſt of Catalonia. N. lat. 41° 38′. E. long. 2° 37′.

PUNTO *del Monte*, a town of South America, in the province of Cordova; 15 miles S. of Cordova.

PUNUGGA, a village of Bootan, ſituated in a deep hollow, and ſurrounded with mountains, for the moſt part covered with pines, along whoſe ſides clouds are perpetually hovering. On the borders of this village are many large heaps of fir-leaves, which being left to ferment and rot, are uſed as excellent manure.

PUNUNAGUR, a town of Bengal; 10 miles W. of Nattore.

PUNWARY, a town of Hindooſtan, in the circar of Gohud; 18 miles E. of Raat.

PUOLANGO, a town of Sweden, in the government of Ulea; 40 miles S. of Cajana.

PUPA, in *Natural Hiſtory*, a name lately ſubſtituted in the room of chryſalis or aurelia, becauſe many inſects in this ſtate reſemble an infant in ſwaddling clothes; and all, except thoſe of the hemiptera order, take no nouriſhment. See Entomology.

PUPIGLIO, in *Geography*, a town of Etruria; 10 miles N. of Piſtoia.

PUPIL, Pupillus, in the *Civil Law*, a boy or girl not yet arrived at the age of puberty, *i. e.* under fourteen years of age for the boy, and under twelve for the girl.

While a minor remained under the direction of a tutor, he was called a pupil; after puberty, a curator being aſſigned him, he ceaſed to be called a pupil.

A tutor is obliged to pay intereſt for what monies of his pupil lie idle and unemployed. A tutor is allowed to do any thing for his pupil, but nothing againſt him.

Pupil is alſo uſed by way of extenſion, in *Univerſities*, &c. in the ſenſe of *alumnus*, for a youth under the education or diſcipline of any one.

Pupil, in *Anatomy*, the round opening in the iris, by which the rays of light are admitted into the eye. See Eye.

Pupil, in *Optics*. It is obſerved, that as we are forced to uſe various apertures to our optic glaſſes, ſo nature has made a like proviſion in the eyes of animals, whereby to ſhut out too much, and admit ſufficient light, by the changes in the aperture of the pupil.

The ſtructure of the uvea and iris is ſuch, as that, by their aperture, the pupil is contractible and dilatable at pleaſure, ſo as to accommodate itſelf to objects, and to admit more or fewer rays, as the object, being either more vivid and near, or more obſcure and remote, requires more or leſs light: it being a conſtant law, that the more luminous the object, the ſmaller the pupil; and again, the nearer the object, the ſmaller the pupil; and *vice verſâ*.

This fact has been long ago noticed by optical writers. B. Porta, about the middle of the ſixteenth century, in his treatiſe De Refractione, p. 74, obſerves, that the pupil is contracted involuntarily when it is expoſed to a ſtrong light, and opens of itſelf when the light is ſmall. A ſimilar obſervation was made by his countryman and contemporary, Father Paul of Venice. Galen, indeed, firſt obſerved the dilatation of the pupil of one eye, when the other was ſhut or loſt, and the contraction of it, when the other was opened or recovered; and in this opinion he was followed by all naturaliſts and philoſophers, till Fabricius ab Aquapendente, profeſſor at Padua, by obſerving the eye of a cat, found

found that the pupil not only dilated and contracted itſelf, when one of the eyes was ſhut, but alſo when both were open. F. Paul found, from repeated experiments, that the pupil not only of cats, but alſo of men, and other animals, always contracted itſelf when the eye was expoſed to a bright light, and again dilated itſelf when the light was faint and languid. This he always obſerved, as well when both eyes were open, as when one of them was ſhut. The ſame remark had been made by Achillinus, in a treatiſe publiſhed in 1322; and the fact was known to the Arabians, Rhazes and Avicenna. That the pupil of the eye is enlarged, in order to view remote objects, and that it is contracted while we are viewing thoſe that are near, is a fact with which Scheiner, in the beginning of the ſeventeenth century, was well acquainted, and which he proved by experiments, and illuſtrated by figures. When a needle, or any ſmall object, is brought near to the eye of any perſon, who looks attentively at it, the pupil, he ſays, is plainly ſeen to contract; and it as conſtantly expands whenever it is withdrawn.

This alteration of the pupil is effected by certain muſcular fibres on the outſide of the uvea, which arrive from nerves detached hither from the ſclerotica. Theſe fibres proceeding ſtraight from their origin towards the centre, terminate in the orbicular limb or verge of the pupil, which conſiſts of orbicular fibres, whereby the figure and ſpace of the pupil are defined. The firſt, or longitudinal fibres, dilate the aperture of the pupilla; the latter, or orbicular ones, conſtringe it.

Some authors, however, attribute the motions of the pupilla to the ligamentum ciliare; and others think, that both this, and the fibres of the uvea, concur herein. Dr. Derham adds, that while the pupil opens and ſhuts, the ligamentum ciliare dilates or compreſſes the cryſtalline, and brings it nigher to, or farther from, the retina, as the object is more or leſs remote.

There is no doubt that the change to which the pupil is ſubject is the effect of light upon the eye. Dr. Hartley, Obſ. on Man, vol. i. p. 219, ſuppoſes, that the light which enters at the pupil has great efficacy in contracting both the greater and leſs rings of the iris, as may be concluded, he ſays, from the immobility of the pupil in a gutta ſerena; alſo becauſe, on this ſuppoſition, the light which paſſes in at the pupil muſt, by contracting the leſs ring, become a check and guard againſt its own too free admiſſion, which is agreeable to the tenor of nature in like inſtances. The retina, he obſerves, extends to the greater ring, and may ſend ſome nervous fibres to it, and even to the iris. Dr. Whytt alſo ſays, Eſſay on vital and involuntary Motion, p. 112, that the contraction of the pupil is not performed by the action of light upon the iris, but upon the retina; ſince whatever intercepts the rays of light, ſo as to prevent their reaching the retina, cauſes a preternatural dilatation of the pupil; becauſe in a cataract, where the cryſtalline humour, being conſiderably opaque, intercepts a great part of the rays, the pupil loſes a good deal of its contractile power. This author alſo obſerves, that the wideneſs of the pupil in a ſyncope, apoplexy, and confirmed gutta ſerena, ſhews that, in order to dilate the pupil to its largeſt ſize, no effort of the mind is neceſſary, but only the ſuperior contractile power of the longitudinal fibres of the uvea, when its circular muſcle is not excited into action by the ſtimulus of light on the retina. M. Mery informs us (Mem. Ac. Paris, for 1704) that, having plunged a cat in water, and expoſing her eye to the ſtrong light of the ſun, the pupil was not at all contracted by it; whence he infers, that the contraction of the iris is not produced by the action of the light, but by ſome other circumſtance. For he contends, that the eye in this ſituation receives more light than in the open air. M. de la Hire, in reply, endeavours to ſhew, (Mem. Ac. Par. for 1709) that fewer rays enter the eye under water, and that, in thoſe circumſtances, it is not ſo liable to be affected by them. Beſides, it is obvious to be remarked, that the cat muſt be in great terror in this ſituation; and being an animal that has a very great voluntary power over the muſcles of the iris, and being now extremely attentive to every thing about her, ſhe might have her eyes open, notwithſtanding the action of the light upon it, and though it might be very painful to her.

The figure of the pupil, in various animals, is wonderfully adapted to their various circumſtances and occaſions: in ſome, *e. gr.* in man, it is round, that form being fitteſt for the poſition of our eyes, and the various uſes we make of them in all directions.

In others, it is elliptical or oblong: in ſome of which, *e. gr.* the horſe, ſheep, ox, &c. the ellipſis is tranſverſe, and the fiſſure large, to enable them to ſee laterally, and even with a little light; and thereby both to gather their food the better in the night, and to avoid dangers on either ſide. In others, *e. gr.* the cat, the ellipſis is erect, and is alſo capable of opening very wide, and ſhutting very cloſe; by means of the latter of which ſtates, that animal can exclude all, but, as it were, a ſingle ray of light, and ſo avoid all the inconveniencies of the bright ſun; and by the former, it can take in all the fainteſt rays, and thus avoid the inconveniencies of the night: an incomparable proviſion for theſe animals, which are to watch and way-lay their prey both by day and night, to ſee upwards and downwards, to climb, &c. See Eye and Vision.

Pupil, *Cloſure of.* A preternatural ſmallneſs of the pupil always renders the patient incapable of diſcerning objects well at night-time, and occaſions a diminution of viſion. The conſequence of a complete cloſure of the pupil, a caſe termed *ſynizeſis*, is total blindneſs. Both theſe affections only differ from each other in degree, and they originate from the ſame cauſes. The moſt frequent cauſe is a violent inflammation of the eyes, particularly when ſuch diſorder extends to the iris, and ariſes at a period when the anterior and poſterior chambers of the aqueous humour contain none of this fluid. This caſe principally happens after the extraction of the cataract. Here the inflammation conſtantly affects the capſule of the cryſtalline lens, ſo as to make it opaque, and at the ſame time adhere behind the pupil to the iris; a circumſtance which is well deſerving attention. Not unfrequently, however, a cloſure of the pupil takes place during ophthalmy, notwithſtanding both chambers of the eye are full of the aqueous humour. Wounds of the iris ſometimes cauſe this unpleaſant occurrence, eſpecially when they continue open, and do not heal. It is obſerved to be moſt frequently produced by ſuch wounds as divide the radiated fibres of the iris tranſverſely. Theſe wounds, however, do not invariably remain open: ſometimes they cloſe, and then the pupil undergoes no alteration. Even when ſuch wounds do not unite, a cloſure of the pupil does not always follow. In theſe inſtances, the natural pupil has been remarked to become cloſed, and the preternatural aperture in the iris to be widened, when the eye was expoſed to the light; and, on the contrary, immediately the light was diminiſhed, the pupil became dilated, and the other opening was contracted and cloſed. Wounds of the iris in the other direction, even when they remain diſunited, often cauſe little or no diminution of the natural motion of the pupil.

It ſometimes happens, that a greater or leſſer portion of the iris is detached from the circumference of the cornea;

and, in this ſituation, an oval aperture is produced, through which the rays of light paſs into the eye. A complete cloſure of the pupil is uſually the conſequence of ſuch detachment of the iris. A blow on the eye, a kick of a horſe, or ſome other external violence, attended with a violent concuſſion of the eye, is the common cauſe of this detachment of the iris. Janin has ſeen it brought on by a prolapſus of the iris through an ulcerated opening in the cornea. The iris was kept in a ſtate of tenſion, and the patient was ſuffering conſtant pain in the eye; but, after a time, this pain ſuddenly ceaſed, when it was remarked, that the iris was torn from the upper edge of the cornea at five different points. The patient, who had been deprived of his ſight by the cloſure of the pupil, now recovered it again. Through the aperture, formed by a ſeparation of the iris from the cornea, patients commonly ſee diſtant objects tolerably well, notwithſtanding the opening is immoveable, and not in the centre of the eye; but, in general, they can ſee only a half of ſuch objects as are near. In caſes where the iris is thus detached, the pupil ſometimes continues open. Janin once noticed an alternate motion in the pupil and the preternatural opening. Between them the iris was thrown into folds, or wrinkles. Immediately a ſtrong light entered the eye, the wrinkles diminiſhed, the pupil contracted, and aſſumed a long narrow ſhape, while the preternatural opening grew larger and wider. In dark places, the latter became ſmaller, the pupil larger, and the part of the iris ſituated between them more wrinkled.

Sometimes the pupil becomes cloſed, in conſequence of a ſpaſmodic contraction of the iris. At firſt, the pupil is merely leſſened in diameter; the power of ſeeing decreaſes; and at length the eye is very ſenſible of the light, though not at all inflamed. At laſt, the pupil is entirely cloſed. This caſe preſents itſelf moſt frequently after operations for the cataract. The pupil occaſionally undergoes a gradual diminution after ſuch operations, and in the end is totally obliterated, without any particular cauſe, inflammation, or pain; and this event may happen ſeveral weeks, months, or years, after the time of thoſe operations. It is remarked by ſurgical writers, that ſuch perſons as frequently read for a long while, and attentively look at ſhining, bright, ſtrongly illuminated objects, run a riſk of being attacked with this diſorder. The pupil, which contracts itſelf very much during the inſpection of theſe objects, at length becomes habituated to a ſtate of contraction, and loſes all power of expanding itſelf. Richter obſerves, that this form of the complaint is termed *ſynizeſis ex conſuetudine.*

Infants are ſometimes born without pupils. In this caſe, the ſituation of theſe openings is occupied by the membrana pupillaris. By ſome this affection has been erroneouſly called *cataracta pupillaris:* as Richter obſerves, the term *ſynizeſis congenita* is much more applicable to it. A prolapſus of the iris is commonly attended either with a diminution, or a total cloſure of the pupil. When the iris is reduced in time, the pupil generally expands again; but when the reduction is not effected till after a certain period, this opening remains cloſed, and this notwithſtanding every portion of the iris be now replaced. A prolapſus of the vitreous humour ſometimes occaſions, and leaves after it, a contracted ſtate of the pupil. Every long continued deficiency of the aqueous, or conſiderable loſs of the vitreous humour, by whatſoever cauſe produced, is accompanied with riſk of a permanent diminution, or even a total cloſure of the pupil: hence it is often a ſymptom of *atrophia oculi.*

Sometimes, though the pupil is of proper dimenſions, it is obſtructed by extraneous matter. This caſe is termed *ſynizeſis ſpuria.* The ſubſtance producing the obſtruction, is either a portion of coagulated blood, which is the conſequence of an extravaſation of this fluid in the anterior chamber; thick matter from a ſuppuration within the eye; or the remains of a diſeaſed lens continuing after the operation of extracting the cataract. A white opaque membrane, like a cyſt, is ſometimes ſeen protruding through the pupil into the anterior chamber. The capſular cataract is occaſionally ſo moveable, that, when the head is inclined forwards, it enters the pupil, and partly comes into the anterior chamber; but returns into its former poſition, as ſoon as the head is inclined backward again. Mauchart aſſerts, that he has ſeen a fungous excreſcence growing from the edge of the iris, and filling up the pupil.

When the diminution or cloſure of the pupil is of long ſtanding, it can never be relieved, except by an operation, whatever may be the nature of the cauſe from which it originates. When the pupil has been for a long while in a diminiſhed or cloſed ſtate, it loſes entirely the power of expanding again, and continues leſſened, or ſhut, notwithſtanding the removal of the cauſe of the diſorder. If the affection be congenital, or the conſequence of inflammation, it can never be obviated except by an operation, however ſhort the period of its duration may be. When it ariſes from irritation of the iris, or from intenſe obſervation of ſhining, bright objects, and has not exiſted a long time, it may be cured without an operation. Alſo, in caſes where the operation is neceſſary, the mode of performing it differs according to circumſtances.

Patients who become afflicted, in conſequence of frequently obſerving bright, glittering objects, may obtain relief by a timely avoidance of every light that is too ſtrong, wearing green ſpectacles, viewing objects with an opera glaſs, and frequently waſhing the eye with ſome warm emollient liquor, eſpecially a decoction of mallows, hemlock, and poppy-heads. The peculiar virtue of the extract of belladonna, in making the pupil dilate, might here alſo be turned to great advantage. It is to be diluted and rubbed over the eye-lids and eye-brow, and allowed to remain applied a certain length of time every day. The ſame means are likewiſe proper in caſes, where the diſorder depends upon irritation. Richter ſpeaks favourably of the good effects of antimonial wine, and the extract of aconitum, as internal medicines, together with warm bathing and bliſters. Here the outward application of the extract of belladonna unqueſtionably merits a careful trial.

There is a preternatural contraction of the pupil, which alternately ariſes and then ceaſes again. This caſe ſometimes laſts only a few hours; ſometimes ſeveral days. During the attack, patients ſee more weakly than uſual, or cannot ſee but very little, according as the pupil happens to be more or leſs diminiſhed. In particular inſtances, the attacks come on at fixed times, and the complaint is then periodical. During the diſorder, the pupil ſeems to be affected with ſpaſm. Occaſionally, indeed, ſpaſmodic complaints, ſays Richter, take place at the ſame time in other parts. Here the diſeaſe is moſt commonly the conſequence of irritation ſeated in the abdominal viſcera, and requires aperient, and eſpecially emetic medicines. When theſe means prove ineffectual, it is at length neceſſary to reſort to the external and internal uſe of anodyne tonic remedies, valerian, bark, and ſmall doſes of ipecacuanha. The outward application of the extract of belladonna to the eye-brow and eye-lids promiſes alſo, in ſuch caſes, to be an uſeful auxiliary means. This ſort of cloſure of the pupil has been obſerved as a ſymptom of hyſteria.

The eminent Mr. Cheſelden firſt made the propoſal of perforating the iris, and alſo firſt put ſuch an operation in

 execution.

execution. He introduced a ſlender knife, about one line from the margin of the cornea, through the coats of the eye, into the poſterior chamber, and puſhed it through the iris in the ſituation of the cloſed pupil, ſo as to form in that membrane a ſmall longitudinal inciſion. It is alleged that this operation of Cheſelden's has been repeatedly performed, and for the moſt part unſucceſsfully. According to the obſervations of Janin and Warner, the inciſion did not dilate, and became ſhut up again ſoon after it had been made. In one example, Janin was prevented from completing the operation with accuracy, in conſequence of hemorrhage rendering the aqueous humour turbid. The plan of introducing the knife into the poſterior, inſtead of the anterior chamber, ſeems alſo to be diſadvantageous; for, in this laſt mode, the iris can be more eaſily got at, and nothing is injured except the inſenſible cornea. On the other hand, in Cheſelden's method, all the coats of the eye, the lens and its capſule, and the ciliary proceſſes, are all wounded. Beſides, as the point of the knife is concealed behind the iris, one can never be certain that it is preciſely oppoſite the place where the perforation of the iris ought to be made.

It was the opinion of Janin, that when the inciſion in the iris was made in a parallel direction to the radiated fibres of this membrane, it always very ſoon cloſed again; and, on the contrary, that when it was made acroſs theſe fibres, it not only dilated, but continued permanently open. He, therefore, uſed to operate as follows: he firſt divided the lower half of the cornea, as in the operation for the cataract; he then puſhed a finely pointed pair of ſciſſors into the iris, about one line from the lower edge of the cornea, and the inciſion was made in a perpendicular direction on the inſide of the pupil, without touching the pupil itſelf. The cut uſually became dilated immediately, and remained open. But care muſt always be taken to make the wound in the iris on the ſide of the pupil next the inner canthus, as making it on the oppoſite ſide might occaſion ſquinting. See Janin's Mémoires ſur l'Œil.

Wenzel's plan is more modern. The knife is introduced into the cornea in the manner uſually done in the operation for the cataract; but when it has approached within half a line of the place of the cloſed pupil, its point is to be depreſſed to the depth of half a line through the iris. Three-quarters of a line from this puncture, towards the inner canthus, the point is to be elevated again; and the inciſion of the cornea is then to be finiſhed, as in operating for the cataract. In this way, a cut is made in the iris, reſembling on a ſmall ſcale the inciſion on the cornea; that is to ſay, it is of a ſemilunar ſhape, and forms a ſmall flap; but it is rarely ſo ſmooth and even as that in the cornea. The flap is to be cut away with a ſmall pair of ſciſſors, ſo that a roundiſh aperture, which is ſure to remain open, is produced in the iris. When the flap cannot be got hold of, ſo as to admit of being removed with ſciſſors, a ſmall piece of the iris is to be cut out.

The method which we have next to take notice of, is that propoſed by the eminent Scarpa. He conceives, that the artificial pupil may be moſt eaſily made, by detaching a certain extent of the circumference of the iris, next the noſe, from the ciliary ligament, by means of a couching needle. Others object, however, that this mode is not only difficult, but that the aperture is hardly ever permanent.

The laſt way of operating, of which it remains for us to ſpeak, is that recommended by Mr. Gibſon. This ſurgeon begins by making a puncture in the cornea, with a broad cornea knife, within a line of the ſclerotica, to the extent of about three lines. All preſſure is now to be removed from the eye-ball, and the cornea knife gently withdrawn. The conſequence of this is, that a portion of the aqueous humour eſcapes, and the iris falls into contact with the opening in the cornea, and cloſes it, like a valve. A ſlight preſſure muſt now be made upon the upper and inner part of the eye-ball, and be gently increaſed, or varied in direction, till the iris gradually protrudes, ſo as to preſent a bag of the ſize of a large pin's head. This protruded portion muſt be cut off with a pair of fine curved ſciſſors, and, at the ſame time, all preſſure is to be removed. The iris will then recede within the eye, and the piece that has been removed will leave an artificial pupil more or leſs circular.

When the centre of the cornea is ſo opaque, that the rays of light cannot enter the pupil, and the circumference of that membrane is tranſparent, viſion may be materially improved by removing a portion of the iris oppoſite the undiſeaſed part of the cornea.

There can be no doubt that, with reſpect to the comparative merit of the preceding modes of operating, Gibſon's plan ought in general to be preferred, as being nearer and ſafer than the others. Conſult Sharp's Treatiſe of the Operations; Janin's Mem. ſur l'Œil; Wenzel on the Cataract; Scarpa ſulle Malattie degli Occhi, capo 16; Richter's Anfangſgrunde, &c. band. 3. kap. 9; Gibſon's Pract. Obſ. on the Formation of an artificial Pupil, &c.

Pupil, *Preternatural Dilatation of.* This affection, which is termed *mydriaſis*, is uſually a ſymptom of ſome other diſeaſe, and is hardly ever an original complaint. It occurs in very different degrees. Sometimes the pupil is ſo conſiderably expanded, that the iris can juſt be diſcerned, like a ſmall fold at the inner circumference of the margin of the cornea. In ſome caſes, the pupil is totally immoveable; in others, it retains a certain degree of motion. Not unfrequently, it has loſt its round ſhape, and become of an oblong, or angular figure. In particular caſes, the affection is only in one eye; in the majority of inſtances, it takes place in both. It is often accompanied with total blindneſs; occaſionally, though leſs commonly, the patient retains the faculty of ſeeing. In the latter caſe, the patient has an averſion to the light, or is even quite blind in the day. He is alſo in conſtant danger of being totally deprived of viſion in a gradual way by the gutta ſerena. (See Gutta Serena.) To ſome patients of this deſcription, all objects appear to be ſmaller and more diſtant than they are in reality. The following are the diſeaſes of which mydriaſis is commonly a ſymptom. 1. Amauroſis, or the gutta ſerena. Of this complaint, however, it is not an inſeparable and conſtant ſymptom, the pupil ſometimes retaining the power of motion, and being quite free from blemiſh; and in caſes where it is dilated and motionleſs, it now and then recovers its natural ſize and moveableneſs, although the amauroſis continues unchanged. 2. The cataract. Here mydriaſis happens under two different ſtates; namely, either when the cataract is adherent to the iris; or when the opaque cryſtalline lens is preternaturally thick and large. In the firſt caſe, it uſually happens that the pupil is at the ſame time incapable of motion, and irregular; in the ſecond, it ſometimes can move in a certain degree, and the iris is convex and preſſed forward toward the cornea. 3. Hydrophthalmia, or dropſy of the eye. Here the dilatation of the pupil ariſes immediately from the diſtended ſtate of the eye-ball, and with this the diſorder increaſes or ſubſides. (See Hydrophthalmia.) 4. In patients who are troubled with worms; who are in ſwoons, who are afflicted with hydrocephalus, apoplexy, or any comatoſe diſeaſe, the pupils are in general preternaturally

ternaturally dilated. In all ſuch caſes, the only indication is to endeavour to remove the original diſeaſe, of which the mydriaſis is merely a ſymptom.

In the caſe where mydriaſis is to be regarded as the only diſorder, the complaint ſeems to depend upon a weakneſs or paralyſis of the fibres which cloſe the pupil. Here it is commonly the conſequence of apoplexy, a blow on the eye, or a violent and ſudden diſtention of the pupil, as, for example, ſometimes happens in the extraction of a cataract. When the diſeaſe is of long ſtanding, there is little hope of cure, whatever may be the cauſe from which the complaint ariſes. When it is recent, the pupil will ſometimes regain the power of moving and contracting under the uſe of internal and external ſtimulating tonic remedies. The chief means of this claſs are, bliſters applied to the eye-brows, ethereal oil rubbed into the ſkin around the orbit, electricity, emetic medicines in ſmall and full doſes, and other ſimilar remedies, which are uſually preſcribed for the relief of paralytic affections of other parts. When theſe means prove unavailing, the practitioner muſt be content with recommending a palliative plan, which will be preſently noticed.

As the pupil naturally dilates in the dark, it follows, that when a perſon is kept a long while away from the light, a *mydriaſis ex conſuetudine* is produced, the pupil becoming habituated to the expanded ſtate, and loſing the power of contraction. In moſt inſtances, it gradually recovers its motion after the eye has been for a certain time expoſed to the light again. The light, however, muſt be allowed to get to the eye only by degrees, or elſe its ſudden operation on the eye, in the expanded ſtate of the pupil, would be apt to impair, or even deſtroy viſion altogether. When the pupil does not recover its power of motion, the patient muſt be ſatisfied with reſorting to palliative means. It has been remarked, that mydriaſis is ſometimes a congenital defect. All attempts at a radical cure muſt here be attended with extreme difficulty. When the light cannot be endured without inconvenience, the palliative plan is neceſſary. A blow on the eye ſometimes tears the pupil. The rent moſtly remains open, and the patient is in the ſame ſtate as if affected with mydriaſis. Here, as the laceration cannot be repaired, the indication is to prevent, by palliative means, viſion from being hurt by the too great ſtrength of the light.

Through a preternaturally dilated pupil the light enters the eye in ſuch quantity, that the patient is blinded. He not only ſees things very indiſtinctly in light places, but he alſo runs a riſk of being gradually entirely deprived of viſion, in conſequence of the too ſtrong action of the light upon the eye. The prevention of ſuch miſchief is the object of the palliative treatment. By it the light which falls upon the eye is to be diminiſhed, ſo that the patient may be enabled to ſee not only plainly and without inconvenience in light places, but alſo without any danger of loſing his ſight altogether. The uſual means recommended for this purpoſe are, eye-ſhades, by which the light, coming principally from above, is kept from entering the eye; black veils over the face; green ſpectacles, which leſſen the quantity of rays of light coming from objects which the patient is looking at; ſpectacles made with black cards, in the centre of which is left an opening of the ſize of the natural pupil. But the beſt and moſt proper means is a pair of tube-ſpectacles. This is a common pair of ſpectacles, which, inſtead of glaſſes, has adapted to its two rings two conical tubes, the baſes of which are to be put towards the eyes, and the narrower parts towards the objects which are looked at. Theſe tubes ought to be made of black leather, and they ſhould be three or four inches long. Their diameter at the baſe muſt be equal that of the circumference of the orbit; but their other ends need not be quite ſo wide. The edge of their baſes is to be cut in ſuch a way, that they will fit cloſely on the circumference of the orbit. The uſe of theſe tubes conſiſts in their keeping off all the rays of light coming laterally, and only admitting thoſe into the eye, which proceed from objects in the axis of viſion. Every ſurgeon will be able, according to circumſtances, to multiply and vary the contrivance here deſcribed. See Richter's Anfangſgr. der Wundarzneykunſt, band 3. kap. 10.

PUPILLARIS MEMBRANA, in *Anatomy*, a circular membrane, by which the pupil is cloſed during the greater part of utero-geſtation. See EYE.

PUPILLARITY, or PUPILLAGE, the ſtate of a pupil; in oppoſition to *puberty*.

PUPPET, in *Natural Hiſtory*. See AURELIA.

PUPPISOS, a name given by ſome authors to the os frontis. The future in this bone is alſo called by many anatomiſts the *futura puppis*.

PUPPOLA, in *Geography*, a town of Sweden, in the government of Ulea; 45 miles S. of Ulea.

PUPULÆ, a name uſed by ſome to expreſs the extremities of the fingers.

PUR, in *Geography*, a river of Ruſſia, which runs into the Tazovſkaia gulf. N. lat. 67° 40'. E. long. 78° 34'.

PUR *autre vie*, in our *Law-Books*, is uſed where lands are held for the life of another. See OCCUPANT, and TENANT.

PURA *Eleemoſyna*, *pure alms*, denotes a tenure, whereby the churchmen hold lands in Scotland, ſomewhat on the footing of the primitive clergy.

PURA *Haſta*. See HASTA.

PURALLA BAY, in *Geography*, a bay on the coaſt of Chili. S. lat. 42° 10'.

PURANA, the common name of a ſeries of poetical romances, conſidered among the Hindoos as ſacred works, the offspring of inſpired writers, communicated for the inſtruction and benefit of mankind. They are aſcribed, in their preſent form, to a celebrated man in the literary hiſtory of the Hindoos, whom they call Vyaſa. (See VYASA.) He is ſuppoſed to have reduced an immenſe maſs of inſpired writings into eighteen works, and to have arranged them as they now appear. The following are the titles of theſe eighteen books, to which the common denomination of Purana is appended when ſpoken of or referred to. 1. Brahm, or the Great One. 2. Padma, or the lotos. 3. Brahmanda. 4. Agni, or fire. 5. Viſhnu. 6. Garuda. 7. The transformations of Brahma. 8. Siva. 9. Linga. 10. Nareda. 11. Skanda. 12. Markandeya, or the immortal man. 13. Bhawiſhya, or the prediction of futurity. 14. Matſya. 15. Varaha. 16. Kurma. 17. Vamana. 18. Bhagavata. Of theſe, the firſt four relate to coſmogony; the next nine to the attributes and powers of the Deity. The ſixth is named after the vehicle or bird of Viſhnu, called Superna, as well as Garuda. (See SUPERNA.) See LINGA, for the myſterious ſymbol whence the ninth derives its name. Nareda, whoſe laws and hiſtory are detailed in the tenth, is a mythological ſon of Brahma. Skanda, the hero of the eleventh, is a name of *Kartikya*; ſee that article. The fourteenth and three following relate the hiſtories of four of the principal incarnations of Viſhnu the preſerver, called *Matſyavatara*, *Varahavatara*, *Kurmavatara*, and *Vamanavatara*. Under theſe articles reſpectively will be found a brief notice of the outline of their hiſtories. The eighteenth, called Sri Bhagavata, is the life of Kriſhna, (ſee KRISHNA,) with

with which the poet Vyaſa is popularly imagined to have crowned the whole ſeries; though ſome reaſonably aſſign them different compoſers; and the ſeries is differently arranged and named by other authorities. Every Purana treats of five ſubjects. 1. The creation of the univerſe. 2. Its progreſs, and the renovation of the worlds. 3. The genealogy of gods and heroes. 4. Chronology, according to a fabulous ſyſtem. 5. Heroic hiſtory, containing the achievements of demigods and heroes. Since each Purana contains a coſmogony, with mythological and heroic hiſtories, they may, not unaptly, be compared to the Grecian theogonies.

A copy of, we believe, all the eighteen mythological poems, is preſerved in the library of the Eaſt India houſe. It is eſtimated that the whole cannot conſiſt of leſs than half a million of ſtanzas. Hitherto no tranſlation of any of them, or of any conſiderable portion of either, hath been made from the original into any European language. They are, of courſe, written in the Sanſcrit tongue. In ſome articles of this work a ſtanza, or a brief outline of ſome of the Puranic tales, elucidatory of the character or ſubject under diſcuſſion, is occaſionally introduced, and may perhaps give ſome little idea of the ſtyle of theſe extravagant poems. The reader, in this view, may conſult the following, in addition to the other articles herein and thence referred to; JAMBAVANTA, KALPA, KARSHAGNI, KRITIKA, LILESWARA, LOTOS, MERU, MUNI, NAKSHATRA, NARAMEDHA, PAVAKA, PAVANA, PIKESWARI, POLLEAR, PRITHU, &c. &c.

As to theſe extravagant, and not always decent, tales of the Puranas, the probability is that phyſical or hiſtorical facts are thus connected under a veil of allegory, carried through a ſeries of poetical narratives and adventures, related of the perſonified attributes of the Deity. The facts are either forgotten, or unknown to the vulgar; but the fables remain, and are generally and commonly alluded to in compoſition and converſation. Taken literally, as the tranſactions of divine or holy perſons, nothing (bating the invention, imagery, and other poetical merits) can be more contemptible than theſe Puranic romances; but if we deſire to extract the grains of ore that the maſs may probably contain, we muſt be content to examine them as they are; and in caſe of failure, many inquiſitive reſearchers will deem their labour not loſt, in the invention and other poetical beauties abounding in theſe wild compoſitions.

We ſhall briefly give an abſtract of the contents of two or three of the Puranas, whence a judgment may be formed of the others. The Agni Purana is feigned to have been delivered by Agni, or Pavaka, the god of fire. (See PAVAKA.) It contains a great variety of ſubjects, and ſeems to have been intended as an epitome of Hindoo learning. The poem opens with a ſhort account of the ſeveral incarnations of Viſhnu, an enumeration of which, with a brief outline of their hiſtory, will be found in the article VISHNU of this work, and thoſe thence referred to. It dwells, however, chiefly on the incarnations of *Kriſhna* and *Rama*. (See theſe articles.) Then follow a hiſtory of the creation; a tedious diſſertation on the worſhip of the gods, with a deſcription of their images, and directions for conſtructing and ſetting them up; a conciſe deſcription of the earth, particularly of thoſe places which are eſteemed holy, with the forms of worſhip to be obſerved at them; a treatiſe of aſtronomy, or rather aſtrology; a variety of incantations, charms, and ſpells, for every occaſion. One ſpecies of this is named *mantra*, under which article a ſufficient account is given of them; computations of the periods called *manwantara*, *kalpa*, &c. (ſee KALPA); a deſcription of the ſeveral religious modes of life called *aſrama*, and the duties to be performed in each; rules for penance (on this head ſee TAPAS); feaſts and faſts to be obſerved throughout the year; rules for beſtowing charity; a diſſertation on the great advantages to be derived from the myſtic word OM (under which article of this work the reader will probably find ſufficient of myſticiſm), with a hymn to Variſhta, of whom ſomething occurs under that article. The next head relates to the office and duties of princes; under which are given rules for knowing the qualities of men and women; for chooſing arms and enſigns of royalty; for the choice of precious ſtones; and a treatiſe on the art of war. The next head treats of worldly tranſactions between man and man, as to buying and ſelling, borrowing and lending, giving and receiving, &c. &c. Then follow certain ordinances, according to the Veda, reſpecting ſecurity from misfortunes, &c. and for the worſhip of the gods. Genealogies of the two races of ſolar and lunar kings, called Suryavanſa and Chandravanſa (ſee SURYA); of the family of Yadu and of Kriſhna, with a ſhort hiſtory of the twelve years' war, deſcribed in the Mahabarat. (See MAHABARAT.) A treatiſe on the art of healing, as applicable to man and beaſt, with rules for the management of elephants, horſes, and cows; charms and ſpells for curing various diſorders; and the mode of worſhipping certain divinities; on the letters of the Sanſcrit alphabet; on the ornaments of ſpeech, as applicable to oratory, poetry, and the drama; on the myſtic ſignification of the ſingle letters of the Sanſcrit alphabet; a grammar and ſhort vocabulary of that language. The whole of this deſultory work is divided into 353 ſhort chapters.

The Siva Purana is ſometimes called alſo, after one of the forms of his conſort, the Kalika Purana. (See KALI.) It is a mythological hiſtory of that goddeſs, including her adventures under various names and characters. Many of thoſe names and characters are enumerated under the article PARVATI, her more common name; and Mr. Moor has given an extract under *Naramedha*, which word means a man-ſacrifice, the rites and ceremonies of that horrid offering being minutely laid down in this Purana. It is a curious and entertaining work, including as epiſodes ſeveral beautiful allegories, particularly one founded on the motions of the moon. See Moor's Hindu Pantheon.

The Vayu Purana, as one of theſe poetical romances is variouſly called, but *which* we have not the means at this moment of aſcertaining, is attributed to the regent of wind Vayu, otherwiſe and more commonly called Pavana (ſee PAVANA); where the reaſon is ſurmiſed why the Purana is not called after that name. It contains, among a variety of other curious ſubjects, a circumſtantial detail of the creation of all things, celeſtial and terreſtrial, with the genealogy of the firſt inhabitants; chronological computations as to the grand periods *manwantara*, *kalpa*, &c. before ſpoken of; a deſcription of the earth, as divided into iſlands, continents, &c. and its dimenſions, and alſo of other planets and fixed ſtars, their diſtance, circumference of orbits, &c. &c. Under the article PAVANA, an extract is given from the Matſya Purana, directing how images or pictures are to be made of the god of wind. Moſt of the Puranas contain directions of that ſort.

A brief notice of one other of theſe inſpired works will ſuffice. The Nareda Purana is believed to have been delivered by the inſpired Nareda, a mythological ſon of Brahma. Under the article *Nareda*, (ſee Hindu Pantheon) an account is given of him, with his genealogy, and the derivation of his name, from the Varaha Purana. Like the others, this poem opens with deſcribing "how heaven and earth roſe out of chaos;" but it treats principally of the unity of God, and as it ſectarially is written with the Vaiſhnava bias (ſee VAISHNAVA),

NAVA), it deſcribes Viſhnu as the Deity. On this point, ſee SECTS *of Hindoos*. It argues that all other gods are but emblems of the works of Maha Viſhnu, and the female deities, or ſaktis, emblems or perſonifications of his powers. Other Hindoo ſects ſay the ſame of the deity of their excluſive worſhip, as noticed under KRISHNA, RAMA, SIVA, &c. It ſtates that the worſhip of the Trimurti, or either of the triad (ſee TRIMURTI), whether the creator, preſerver, or regenerator, is in effect worſhipping of Viſhnu. This Purana concludes with rules for the ſeveral tribes in their ſpiritual and temporal conduct through life.

Theſe voluminous and certainly curious poems, are held in the general eſtimation of the Hindoos, as ſecond only to the Veda, their immediate ſcripture. (See VEDA.) In each of the Vedas are certain paſſages interſperſed, relating chiefly to coſmogony, which are called Purana, but are wholly different from the eighteen mythological poems, the ſubject more eſpecially of this article.

With reſpect to the age of the Puranas, orientaliſts differ widely. Sir W. Jones ſatisfied himſelf that they have been written about 2500 years. He does not ſtate preciſely the mode of reaſoning, by which he arrived at this concluſion; he gives, however, the outline of the proceſs, and aſks the public to give him credit for a few very curious facts, which, although, he ſays, capable of ſtrict proof, could then be only aſſerted. We are not aware that the proofs were ever ſubmitted to the public; and whatever they were, they have not wrought conviction on the minds of all. Mr. Colebroke, however, (Aſ. Reſ. vol. vii.) leaves us to infer that he thought them very little inferior in point of antiquity to the age aſſigned them by his illuſtrious predeceſſor in the chair of the Aſiatic Society. Mr. Wilford expreſsly ſays, that "the Puranas are certainly a modern compilation from valuable materials, that I am afraid no longer exiſt: an aſtronomical obſervation of the heliacal riſing of Canopus, mentioned in two of the Puranas, puts this beyond doubt." (Aſ. Reſ. vol. v.) Mr. Bentley, after giving various reaſons and calculations for the foundation of his opinion, ſays, "It muſt be evident that none of the modern romances, commonly called the Puranas, at leaſt in the form in which they now ſtand, are older than 684 (now 1813, about 695) years, but that ſome of them are the compilations of ſtill later times." (Ib. vol. viii.) As far, indeed, as the eighteenth Purana, called Sri Bhagavat, is concerned, Mr. Colebroke countenances Mr. Bentley's opinion. "I am inclined," he ſays, "to adopt an opinion ſupported by many learned Hindoos, who conſider the celebrated Sri Bhagavata as the work of a grammarian, ſuppoſed to have lived about 600 years ago." Ib. (See SRI BHAGAVAT.) Be this as it may, the orthodox Hindoos have implicit faith in, and great veneration for, thoſe celebrated poems, or "ſacred hiſtories," as they call them; and it is authoritatively aſſerted, that "the Veda, the revealed ſyſtem of medicine, the Puranas, and the code of Menu, are four works of ſupreme authority, which ought never to be ſhaken by arguments merely human. (See MENU.) There are, however, many individuals of all the four tribes of Hindoos, feweſt certainly in that of Brahmana, who correſpond with the Levites of Iſrael, who deny the divine origin of the Puranas, looking upon them in nearly the ſame light as a rational critic of Europe may do.

PURANGURRAH, in *Geography*, a town of Bengal; 20 miles S.E. of Iſlamabad.

PURARI, a name of the Hindoo deity *Siva*; which ſee.

PURARYA, in *Geography*, a town of Hindooſtan, in Oude; 32 miles N. Kairabad.

PURBACH, GEORGE, in *Biography*, an eminent mathematician and aſtronomer in the 15th century, was born at Purbach, a town on the confines of Auſtria and Bavaria, in 1423. He was educated at Vienna, where he manifeſted great talents, and took his degree of M. A. with great applauſe. He directed his attention principally to mathematics, and advanced in that ſcience with almoſt incredible rapidity. For farther improvement, he viſited the moſt celebrated univerſities of Germany, France, and Italy. He found a particular friend and patron in cardinal Cuſa, and he formed an intimacy with John Blanchini of Bologna, who admiring Purbach's extenſive knowledge, and his ready method of communicating inſtruction, wiſhed to prevail upon him to deliver lectures on aſtronomy at Ferrara; but Purbach preferred returning to Vienna, where he obtained the mathematical profeſſorſhip in that univerſity. About this time he received offers from Ladiſlaus, king of Hungary, to become his aſtronomer, accompanied with promiſes of liberal rewards and diſtinguiſhed honours, which he declined.

The fame of Purbach, as a mathematical profeſſor, was ſoon widely diffuſed, and brought numerous ſtudents to attend his lectures at Vienna. Among others was the celebrated Regiomontanus, who ſecured the eſteem of his maſter, and was choſen the aſſiſtant and companion in his labours. From this time they maintained an union of ſtudies, in their endeavours to improve the different branches of mathematical ſcience, and more particularly aſtronomy. This ſcience they would, no doubt, have materially improved by their joint labours, had Purbach's life been prolonged. His firſt eſſay was to amend the Latin tranſlation of Ptolemy's Almageſt. After this he wrote "An Introduction to Arithmetic," and proceeded to draw up another "On Gnomonics," or dialling, with tables ſuited to the difference of climates and latitudes. This was followed by a ſmall tract "Concerning the Altitudes of the Sun," with a table, and "Aſtrolabic Canons." After this he made ſolid ſpheres, or celeſtial globes, and not only explained their conſtruction and uſes, but added to them a new table of fixed ſtars, with the longitude by which every ſtar had increaſed, from the time of Ptolemy to the middle of the fifth century. He alſo invented various other inſtruments, among which was a "gnomon," or geometrical ſquare, with canons, and a table for the uſe of it, which he ſent to the archbiſhop Strigonia, who was himſelf a man of great erudition, and entertained a high opinion of Purbach. Our author made conſiderable improvements in trigonometry; prepared tables of the fixed ſtars, and undertook to reform thoſe of the planets, and conſtructed ſome entirely new ones. When theſe tables were finiſhed, he drew up a kind of perpetual almanack, chiefly for the moon, anſwering to the periods of Meton and Calippus: alſo an almanack for the planets, or, as it was afterwards called, an Ephemeris for many years. He finiſhed his "Theoriæ Novæ Planetarum," (ſee MULLER,) which was made a textbook in all the ſchools, and was commented upon by ſome of the moſt eminent mathematicians. Purbach died in the 38th year of his age, in 1461.

PURBECK, *Iſle of*, in *Geography*, a diſtrict in the Blandford diviſion of the county of Dorſet, England, is bounded on the weſt by Luckford lake; on the ſouth by the Britiſh channel; and on the other ſide by the river Frome, and the bay of Pool. It is improperly called an iſland, being in fact only a peninſula, as it may be entered from Eaſt Lulworth by an iſthmus, between the head of Luckford lake and the ſea. This diſtrict extends twelve miles in length, and varies from ſeven to ten in breadth.

It

It includes two hundreds, called Hazler and Rowbarrow, the former comprehending the eaſtern diviſion of the iſle, and the latter the weſtern. Theſe are ſubdivided into nine pariſhes, and contain one town, Corſe-caſtle, and ſeveral large villages and hamlets. The ſoil is every where calcareous; but the ſurface is much diverſified by hill and dale. The quarries, ſhores, and cliffs, on the ſouth ſide of the iſle in particular, afford an inexhauſtible fund of natural curioſities. Near Kington, Worth, Langton, and Swanwich, are extenſive quarries of freeſtone; and in many parts is a ſtone that riſes thin, and is uſed for tiling; alſo a hard paving ſtone, much of which was uſed in rebuilding London after the fire, and in paving the ſtreets and courts. At Swanwich is a white ſtone full of ſhells, which takes a high poliſh, and looks like alabaſter; and near Dunſhay is dug up marble of various colours, but chiefly a grey kind, formed by a congeries of ſhells, and anciently much uſed for grave ſtones and monuments. It was likewiſe very generally employed for ſmall columns in the churches which were erected during the 13th century. The cornua ammonis are frequently diſcovered here, ſome of them two or three feet in diameter.

In ancient times the whole of this iſle was a foreſt, and was well ſtocked with red and fallow deer, and ſtags, eſpecially in the weſt parts; but theſe were almoſt entirely deſtroyed in the civil wars. James I. was the laſt of our kings who hunted here. The whole iſle was till lately governed by a lord-lieutenant, who was admiral of the iſle, and had power to raiſe and muſter a militia; but this office ceaſed when the regular militia act was paſſed. Formerly there were many gentlemen's ſeats diſperſed all over the iſle; which were probably built for the reception and accommodation of the nobility and gentry who attended the royal hunts, as moſt of the owners of eſtates in this part of the country had their principal ſeats elſewhere, and only came hither in the hunting ſeaſons. Theſe are now almoſt, without exception, converted into farm-houſes. For an account of the only town in Purbeck, ſee CORFE-CASTLE. Hutchins's Hiſtory and Antiquities of the County of Dorſet, 2d edit. by Gough. Beauties of England and Wales, vol. iv. by John Britton, and E. W. Brayley.

PURBECK *Stone*, the *ſaxum arenarium cinereum Purbecenſe* of Da Coſta, and *pſadurium friabile albido fuſcum* of Hill, is an alkaline ſand-ſtone, which is harſh and rough, of a diſagreeable aſhen colour, very heavy, and moderately hard, of a texture not very compact, but ſomewhat porous, and is compoſed of an angular grit, cemented together by an earthy ſpar: it cuts freely, and with a tolerable even or ſmooth ſurface, but will not take a poliſh. It will not ſtrike fire with a ſteel, and burns to a white colour. The quarries of this ſtone are in the iſland of Purbeck, in Dorſetſhire, whence it is brought to London in great quantities, and uſed in building, and for pavements. Its ſpecific gravity is 2.68. There is alſo another kind of Purbeck ſtone, the *ſaxum fuſco-albidum* of Da Coſta, and the *ſympexium duriſſimum, ſplendidum albido-fuſcum* of Hill, which is alkaline, of a dull, diſagreeable, pale, browniſh, white colour, and is not capable of a poliſh, though it cuts to a very ſmooth ſurface: it is of a fine, cloſe, compact texture, not quite deſtitute of brightneſs, but full of ſparks of pure ſpar, and intimately mixed with vaſt quantities of ſmall pectunculi, which are often ſaturated and filled with the ſame ſubſtance; it is very heavy and hard, and water does not pervade its texture; it does not ſtrike fire with ſteel, and when burnt, acquires a clear aſhen colour. This ſtone is brought from Purbeck, and uſed in building, pavements, &c. Hill informs us, that it is likewiſe found in many other parts of the kingdom, and that there are large ſtrata of it in Yorkſhire. Da Coſta's Foſſils, p. 128—152.

PURBUTTY, in *Geography*, a river of Hindooſtan, which runs into the Chumbul; ſeven miles W. of Suiſopour, in the country of Agimere.

PURCARI, a town of European Turkey, in Beſſarabia, on the Dnieſter; 4 miles S.E. of Bender.

PURCELAIN. See PORCELAIN.

PURCELL, HENRY, in *Biography*, an Engliſh muſician of more extenſive genius than perhaps our country can boaſt at any other period of time, was born in 1658. His father, Henry, and uncle, Thomas Purcell, were both muſicians, and gentlemen of the chapel royal, at the reſtoration of king Charles II. There is a three-part ſong in Playford's "Muſical Companion," by Henry Purcell, which, being printed in 1667, when our great muſician was but nine years old, muſt have been the production of his father. There is likewiſe a chant in the firſt volume of Boyce's Collection, p. 289, N° II, called the "burial chant," by Thomas Purcell, his uncle, who continued in the ſervice of the chapel till the time of his death, in 1682. Though theſe compoſitions promiſe no great hereditary genius, they are mentioned here, as mankind is naturally curious concerning every thing that is connected with eminent perſons.

From whom Henry received his firſt inſtructions in muſic, cannot be very clearly aſcertained. But his father dying in 1664, when he was no more than ſix years old, it is probable he was qualified for a choriſter by Capt. Cook, who was maſter of the children from the reſtoration till the time of his death, in 1672. For, as Purcell was appointed organiſt of Weſtminſter Abbey at eighteen years of age, he muſt have learned the elements of his art before his fourteenth year, at which time Pelham Humphrey, brought up in the royal chapel under Capt. Cook, was appointed his ſucceſſor, as maſter of the boys. Purcell certainly continued to ſing in the king's chapel, and to receive leſſons from Humphrey till his voice broke, an accident which uſually happens to youth at ſixteen or ſeventeen years of age: after this, perhaps, he had a few leſſons in compoſition from Dr. Blow, which were ſufficient to cancel all the inſtructions he had received from other maſters, and to occaſion the boaſt inſcribed on the tomb-ſtone of Blow, that he had been

"Maſter to the famous Mr. Henry Purcell."

But there is nothing more common than this petit larceny among muſicians: if the firſt maſter has drudged eight or ten years with a pupil of genius, and it is thought neceſſary, in compliance with faſhion or caprice, that he ſhould receive a few leſſons from a ſecond, he inſtantly arrogates to himſelf the whole honour, both of the talents and cultivation of his new ſcholar, and the firſt and chief inſtructor is left to ſing, *ſic vos non vobis*.

Purcell is ſaid to have profited ſo much from his firſt leſſons and cloſe application, as to have compoſed, during the time of his being a ſinging boy in the chapel, many of his anthems, which have been conſtantly ſung in our cathedrals ever ſince. Eighteen was a very early age for his being appointed organiſt; that is, maeſtro di capella of Weſtminſter Abbey, one of the firſt cathedrals in the kingdom for choral compoſitions and performance. It was not likely he would ſtop here: the world is, perhaps, more partial to promiſing youth than accompliſhed age: and at twenty-four, in 1682, he was advanced to one of the three places of organiſt of the chapel royal, on the death of Edward Low, the ſucceſſor of Dr. Chriſtopher Gibbons, in the ſame ſtation.

After this, he produced ſo many admirable compoſitions for the church and chapel of which he was organiſt, and where he was ſure of having them better performed than elſewhere, that his fame was ſoon extended to the remoteſt parts of the kingdom.

From this time, his anthems were eagerly procured, and heard with pious rapture wherever they could be performed; nor was he ſuffered long to devote himſelf totally to the ſervice of the church. He was, very early in life, ſolicited to compoſe for the ſtage, and chamber, in both which undertakings he was ſo ſuperior to all his predeceſſors, that his compoſitions ſeemed to ſpeak a new language; yet, however different from that to which the public had been long accuſtomed, it was univerſally underſtood. His ſongs ſeem to contain whatever the ear could then wiſh, or heart could feel.

We have been aſſured by a very good judge of muſic, who was nineteen years of age when Purcell died, and remembered not only his perſon very well, but the effect which his ſongs had on himſelf and the public at that time, when many of them were firſt heard; and uſed to ſay, that "no other vocal muſic was liſtened to with pleaſure, for near thirty years after Purcell's death; when they gave way only to the favourite opera ſongs of Handel."

The unlimited powers of this muſician's genius embraced every ſpecies of compoſition that was then known, with equal felicity. In writing for the church, whether he adhered to the elaborate and learned ſtyle of his great predeceſſors Tallis, Bird, and Gibbons, in which no inſtrument is employed but the organ, and the ſeveral parts are conſtantly moving in fugue, imitation, or plain counterpoint; or, giving way to feeling and imagination, adopted the new and more expreſſive ſtyle of which he was himſelf one of the principal inventors, accompanying the voice-parts with inſtruments, to enrich the harmony, and enforce the melody and meaning of the words, he manifeſted equal abilities and reſources. In compoſitions for the theatre, though the colouring and effects of an orcheſtra were then but little known, yet as he employed them more than his predeceſſors, and gave to the voice a melody more intereſting and impaſſioned than, during the ſeventeenth century, had been heard in this country, or perhaps in Italy itſelf, he ſoon became the darling and delight of the nation. And in the ſeveral ſpecies of chamber muſic which he attempted, whether ſonatas for inſtruments, or odes, cantatas, ſongs, ballads, and catches, for the voice, he ſo far ſurpaſſed whatever our country had produced or imported before, that all other muſical productions ſeem to have been inſtantly conſigned to contempt or oblivion.

As many of his numerous compoſitions for the church, particularly thoſe printed in the ſecond and third volumes of Dr. Boyce's Collection, are ſtill retained in the king's chapel, and in our cathedrals, we ſhall here acquaint the muſical reader in what manner we have been affected by ſome of theſe productions, in a late attentive peruſal of them.

It appears by Dr. Bayley's "Collection of the Words of Anthems uſed in his Majeſty's Chapel Royal," that ten of Purcell's are ſtill performed there; and in the late Rev. Mr. Maſon's "Copious Collection of the Words of ſuch Anthems as are uſed in the Cathedral of York," that nearly twenty of his choral compoſitions are ſtill ſung in that choir.

Purcell's four-part anthem, "O God, thou art my God," (Boyce's Collection, vol. ii. p. 148.) muſt certainly have been one of his juvenile productions, before he had ſufficiently refined his ear, or exerciſed his judgment; as there are many crude harmonies, and falſe accents in it, which in riper years he would not have tolerated.

Of his ſix-part anthem, "O God thou haſt caſt us out," the firſt movement, in which there are many bold harmonies, is extremely elaborate, yet ſpirited and pleaſing. The verſe, "O be thou our help," is not only full of new and fine effects, but touching. By thoſe who object not to the confuſion in the words which ariſes from fugue and imitation, while the ſeveral parts are ſinging different portions of the ſame ſentence, at the ſame time, the words will appear perfectly well accented and expreſſed.

The firſt movement of his full anthem in eight parts, "O Lord God of hoſts," is a noble compoſition, *alla Paleſtrina*, in which all the laws of fugue upon two, and ſometimes more, ſubjects, are preſerved inviolable; the harmony, though bold, is, in general, chaſte, and the effect of the whole ſpirited and majeſtic. The ſecond movement is extremely pathetic and expreſſive; but, both in that and the laſt movement, he ſeems trying experiments in harmony; and, in hazarding new combinations, he ſeems now and then to give the ear more pain than pleaſure.

The two-part anthem, "Thy way, O God, is holy," continues to be excellent muſic ſtill, in the ſlow movements; the quick, however, ſeems ſomewhat antiquated, and the melody to theſe words, "the air thundered," &c. ſeem too light and dramatic for the church at any period.

The three-part anthem, "Be merciful unto me, O God," is admirable throughout. Indeed, to our conceptions, there ſeems no better muſic exiſting, of the kind, than the opening of this anthem, in which the verſe, "I will praiſe God," and the laſt movement, in C natural, are in melody, harmony, and modulation, truly *divine muſic*.

The complete ſervice of Purcell, in B flat, printed by Boyce, is a moſt agreeable and excellent piece of counterpoint, of which the modulation frequently ſtimulates attention by unexpected tranſitions, yet of ſo ſober a kind as never to give the ear the leaſt uneaſineſs, till we come to the bottom of p. 110, and then the ſame crudities of the ſharp 3d and flat 6th, and flat 3d, 4th, and 5th, which we have already cenſured in the works of Dr. Blow, occur; which we hope, in ſpite of our partiality for Purcell, the organiſts of our cathedrals ſcruple not to change for better harmony.

Theſe two or three combinations, like ſome words and phraſes which Shakſpeare tried unſucceſsfully to render current, have been rejected by poſterity; and it is in vain to attempt at forcing them upon the public by the mere weight of authority. The ear will patiently bear very rough uſage from an artiſt who in general makes it ſuch ample amends; however, there are limits, beyond which it is unſafe to exerciſe cruelty of all kinds; and the auricular ſenſe will be deadened, diſguſted, or rendered indifferent to muſic's powers, by too harſh treatment.

The "Benedictus," as well as "Te Deum," and all the reſt of the ſervice, muſt be extremely pleaſing, in all other reſpects, to every ear ſenſible to harmony. The words are, in general, accented with great accuracy (except the contracting *higheſt* into a monoſyllable, to which only one note is given); and the few points of imitation are fragments of agreeable melody. In p. 121 of Boyce, the A ♭ and A ♮, at the word *beſeech*, in the Kyrie, are peculiarly beautiful, as are the 7th with the 9th at "before all worlds," in the creed, and the cloſe at "by whom all things were made." The point at "throughout all generations," in the Magnificat, is what the Italians call *ben tirato*, well-worked. In the laſt line, however, of page 132, ſo many exceptionable combinations

nations occur, that we cannot paſs them over without a ſtigma. Yet, upon the whole, the abilities of Purcell, as a profound contrapuntiſt, appear perhaps more in the courſe of this ſervice than elſewhere; as he has manifeſted deep ſtudy and meditation in a ſpecies of writing to which it was not likely that his creative and impetuous genius would ſubmit, having had the patience, as well as abilities, to enrich it with no leſs than four different canons, of the moſt difficult conſtruction, as of two, three, and four in one, by inverſion.

The ſuperior genius of Purcell can be fairly eſtimated only by thoſe who make themſelves acquainted with the ſtate of muſic previous to the time in which he flouriſhed; compared with which, his productions for the church, if not more learned, will be found infinitely more varied and expreſſive; and his ſecular compoſitions appear to have deſcended from another more happy region, with which neither his predeceſſors nor contemporaries had any communication.

Beſides the whole ſervice, with three full, and ſix verſe anthems, in Dr. Boyce's Collection, there are nine verſe and full anthems, wholly different, ſtill ſung in the cathedral at York. And in Dr. Tudway's Collection, Britiſh Muſeum, there are, beſides a whole ſervice in B flat, different from that in Boyce, eight full and verſe anthems, different from all the reſt, four of which were compoſed for the chapel royal of Charles II., and are accompanied with inſtruments. And ſtill, excluſive of theſe and the hymns printed in the two books of "Harmonia Sacra," in a manuſcript bequeathed to Chriſt-church college, Oxon. by Dr. Aldrich, there are two motets, and a "Gloria Patri" for four and five voices, in Latin, with ſeven pſalms and hymns for three and four voices, by our fertile and diligent compoſer, that have all their peculiar merit, but of which ſome may, without hyperbole, be ſaid to reach the true ſublime of ſacred muſic.

To enter into a minute examination of theſe, and his admirable Te Deum and Jubilate, compoſed for St. Cecilia's day, 1694, would extend this article to too great a length; though they merit much praiſe as well as critical remark; for which, on the Te Deum we refer our readers to the ample account of him and his works, in Burney's Hiſtory of Muſic, vol. iii.

Purcell's theatrical compoſitions, if we recollect the number and excellencies of his productions for the church, and the ſhortneſs of his life, will ſurpriſe by their multiplicity as well as ſingular merit. Of thoſe dramas which are called operas, and of which muſic and decorations were the principal allurements held out to the public, a detailed account is given in ſpeaking of the origin and progreſs of the muſical drama in England, previous to the uſe of the Italian language, muſic, and performers on our lyric ſtage. (See MASQUES, and MATTHEW LOCK.) And of Purcell's detached and incidental ſongs, dialogues, and ſcenes that were performed at our national theatre, or playhouſe, the principal will be mentioned in ſpeaking of his "Orpheus Britannicus," or poſthumous collection of his miſcellaneous compoſitions. But before we enter on an examination of this work, it ſeems neceſſary to acquaint the reader, that the chief part of his inſtrumental muſic for the playhouſe is included in a publication that appeared two years after his deceaſe, under the title of "A Collection of Ayres compoſed for the Theatre, and on other Occaſions, by the late Mr. Henry Purcell. London, printed for Frances Purcell, Executrix of the Author, 1697." Theſe airs are in four parts, for two violins, tenor and baſe, and were played as overtures and act-tunes in our own memory, till they were ſuperſeded by Handel's hautbois concertos, and thoſe, by his overtures, while Boyce's ſonatas, and Arne's compoſitions, ſerved as act-tunes. In proceſs of time theſe were ſupplanted by Martini's concertos and ſonatas, which were thrown aſide for the ſymphonies of Van Maldere, and ſonatas of the elder Stamitz. About this time, the trios of Campioni, Zanetti, and Abel, came into play, and then the ſymphonies of Stamitz, Canabich, Holtzbauer, and other Germans, with thoſe of Bach, Abel, and Giardini; which, having done their duty many years very pleaſantly, "ſlept with their fathers;" and at preſent give way to Vanhall, Boccherini, Haydn, and Pleyel. "Sic tranſit gloria muſicorum!"

Purcell ſeems to have compoſed introductory and act-tunes to moſt of the plays that were brought on the ſtage during his time. The publication of theſe, in four parts, contains his muſic to the following dramas:

"Abelazor," 1677. The muſic of this conſiſts of an overture, and eight airs or tunes.

"The Virtuous Wife," 1680. Overture and ſeven airs.

"Indian Queen." The firſt movement of this overture is equal to any of Handel's. There are likewiſe two or three trumpet-tunes, well calculated for the inſtrument, and a rondeau at the end, which would now ſeem new, if played in a concert by a good band.

"Diocleſian, or the Propheteſs," 1690. The inſtrumental muſic of this Engliſh opera given here, conſiſts of an overture of two movements, the firſt excellent in the ſtyle of Lulli, and afterwards of Handel, with better fugues; *preludio*, accompaniment to a ſong, trumpet-tune, air, hornpipe, country-dance, and *canaries*.

"King Arthur," 1691. Overture and twelve tunes.

"Amphitrion," 1691. Overture and eight tunes.

"Gordian Knot untied," 1691. Overture and ſeven tunes.

"Diſtreſſed Innocence, or the Princeſs of Perſia," 1691. Overture and ſeven tunes, all proofs of the author's original genius.

"The Fairy Queen," 1692. Two overtures and ſixteen tunes of different kinds. N° 12, an air, 4 in 2, is a very curious canon on two ſubjects: the firſt treble and baſe performing one, and the ſecond and tenor the other. There is as much accent and ſpirit in this compoſition, as if it were in free counterpoint.

"The Old Bachelor," 1693. Overture and eight tunes.

"The Married Beau," 1694. Overture and eight tunes, among which is a very agreeable air for the trumpet, a march, and a hornpipe, that are characteriſtic. This laſt is very much in the ſtyle of a Spaniſh fandango.

"The Double Dealer," 1694. Overture and ten tunes. N° 6 and 9, pretty and curious.

"Bonduca," 1695. Overture and eight tunes, including "Britons ſtrike home," and "To arms," in four parts.

Theſe are the contents of this poſthumous publication; but beſides the muſic for theſe dramas, he compoſed overtures, act-tunes, and ſongs, for "Timon of Athens," 1678; for "Theodoſius, or the Force of Love," 1680; for Dryden's "Tempeſt," 1620; and for "Don Quixote," 1694.

But few of Purcell's ſingle ſongs ſeem to have been printed during his life. He publiſhed the muſic to a maſque ſung in the tragedy of "Oedipus," when it was revived in 1692. And "a muſical entertainment, performed Nov. 22, 1683, on St. Cecilia's day, printed in ſcore by John Playford, with a dedication to the gentlemen of the muſical ſociety, and particularly the ſtewards, written by Henry Purcell, compoſer of the muſic."

There are ſeveral of his ſongs in Playford's Collection, called "The Theatre of Muſic, 1687, fourth and laſt Book;" and though theſe are not in his beſt manner, they are more original and intereſting than the reſt. Among theſe, p. 50, "A new ſong to a Scotch tune," by our author, ſeems to us more pleaſing and leſs ſtolen, than any ſpurious Scotch tune, or imitation of the national melody of the northern inhabitants of this iſland, that has been ſince produced.

Page 62 of the ſame Collection, there is an admirable piece of recitative, in a truly grand ſtyle: "Amidſt the ſhades," &c. But the collection of his ſecular vocal muſic, which did him the greateſt honour, and long rendered his name dear to the Britiſh nation, was publiſhed by his widow two years after his deceaſe, by the title of "Orpheus Britannicus." Here were treaſured up the ſongs from which the natives of this iſland received their firſt great delight and impreſſion from the vocal muſic of a ſingle voice. Before that period we had cultivated madrigals, and ſongs in parts, with diligence and ſucceſs; but in all ſingle ſongs, till thoſe of Purcell appeared, the chief effects were produced from the words, not the melody. For the airs, till that time, were as unformed and mis-ſhapen, as if they had been made of notes ſcattered about by chance, inſtead of being caſt in an elegant mould. Excluſive admirers of modern ſymmetry and elegance, may call Purcell's taſte barbarous; yet in ſpite of ſuperior cultivation and refinement, in ſpite of all the viciſſitudes of faſhion, through all his rudeneſs and barbariſm, original genius, feeling, and paſſion, are, and ever will be, diſcoverable in his works, by candid and competent judges of the art.

To this admirable collection are prefixed ſeven copies of verſes to his memory, at the head of which is an ode, written on his death, by Dryden, which was ſet by Dr. Blow, and performed at the concert in York Buildings.

There are few ſongs in the "Orpheus Britannicus" but what contain ſome characteriſtic marks of the author's great and original genius. The melody, however, will at firſt ſeem to many at preſent uncouth and antiquated; but by a little allowance and examination, any one poſſeſſed of a great love for muſic, and a knowledge of our language, will feel, at certain places of almoſt every ſong, his ſuperior felicity and paſſion in expreſſing the poet's ſentiments which he had to tranſlate into melody.

The favourite ſongs with Purcell's admirers in our youth, were the following; and upon a late attentive peruſal of the book, they ſeem to have merited particular diſtinction. "Celia has a thouſand charms:" the firſt movement of this, like many of Purcell's ſongs, ſeems only *recitative* graced, or embelliſhed with the faſhionable *volate*, or *flouriſhes* of the times, which are now as antiquated as the curls of his own perruque, or the furbelows and flounces of queen Elizabeth. The ſecond movement, however, of this ſong, is plaintive and graceful; and at "I ſhould my wretched, wretched, fate deplore," is ſtill new and pathetic.

"You twice ten hundred deities," opens with what ſeems to us the beſt piece of recitative in our language. The words are admirably expreſſed throughout this ſong, by modulation as well as melody. And there is a propriety in the changes of movement, which does honour to Purcell's judgment, as much as the whole compoſition to his genius. The change of ſtyle and ſluggiſh motion given to the notes at theſe words, "from thy ſleeping manſion riſe," is a model of muſical imitation and expreſſion. The modulation is ſtill ſo excellent, that the beſt modern maſters are obliged to adopt it on almoſt all great occaſions.

Of the muſic to "King Arthur" we ſhall ſay but little, as it has been lately revived, well performed, and printed. If ever it could be ſaid with truth of a compoſer, that he has *devancé ſon ſiecle*, outſtript his age, Purcell is entitled to that praiſe; as there are movements in many of his works which a century has not injured, particularly the duet in King Arthur, "Two daughters of this aged ſtream," and "Faireſt iſles all iſles excelling," which contain not a ſingle paſſage that the beſt compoſers of the preſent times, if it preſented itſelf to their imagination, would reject. The dialogue in the "Propheteſs," "Tell me why, my charming fair," is the moſt pleaſing and ingenious of all the compoſitions of the kind which the rage of faſhion produced during fifty years. The firſt part of "O lead me to ſome peaceful gloom," is truly elegant and pathetic.

"From roſie bowr's," is ſaid to have been "ſet in his laſt ſickneſs," at which time he ſeems to have realized the poetical fable of the ſwan, and to have ſung more ſweetly as he approached nearer his diſſolution; for it ſeems to us as if no one of his productions was ſo elevated, ſo pleaſing, ſo expreſſive, and throughout ſo perfect, as this. The variety of movement, the artful, yet touching modulation, and, above all, the exquiſite expreſſion of the words, render it one of the moſt affecting compoſitions extant to *every Engliſhman* who regards muſic not merely as an agreeable arrangement and combination of ſounds, but as the vehicle of ſentiment, and voice of paſſion.

There is more elegant melody, more elaborate harmony, more ingenious contrivance, in the motion and contexture of the ſeveral parts than in the works of many great compoſers; but to the natives of England, who know the full power of our language, and feel the force, ſpirit, and ſhades of meaning, which every word bears according to its place in a ſentence, and the ſituation of the ſpeaker, or ſinger, we muſt again repeat it, this compoſition will have charms and effects, which, perhaps, Purcell's muſic only can produce.

"When Mira ſings," is a duet that will ever be captivating, as long as the words remain intelligible; of which he has augmented the force, particularly at the end, by notes the moſt ſelect and expreſſive that the muſical ſcale can furniſh.

"Loſt is my quiet," another duet, which ſtill lives. And "Celebrate this feſtival," a birth-day ſong for queen Mary, which is graceful and pleaſing through all its old-faſhioned thoughts and embelliſhments. "I'll ſail upon the dog-ſtar," has all the fire of Handel's prime.

"Mad Beſs" is a ſong, or rather a cantata ſo celebrated, that it needs no panegyric, or renewal of public attention, as every captivating Engliſh ſinger in our memory has revived its favour. The firſt Mrs. Sheridan and Mrs. Bates never gave more exquiſite delight by their admirable performance, than when they regaled their friends with this ſong. Beard, forty years ago, uſed to acquire great applauſe by ſinging Purcell's "Roſy Bowers;" and Fraſi, by her performance of "Mad Beſs," in the concerts at Hickford's rooms, the Caſtle, and Swan concerts, where Stanley was juſtly admired for his ingenious and maſterly manner of accompanying them. "'Tis Nature's Voice," is an enigmatical ſong, ſeemingly on muſic, in which Purcell has crowded all the faſhionable paſſages of taſte and vocal difficulties of the times. Indeed, he ſeems to have anticipated many fantaſtical feats of execution and articulation in which great performers have ſince rioted; and this is the more wonderful, as the Italian opera was not eſtabliſhed, or even attempted here, during the life of Purcell; whoſe deceaſe preceded the arrival of Valentini and Nicolini, the firſt great ſingers imported from Italy, at leaſt ten years.

"Blow,

"Blow, Boreas, blow," was in great favour, during our youth, among the early admirers of Purcell; but this ſeems now more ſuperannuated than any of his popular ſongs.

"Let Cæſar and Urania live," was a duet in a birth-day ode, during the reign of king William and queen Mary, which continued ſo long in favour, not only while thoſe ſovereigns jointly wielded the ſceptre, but even when George II. had loſt his royal conſort, and there ceaſed to be a queen, or Urania, for whom to offer up prayers, that Dr. Green, and afterwards Dr. Boyce, uſed frequently to introduce it into their own and the laureate's new odes. This duet, like many other productions of Purcell, was built on a *ground-baſe* of only two bars, which are invariably repeated to different paſſages of the voice-parts that are in harmony with it, throughout the movement. The latter part of this duet is extremely beautiful, and does not ſeem at all to have ſuffered from the voluntary reſtraint under which the compoſer laboured.

The compoſing ſongs on a ground-baſe, was an exerciſe of ingenuity, in which Purcell ſeems to have much delighted; but though it was as much a faſhion in his time, as the compoſing maſſes on the ſubjects of old tunes in the days of Juſquin, and variations upon thoſe tunes in the days of Bird and Dr. Bull, in which they all manifeſted ſuperior abilities, yet the practice was Gothic, and an unworthy employment for men poſſeſſed of ſuch genius and original reſources. The Italians ſtarted this, as well as moſt other muſical faſhions; for it appears by the works of Tranquinio Merula, publiſhed 1635, that writing upon a ground-baſe was a favourite occupation with that capricious compoſer, as well as our ingenious countryman.

Judges of muſical deſign, modulation, and expreſſion, will meet with many places to admire in ſongs that have never been popular, yet have local beauties, and mark the ſuperior powers of the compoſer; particularly in the "Sighs for the death of king Charles II." In the "Dialogue in tyrannic Love," p. 158, there is a paſſage upon which the late Mr. Bach has conſtructed a favourite movement in one of his *Quartetti concertanti*.

"I attempt from love's ſickneſs," is an elegant little ballad, which, though it has been many years dead, would ſoon be recalled into exiſtence and faſhion, by the voice of ſome favourite ſinger, who ſhould think it worth animation.

"Let the dreadful engines:" this is the laſt ſong in the firſt volume of the "Orpheus Britannicus," of which, though both the words and muſic of the firſt movement are wild and bombaſt, yet the ſecond and laſt diſcover a genius for the graceful comic, as well as the tender and ſublime ſtyle of compoſition; and there are ſeveral paſſages in this cantata ſufficiently gay and new for a modern burletta.

In 1702, a ſecond, and more correct, edition, of the firſt volume of this work was publiſhed, with more than thirty ſongs that were not in the firſt impreſſion; but, in order to make room for which, ſome of the former were excluded.

The ſame year was likewiſe publiſhed a ſecond volume of "Orpheus Britannicus," by Henry Playford, which he dedicated to the earl of Hallifax. The ſong of this ſecond volume, p. 4, beginning, "Ah! cruel nymph!" has great ingenuity in the firſt movement, and grace in the ſecond. And the next air, "Crown the altar," ſeems the moſt pleaſing of any that he has compoſed on a ground-baſe. "May the god of wit inſpire," for three voices, is natural and pleaſing, and the echoes in the ſecond part are very ingeniouſly contrived.

"Thus the gloomy world," accompanied with the trumpet, and violin alternately, is maſterly, and well deſigned to diſplay the trueſt and moſt brilliant tones of the trumpet, though but little is given to the violin, which ſo much better deſerves employment, than an inſtrument of ſuch falſe intonation as the trumpet.

Thoſe that can reliſh good muſic of every age and country, and have no excluſive partiality to individuals of either, will find amuſement in the performance or peruſal of Purcell's "Four Seaſons," in the "Fairy Queen," which comprehend merit of various kinds.

"To arms, to arms," is an admirable military ſong, accompanied by a trumpet, which is ſo confined an inſtrument, that nearly the ſame paſſages muſt be uſed in all ages, ſo that time has robbed this ſong of but little of its novelty. Indeed, the diviſions of this air have been revived of late years, and are now as faſhionable, in frivolous and unmeaning melody, as ever.

There are many excellent ſongs in this volume; however, theſe and their peculiar beauties we muſt paſs over, or our commentary will encroach too much on the limits of our biographical articles, as well as on the time and patience of thoſe readers to whom the name and productions of our Britiſh Orpheus are alike unknown or indifferent. Yet we muſt obſerve, that there is a compoſition in Purcell's "Bonduca," in which he has anticipated a ſpecies of dramatic muſic, which has been thought of late invention; the words are "Hear ye gods of Britain!" which he has ſet in an *accompanied recitative*, *á tempo*, or *aria parlante*. The beginning, however, with the baſe *à pedale*, has the true characteriſtic of recitative. Afterwards, when the baſe is put in motion, the whole has the properties of an air, ingeniouſly and ſpiritedly accompanied by two violins and a baſe. Beſides the true dramatic caſt of this compoſition, there are new harmonies hazarded, which we do not recollect having ſeen in anterior contrapuntiſts, at leaſt of our own country.

We dare proceed no further in analyzing the works of our illuſtrious countryman, though it would afford us great pleaſure, as we never look at them without ſeeing a merit very ſuperior to that of any of his contemporaries out of Italy, and even there, only the vocal compoſitions of Cariſſimi and Stradella ſeem to ſurpaſs them in grace and elegance. Cariſſimi appears to have been his model in his beſt recitatives, and Lulli in the worſt; and it is manifeſt that he was fond of Stradella's manner of writing, though he never pillaged his paſſages.

We muſt not quit his vocal muſic without an honourable and grateful memorial of his catches, rounds, and glees, of which the humour, ingenuity, and melody, were ſo congenial with the national taſte, as to render them almoſt the ſole productions of the facetious kind that were in general uſe for near fourſcore years. And though the countenance and premiums beſtowed of late years upon this ſpecies of compoſition, as well as modern refinements in melody and performance, have given birth to many glees, of a more elegant, graceful, and exalted kind, than any which Purcell produced; yet he ſeems hardly ever to have been equalled in the wit, pleaſantry, and contrivance of his catches.

Of fifteen anthems, with ſymphonies and inſtrumental parts, with innumerable odes and miſcellanies, we have room to ſay nothing, though much praiſe is due to many of them.

An abſurd cuſtom prevailed in Purcell's time, which he carried to greater exceſs, perhaps, than any other compoſer, of repeating a word of one or two ſyllables an unlimited number of times, for the ſake of the melody, and ſometimes before the whole ſentence has been heard. Such as no, no, no, —all, all, all—pretty, pretty, pretty, &c. *ad infinitum*. But there is equal redundance and obſcurity in the uſe which the Italians make at preſent of *sì*, *sì*, *sì*, and *nò*, *nò*, *nò*, in their ſongs.

Purcell

Purcell was ſo little acquainted with the unlimited power of the violin, that we have ſcarcely ever ſeen a becoming paſſage for that inſtrument in any one of his works; the ſymphonies and ritornels to his anthems and ſongs being equally deficient in force, invention, and effect. And though his ſonatas contain many ingenious, and, at the time they were compoſed, new traits of melody and modulation, if they are compared with the productions of his contemporary, Corelli, they will be called barbarous. But Corelli wrote for an inſtrument of which he was a great maſter: and who ever entirely ſucceeded in compoſing for one of which he was ignorant? When a great performer on keyed inſtruments condeſcends to compoſe for the violin, upon which he has never been a good player, or the voice, without knowing in what good ſinging conſiſts, the paſſages all come from the head, and none from the hand, except the hand of a harpſichord player, which is ever unfit to ſuggeſt ideas either for a voice, or for any other inſtrument than his own. Such a compoſer for the violin muſt inevitably embarraſs the player with perpetual aukwardneſſes and difficulties without effect, which diſcover an utter ignorance of the finger-board.

If Purcell, by travelling, or by living longer at home, had heard the great inſtrumental performers, as well as great ſingers, that arrived in this country ſoon after his deceaſe, and had ſuch to compoſe for, his productions would have been more regular, elegant, and graceful; and he would certainly have ſet Engliſh words better than it was poſſible for any foreigner to do, for our feelings, however great his genius, or excellent, in other reſpects, his productions. But Purcell, like his ſucceſſor, Arne, and others who have compoſed for the playhouſe, had always an inferior band to the Italian opera compoſers, as well as inferior ſingers, and an inferior audience to write for.

The diligent and candid Walther, by not having aſſigned to Purcell a niche in his Muſical Dictionary, ſeems never to have heard of his exiſtence; but Purcell was ſo truly a *national* compoſer, that his name was not likely to be wafted to the continent; and the narrow limits of his fame may be fairly aſcribed, not only to the paucity and poverty of his compoſitions for inſtruments, for which the muſical productions are an intelligible language to every country, but to his vocal compoſitions being ſolely adapted to Engliſh words, which render it unlikely for their influence to extend beyond the ſoil that produced them.

We ſhould, however, have known as little of Lulli, as the French or Italians of Purcell, but for the partiality which Charles II. acquired, by his long reſidence on the continent, for the arts and amuſements of France. The firſt attempts at operas here, after the Reſtoration, were either in French, or on the model of thoſe that were then in high favour at Verſailles. And whoever is equally acquainted with the recitative, we had almoſt ſaid the general melody of Lulli and Purcell, muſt perceive a ſtrong reſemblance.

Purcell, however, having infinitely more fancy, and, indeed, harmonical reſources, than the Frenchified Tuſcan, his productions now afford far greater pleaſure and amuſement to a liberal lover of muſic, than can be found, not only in the productions of Cambert and Grabu, whom Charles II. and to flatter his majeſty, Dryden, patronized in preference to Purcell, but in all the noiſy monotony of the rhapſodiſt of Quinaut.

Let thoſe who ſhall think Purcell has ſacrificed the national honour by confeſſing his reverence for the productions of Italy, compare the ſecular productions of Engliſh muſicians, from the death of queen Elizabeth to the year 1683, with thoſe of Cariſſimi, Ceſti, Stradella, and innumerable others of great abilities, and if they do not equally hate muſic and truth, they will admire Purcell's probity, as well as his genius.

Indeed, muſic was manifeſtly on the decline, in England, during the ſeventeenth century, till it was revived and invigorated by Purcell, whoſe genius, though leſs cultivated and poliſhed, was equal to that of the greateſt maſters on the continent. And though his dramatic ſtyle and recitative were formed in a great meaſure on French models, there is a latent power and force in his expreſſion of Engliſh words, whatever be the ſubject, that will make an unprejudiced native of this iſland feel, more than all the elegance, grace, and refinement of modern muſic leſs happily applied, can do. And this pleaſure is communicated to us, not by the ſymmetry or rhythm of modern melody, but by his having fortified, lengthened, and tuned, the true accents of our mother-tongue; thoſe notes of paſſion, which an inhabitant of this iſland would breathe, in ſuch ſituations as the words he has to ſet deſcribe. And theſe indigenous expreſſions of paſſion Purcell had the power to enforce by the energy of modulation, which, on ſome occaſions, was bold, affecting, and ſublime.

Theſe remarks are addreſſed to none but Engliſhmen: for the expreſſion of words can be felt only by the natives of any country, who ſeldom extend their admiration of foreign *vocal* muſic, farther than to the general effect of its melody and harmony on the ear; nor has it any other advantage over *inſtrumental*, than that of being executed by the human voice, like *ſolfeggi*. And if the Italians themſelves did not come hither to give us the true expreſſion of their ſongs, we ſhould never diſcover it by ſtudy and practice.

It has been extremely unfortunate for our national taſte and our national honour, that Orlando Gibbons, Pelham Humphrey, and Henry Purcell, our three beſt compoſers during the laſt century, were not bleſt with ſufficient longevity for their genius to expand in all its branches, or to form a ſchool, which would have enabled us to proceed in the cultivation of muſic without foreign aſſiſtance.

Orlando Gibbons died 1625, at forty-four.

Pelham Humphrey died 1674, at twenty-ſeven.

And Henry Purcell died 1695, at thirty-ſeven.

If theſe admirable compoſers had been bleſt with long life, we might have had a muſic of our own, at leaſt as good as that of France or Germany; which, without the aſſiſtance of the Italians, has long been admired and preferred to all others by the natives at large, though their princes have uſually foreigners in their ſervice. As it is, we have no ſchool for compoſition, no well-digeſted method of ſtudy, nor, indeed, models of our own. Inſtrumental muſic, therefore, has never gained much by our own abilities; for though ſome natives of England have had hands ſufficient to execute the productions of the greateſt maſters on the continent, they have produced but little of their own that has been much eſteemed. Handel's compoſitions for the organ and harpſichord, with thoſe of Scarlatti and Alberti, were our chief practice and delight for more than fifty years; while thoſe of Corelli, Geminiani, Albinoni, Vivaldi, Teſſarini, Veracini, and Tartini, till the arrival of Giardini, ſupplied all our wants on the violin, during a ſtill longer period. And as for the hautbois, Martini and Fiſher, with their ſcholars and imitators, are all that we have liſtened to with pleaſure.

If a parallel were to be drawn between Purcell and any popular compoſer of a different country, reaſons might be aſſigned for ſuppoſing him ſuperior to every great and favourite contemporary muſician in Europe.

Cariſſimi and Stradella, if more poliſhed in their ſtyle, were certainly leſs varied, and knew ſtill leſs of inſtruments,

than

than our countryman. They had both, perhaps, more grace and regularity, but infinitely leſs paſſion and fire.

The elder Scarlatti was more *recherché* and learned, but never ſo natural and effecting.

In Germany, if Keiſer, during an active and much longer life, ſurpaſſed him in the number and excellence of his dramatic compoſitions, his productions for the church, could they be found, would, we believe, bear no compariſon.

Lulli, bleſt likewiſe with ſuperior longevity, compoſed alſo more operas than Purcell, and was the idol of the nation for which he laboured; but though his overtures long ſerved as models, even to Purcell, as well as to the compoſers of all the reſt of Europe, and his muſic was performed by better ſingers, and a more numerous band, ſupported by the patronage of a court, and all the ſplendour of ingenious and coſtly exhibition; it is eaſy to ſee that even his theatrical works are more *manierées*, monotonous, and unintereſting in themſelves, than thoſe of Purcell; but in relinquiſhing the ſtage, and ſtepping on holy ground, we ſhould have found, even in France, during all his glory, and the enthuſiaſm he raiſed, none of his votaries who would attempt to put his ſacred muſic in compariſon with that of our countryman.

Rameau, the ſucceſſor of Lulli in court and popular favour, and who had more learning and theoretical knowledge in the art, than perhaps any practical muſician of modern times; yet, in pathos and expreſſion of words and the paſſions, he was Purcell's inferior, even upon the ſtage; and in the church, he had no claim to celebrity.

Handel, who flouriſhed in a leſs barbarous age for his art, has been acknowledged his ſuperior in many particulars; but in none more than the art and grandeur of his choruſes, the harmony and texture of his organ fugues, as well as his great ſtyle of playing that inſtrument; the majeſty of his hautbois and grand concertos, the ingenuity of the accompaniments to his ſongs and choruſes, and even in the general melody of the airs themſelves; yet in the accent, paſſion, and expreſſion of *Engliſh words*, the vocal muſic of Purcell is, ſometimes to our feelings, as ſuperior to Handel's as an original poem to a tranſlation.

PURCHAS, SAMUEL, was born at Thaxtead, in Eſſex, in 1577. He was educated at Cambridge, and was preſented to a vicarage in his native county. This cure he reſigned to his brother, and came to live in London, for the purpoſe of conducting the great work he had undertaken. The firſt volume folio appeared in 1613, under the title of "Purchas his Pilgrimage, or Relations of the World and the Religions obſerved in all Ages and Places diſcovered from the Creation unto this Preſent:" the other four volumes were publiſhed in 1625. To theſe the general title is "Hakluytus Poſthumus, or Purchas his Pilgrims: containing a Hiſtory of the World in Sea-voyages and Land-travels by Engliſhmen and others:" the name of Hakluyt is introduced, becauſe Purchas became poſſeſſed of the papers which he left behind him. This great work, of which the object is to connect ancient and modern hiſtory, was well received, but probably involved the author in debt. He had been collated to the rectory of St. Martin's Ludgate, and was chaplain to Abbot, archbiſhop of Canterbury. He died about the year 1628, at the age of fifty-one. Biog. Brit.

PURCHASE, in *Law*, in its largeſt and moſt extenſive ſenſe, is defined by Littleton to be the poſſeſſion of lands and tenements, which a man hath by his own act or agreement, and not by deſcent from any of his anceſtors or kindred. In this ſenſe, it is contradiſtinguiſhed from acquiſition by right of blood, and includes every other method of coming to an eſtate, but merely that by inheritance; in which the title is veſted in a perſon, not by his own act or agreement, but by the ſingle operation of law. (Co. Litt. 18.) Purchaſe, in its vulgar and confined acceptation, is applied only to the acquiſition of goods, lands, tenements, or the like, by means of money, or ſome other valuable conſideration.

What we call *purchaſe*, *perquiſitio*, the feudiſts call *conqueſt*, *conquæſtus*, or *conquiſitio*, (ſee CONQUEST); both denoting any means of acquiring an eſtate out of the common courſe of inheritance; and this is ſtill the proper phraſe in the law of Scotland. The difference, in effect, between the acquiſition of an eſtate by deſcent and by purchaſe, conſiſts principally in theſe two points. 1. That by purchaſe the eſtate acquires a new inheritable quality, and is deſcendible to the owner's blood in general, and not the blood only of ſome particular anceſtor. 2. An eſtate taken by purchaſe will not make the heir anſwerable for the acts of the anceſtor, as an eſtate by deſcent will. According to this legal ſignification of the word *perquiſitio*, or purchaſe, it includes the five following methods of acquiring a title to eſtates, viz. *eſcheat*, *occupancy*, *preſcription*, *forfeiture*, and *alienation*, conveyance, or purchaſe, in its limited ſenſe: under which latter head may be compriſed any method in which eſtates are voluntarily reſigned by one man, and accepted by another: whether that be effected by ſale, gift, marriage-ſettlement, deviſe, or other tranſmiſſion of property, by the mutual conſent of the parties. See the ſeveral articles, and TITLE.

Natural perſons, incorporate perſons, ſole or aggregate, deaf, dumb, and blind perſons, minors, and all reaſonable creatures, may purchaſe, except in ſome caſes; but ſome have capacity to purchaſe, and not to hold, as aliens, felons, &c.; and others have ability to hold or not to hold upon a purchaſe, at the election of themſelves or others, as infants, and feme coverts. 1 Inſt. 2, 3. 11 Rep. 77. 7 Rep. 17.

PURCHASE *and value of land.* See VALUATION *of Land*, and POLITICAL *Economy*.

PURCHASE *of writs.* See WRIT.

PURCHASE, in the *Sea Language*, has the ſame ſignification with *draw in*, at land. Thus, they ſay, the capſtern purchaſes apace, *i. e.* draws in the cable apace; and when they cannot draw or hale any thing in with the tackle, they ſay, the tackle will not purchaſe.

PURCHASE is alſo a name given by ſailors to any mechanical power employed in raiſing or removing heavy bodies, or in fixing or extending the ſhip's rigging. Such are the tackles, windlaſſes, capſterns, ſcrews, and handſpikes.

PURCHASE-*Book*, among *Traders*, is the name given to a book, which is a kind of journal, containing an account of all the purchaſes made, or things bought in the day.

PURCHASER, FIRST, *Perquiſitor*, in *Law*, denotes the perſon who firſt acquired an eſtate to his family, whether the ſame was transferred to him by ſale or by gift, or by any other method, except only that of deſcent. See DESCENT.

PURCHASING *of Eſtates*, in *Agriculture*, the buſineſs of buying landed property. In order to perform this ſort of bargain with propriety, and to the beſt advantage, attention is neceſſary to be had to a great variety of circumſtances of different kinds, which reſpect the nature, quality, ſituation, condition, value, and conveniences of the property. See VALUATION *of Land.*

But it is probably beſt done, when to any extent, by a ſurveyor or other perſon who is perfectly converſant with the nature of the buſineſs, and fully acquainted with the

PURGLITZ, or KRZIWOKLAD, in *Geography*, a citadel of Bohemia, in the circle of Rakonitz, where the royal treaſures were anciently kept, and ſtate priſoners confined; ſeven miles S.E. of Rakonitz.

PURGOT, a town of Hindooſtan, in Coimbetore; 35 miles W. of Ardenelle.

PURGOW, a town of Hindooſtan, in Baglana; 25 miles E.N.E. of Baſſeen.

PURGSTALL, a town of Auſtria; four miles N. of Scheibs.

PURIFICATION, in *Chemiſtry*, &c. the act of purifying or refining natural bodies; or of ſeparating the fæces and impurities from them.

For the methods of purifying metals, gold, ſilver, iron, copper, tin, &c. ſee GOLD, SILVER, &c. and REFINING.

For the purification of ſemi-metals, minerals, and other matters, as antimony, ſulphur, camphor, ſaltpetre, &c. ſee ANTIMONY, SULPHUR, CAMPHOR, &c.

PURIFICATION, in *Pharmacy*. See TRYING.

PURIFICATION, in *Matters of Religion*, denotes an offering made the prieſt by women riſing out of child-bed, before they are re-admitted into the church.

By the law of Moſes, a woman, after bringing forth a male child, was unclean forty days; after a female, eighty days; during which time, ſhe was not to touch any thing holy, nor to go near the temple, but was to continue within doors, ſeparate from all company, and commerce of others.

This term expired, ſhe was to preſent herſelf at the temple, and at the door of the tabernacle, to offer a lamb, as an holocauſt, and a pigeon or turtle; which the prieſt taking, offered to God, and prayed for her, that ſhe might be purified.

This ceremony, which conſiſted of two things, an holocauſt, and a ſacrifice of expiation, was called טהר טהרה, *purificatio, purgatio.*

The holy Virgin, though, according to the fathers, exempt from the terms of the law, yet complied with it, and, at the time preſcribed, went to the temple, and accompliſhed the law; in commemoration of which the church yearly ſolemnizes the feaſt of the Purification of the Virgin, on the ſecond of February; called alſo the Feaſt of Candlemas.

PURIFICATION, *The Feaſt of the*, ſeems to be very ancient. It is ordinarily ſaid to have been inſtituted in the time of Juſtinian, in the year 542, and this on occaſion of a mortality, which that year diſpeopled almoſt the whole city of Conſtantinople. Yet there are ſome, who imagine it to have been obſerved before, though in another manner, and on a different day from that fixed by Juſtinian; *viz.* between the Circumciſion and Epiphany. See CANDLEMAS.

The ſame day is the preſentation of our Saviour in the temple.

PURIFICATION, in *Geography*, a town of Mexico, in the province of Xaliſco; eight miles S. of Compoſtella Nuova. N. lat. 19° 58′. W. long. 105° 46′.

PURIM, a ſolemn feaſt held among the Jews on the fourteenth and fifteenth of March, in memory of their deliverance from the conſpiracy of Haman by Eſther. See ESTHER.

This feaſt, which derives its name from the Perſian word *purim*, q. d. *lots*, becauſe it was by the caſting of lots that Haman determined this time for the deſtruction of the Jews, is the Bacchanals of theſe people, which they celebrate with all manner of rejoicing, mirth, and jollity; indulging themſelves with every kind of luxury, eſpecially in drinking wine even to drunkenneſs, which they conſider as part of the duty of the ſolemnity; becauſe it was by means of the wine banquet (they ſay) that Eſther made the king's heart merry, and brought him into that good humour, which inclined him to grant the requeſt preſented by her for their deliverance; and, therefore, they think they ought alſo to make their hearts merry, when they celebrate the commemoration of it. During this feſtival the book of Eſther is ſolemnly read in all their ſynagogues from the beginning to the end, at which they are all to be preſent, men, women, children, and ſervants, becauſe all ſhared in the benefit of the deliverance which Eſther obtained for them. And as often as the name of Haman occurs in the reading of this book, the cuſtom is for all to clap with their hands, and ſtamp with their feet, and cry out, Let his memory periſh. Prideaux's Conn. vol. ii. p. 456.

PURITANS, in *Eccleſiaſtical Hiſtory*. See CATHARI and NOVATIANS.

PURITANS is alſo a term anciently uſed for the Calviniſts of Great Britain, from their profeſſing to follow the pure word of God, in oppoſition to all traditions, human conſtitutions, and other authorities.

The ſeparation, whence this diſtinguiſhing appellation took its riſe, commenced on the following occaſion. Upon the acceſſion of queen Mary, it is well known that popery revived in this kingdom; the ſtatutes of king Edward were repealed, and the penal laws againſt heretics were put in execution againſt the reformers. Many ſuffered at home; and others eſcaped the fury of perſecution by ſeeking refuge in foreign countries. Some went into France and Flanders; ſome to Geneva; and others into thoſe parts of Germany and Switzerland, where the reformation had taken place, and where the magiſtrates received them with great humanity, and allowed them places for public worſhip. The exiles were moſt numerous at Frankfort; and there that conteſt and diviſion began, which gave riſe to the Puritans, and to that ſeparation from the church of England, which continues to this day. In the year 1554, ſome of the Engliſh fugitives ſettled in this city; and agreed to conduct their worſhip, without anſwering aloud after the miniſter, and without uſing the liturgy and ſurplice; to begin the public ſervice with a general confeſſion of ſins, then to ſing a pſalm, after which the miniſter prayed for the divine aſſiſtance, and next proceeded to the ſermon; after ſermon, a general prayer for all eſtates, and particularly for England, at the end of which was ſubjoined the Lord's prayer, and a rehearſal of the articles of belief; then the people were to ſing another pſalm, and the miniſter to diſmiſs them with a bleſſing. Such was the order which they had unanimouſly adopted; and having choſen a miniſter and deacons, they invited their diſperſed brethren to join with them. In the year 1556, Dr. Cox, afterwards biſhop of Ely, came to ſettle at Frankfort with ſeveral of his friends; who interrupting the public ſervice by anſwering aloud after the miniſter, and reading the whole litany, in violation of the agreement upon which the congregation was formed, overpowered the firſt ſettlers; and obtaining leave of the magiſtrates for the free uſe of king Edward's ſervice-book, performed divine worſhip according to the rites that had been authoriſed by that prince; while others, who preferred the Genevan method of worſhip, as more pure and ſimple, left the city of Frankfort, and removed to Baſil and Geneva. Thus commenced the diſtinction of Puritans and Conformiſts, by which the two parties were afterwards known. The former were called Conformiſts, on account of their compliance with the eccleſiaſtical laws enacted by Edw. VI. and the denominations of Nonconformiſts and Puritans were given to the latter, from their inſiſting upon a form of worſhip, more exempt from ſuperſtition, and of a purer kind

than the liturgy of Edward ſeemed to them to be. Upon the acceſſion of queen Elizabeth, the exiles returned to England, where each party ſtrove to advance the reformation according to their own ſtandard. The queen, with thoſe who had weathered the ſtorm at home, were only for reſtoring king Edward's liturgy; but the majority of the exiles were for the worſhip and diſcipline of the foreign churches, and refuſed to comply with the old eſtabliſhment, declaiming loudly againſt the popiſh habits and ceremonies. However, the queen's party prevailed; and in 1559 a committee of divines was appointed to review king Edward's liturgy, who were inſtructed to ſtrike out all offenſive paſſages againſt the pope, and to make people eaſy about the belief of the corporal preſence of Chriſt in the ſacrament. But no alterations were made in favour of thoſe who now began to be called Puritans, from their attempting a purer form of worſhip and diſcipline than had yet been eſtabliſhed; and whoſe ſentiments in many points were agreeable to thoſe maintained by John Wickliffe, the firſt reformer. For they agreed with him in opinion, that in the ſacrament of orders there ought to be but two degrees, preſbyters or biſhops, and deacons; that all human traditions are ſuperfluous and ſinful; that we muſt practiſe and teach only the laws of Chriſt; that myſtical and ſignificant ceremonies in religious worſhip are unlawful; and that to reſtrain men to a preſcribed form of prayer is contrary to the liberty granted them by God. The old feſtivals, with their eves and the popiſh habits, were continued as they were in the ſecond year of king Edward VI. In 1558 the act of ſupremacy was paſſed, in which there is a remarkable clauſe, that gave riſe to the court of high-commiſſion, which proved afterwards ſo oppreſſive; and in 1559 was paſſed an act for the uniformity of common prayer, and ſervice in the church, and adminiſtration of the ſacraments. The Puritans remonſtrated againſt theſe proceedings, and complained, that the groſs ſuperſtitions of popery, which they had looked upon as abrogated and aboliſhed, were now revived, and even impoſed by authority. Some required nothing leſs than that the church of England ſhould be exactly modelled after that of Geneva; others only deſired liberty of conſcience, with the privilege of celebrating divine worſhip in their own way; but neither party obtained the object of their wiſhes. The queen, intent upon the ſuppreſſion of this troubleſome ſect (as ſhe was uſed to call it), permitted its enemies to employ for that purpoſe all the reſources of artifice, and all the ſeverity of the laws. The court reformers pleaded, that every prince had authority to correct all abuſes of doctrine and worſhip within his own territories; the Puritans, on the other hand, whilſt they diſowned all foreign authority and juriſdiction over the church, could not admit of that extenſive power which the crown claimed by the ſupremacy; apprehending it unreaſonable, that the religion of a whole nation ſhould be at the diſpoſal of a ſingle lay perſon. However, they took the oath, with the queen's explication in her injunctions, as reſtoring her majeſty only to the ancient and natural rights of ſovereign princes over their ſubjects.

Farther, the court reformers allowed, that the church of Rome was a true church, though corrupt in ſome points of doctrine and government; that all her miniſtrations were valid, and that the pope was a true biſhop of Rome, though not of the univerſal church. But the Puritans affirmed the pope to be antichriſt, the church of Rome to be no true church, and all her miniſtrations to be ſuperſtitious and idolatrous; they renounced her communion, and durſt not ſuſpend the validity of their ordinations upon an uninterrupted line of ſucceſſion from the apoſtles through her hands. Moreover, it was agreed by all, that the holy ſcriptures were a perfect rule of faith; but the biſhops and court reformers did not allow them to be the ſtandard of diſcipline or church government; affirming that our Saviour and his apoſtles left it to the diſcretion of the civil magiſtrate, in thoſe places where Chriſtianity ſhould obtain, to accommodate the government of the church to the policy of the ſtate. But the Puritans apprehended the holy ſcriptures to be a ſtandard of church diſcipline as well as of doctrine; at leaſt that nothing ſhould be impoſed as neceſſary but what was expreſsly contained in, or derived from them by neceſſary conſequence, and, beſides, they maintained that the diſcretionary power was not lodged with the civil magiſtrate, but with the ſpiritual officers of the church. Farther, the court reformers maintained, that the practice of the primitive church for the firſt four or five centuries was a proper ſtandard of church government and diſcipline, and in ſome reſpects a better than that of the apoſtles, which (according to them) was only accommodated to the infant ſtate of the church while it was under perſecution, whereas theirs was ſuited to the grandeur of a national eſtabliſhment. Whereas the Puritans were for adhering to the bible in the main principles of church government, and for admitting no church officers or ordinances, but ſuch as are herein mentioned; and they apprehended, that the apoſtles, in eſtabliſhing the firſt Chriſtian church on the ariſtocratical plan then obſerved in the Jewiſh ſanhedrim, deſigned it as an unchangeable model to be followed in all times and places. The court reformers alſo maintained, that things indifferent in their own nature, which are neither forbidden nor commanded in the holy ſcriptures, ſuch as rites, ceremonies, habits, &c. might be ſettled, determined, and made neceſſary by the command of the civil magiſtrate, and that in ſuch caſes it was the indiſpenſible duty of all ſubjects to obſerve them. But the Puritans inſiſted, that thoſe things which Chriſt had left indifferent, ought not to be made neceſſary by any human laws, and that ſuch rites and ceremonies as had been abuſed to idolatry, and had a manifeſt tendency to lead men back to popery and ſuperſtition, were no longer indifferent, but to be rejected as unlawful. Nevertheleſs, both parties agreed too well in aſſerting the neceſſity of an uniformity of public worſhip, and of calling in the ſword of the magiſtrate for the ſupport and defence of their ſeveral principles; which they made an ill uſe of in their turns, as they could graſp the power into their hands. The ſtandard of uniformity, according to the biſhops, was the queen's ſupremacy, and the law of the land; according to the Puritans, the decrees of provincial and national ſynods, allowed and enforced by the civil magiſtrate; but neither party was for admitting that liberty of conſcience, and freedom of profeſſion, which is every man's right, as far as is conſiſtent with the peace of the government under which he lives.

In the year 1564, upon a report that the habits, enjoined on the clergy, were generally neglected, and alſo of inattention to other impoſed forms, the queen directed the eccleſiaſtical commiſſioners to conſult ſome proper methods to reduce them to an exact uniformity; upon which they agreed on certain *advertiſements* (as they were called), partly for due order in preaching and adminiſtering the ſacraments, and partly for the apparel of eccleſiaſtical perſons. To theſe advertiſements certain proteſtations were annexed, to be made, promiſed, and ſubſcribed by ſuch as ſhould hereafter be admitted to any office or cure in the church. The queen, though ſhe would give no authority to the advertiſements, which had occaſioned much remonſtrance and complaint, iſſued out a proclamation in 1565, peremptorily requiring

quiring uniformity in the habits, upon pain of prohibition from preaching, and deprivation. Parker, the archbiſhop of Canterbury, was violent and unrelenting; and by various methods of ſeverity, haraſſed, ſilenced, and deprived many of thoſe who ſcrupled the uſe of the habits. The ſuſpended miniſters, finding that renewed applications to the queen and her commiſſioners were ineffectual, publiſhed, in 1566, a ſmall treatiſe in vindication of their conduct; in which they allege, that neither the prophets of the Old Teſtament, nor the apoſtles of the New, were diſtinguiſhed by their garments; that a diſtinction of garments in the Chriſtian church did not generally obtain till long after the riſing of antichriſt; that the garments againſt which they objected, had been abuſed to idolatry, ſorcery, and all kinds of conjurations; that they were an offence to weak Chriſtians, an encouragement to ignorant and obſtinate papiſts, and the uſe of them an affectation of returning to their communion; that at beſt they were only human appointments, ſubject to the apoſtle's reproof, Col. ii. 20—22; that allowing them to be indifferent (which they did not grant), yet they ought not to be impoſed, becauſe it was an infringement of the liberty with which Chriſt had made them free; and finally they urged the ſuffrage of foreign divines, who all condemned the habits, though they were not willing to hazard the reformation in its infancy, on account of them.

If, at this time, the habits and a few ceremonies had been left indifferent, both miniſters and people would have acquieſced; but it was the compelling of theſe things by law that made them ſeparate from the eſtabliſhed church. Accordingly, in 1566, they came to a reſolution, alleging it to be their duty, in their preſent circumſtances, to break off from the public churches, and to aſſemble, as they had opportunity, in private houſes, or elſewhere, to worſhip God in a manner that might not offend againſt the light of their conſciences; and it was debated among them, whether they ſhould uſe as much of the common prayer and ſervice of the church as was not offenſive, or reſolve at once, ſince they were cut off from the church of England, to ſet up the pureſt and beſt form of worſhip, moſt conſonant to the holy ſcriptures, and to the practice of the foreign reformers. The latter of theſe meaſures was concluded upon; and accordingly they laid aſide the Engliſh liturgy, and made uſe of the Geneva ſervice-book. However, it is neceſſary to obſerve, that though all the Puritans of theſe times would have remained in the church, if they might have been indulged in the habits and a few ceremonies, yet they were far from being ſatisfied with the hierarchy. They had other objections beſides thoſe for which they were deprived; of which we ſhall here ſubjoin a ſummary. They complained of the biſhops affecting to be thought a ſuperior order to preſbyters, and claiming the ſole right of ordination, and the uſe of the keys; and aſſuming, in connection with their office, temporal dignities, titles, and employments. As long, however, as the Engliſh biſhops pretended to derive their dignity and authority from no other ſource than the laws of their country, and pleaded a right, merely human, to the rank they held in the church and ſtate, the controverſy was carried on without exceſſive animoſity and zeal; but the flame broke out with redoubled fury in the year 1588, when Bancroft, afterwards archbiſhop of Canterbury, ventured to aſſert that the order of biſhops was ſuperior to the body of preſbyters, not in conſequence of any human inſtitution, but *jure divino*, or by the expreſs appointment of God himſelf. Farther, the Puritans excepted againſt the titles and offices of archdeacons, deans, chapters, and other officials, belonging to cathedrals, as having no foundation in ſcripture, or primitive antiquity, and intrenching upon the privileges of the preſbyters in the ſeveral dioceſes. They complained of the exorbitant power and juriſdiction of the biſhops and their chancellors in their ſpiritual courts, as derived from the canon law of the pope, and not from the word of God, or the ſtatute law of the land. They lamented the want of a godly diſcipline, and were uneaſy at the promiſcuous and general acceſs of all perſons to the Lord's table. Though they did not diſpute the lawfulneſs of ſet forms of prayer, provided a due liberty was allowed for prayers of their own compoſure before and after ſermon, yet they diſliked the frequent repetition of the Lord's prayer in the liturgy, the interruption of the prayers by the frequent reſponſes of the people, ſome paſſages in the office of marriage, as *With my body I thee worſhip*, and in that of burial, as *In ſure and certain hope of the reſurrection to eternal life*, pronounced over the worſt of men, if not excommunicated, &c. They alſo objected againſt the reading of the apocryphal books in the church, while ſome parts of canonical ſcripture were omitted; and though they did not diſlike the homilies, they thought that no man ſhould be ordained a miniſter in the church who was not capable of preaching and expounding the holy ſcriptures. They diſapproved of ſeveral of the church feſtivals or holidays, as having no foundation in ſcripture, or primitive antiquity; and they diſallowed of the cathedral mode of worſhip; nor did they approve of muſical inſtruments in the church ſervice. Finally, they ſcrupled conformity to certain rites and ceremonies, which were enjoined by the rubric, or the queen's injunctions; as the ſign of the croſs in baptiſm, baptiſm by midwives, or other women, in caſes of ſickneſs, and the mode of churching women; the uſe of god-fathers and god-mothers, to the excluſion of parents from being ſureties for the education of their own children; the cuſtom of confirming children, as ſoon as they could repeat the Lord's prayer and their catechiſm, by which they had a right to come to the ſacrament, without any other qualification, and the impoſition of hands, as a ſign of the divine favour, which ſeemed to them to imply a ſacramental efficacy in this ceremony; kneeling at the ſacrament of the Lord's ſupper, whilſt they conſidered that Chriſt gave it to his diſciples rather in a poſture of feaſting than of adoration; that it had no foundation in antiquity; that it had been groſsly abuſed by the papiſts to idolatry in their adoration of the hoſt; and that, if the poſture were indifferent, it ought not to be impoſed as a neceſſary term of communion; nor did they approve of adminiſtering either of the ſacraments in private, even in caſes of danger; bowing at the name of Jeſus; giving the ring in marriage, which they conſidered as derived from the papiſts, who made marriage a ſacrament, and the ring a ſort of ſacred ſign or ſymbol; the prohibition of marriage during certain times of the year, and the licenſing it for money; and, laſtly, the wearing of the ſurplice, and other veſtments to be uſed in divine ſervice.

In points of doctrine there was, at this time, no difference between the Puritans and Conformiſts; and if we add one article more to the preceding, we ſhall have the principal heads of controverſy between the church of England and the Proteſtant Diſſenters, at this day; *viz.* the natural right which every man has to judge for himſelf, and make profeſſion of that religion he apprehends moſt agreeable to truth, as far as it does not affect the peace and ſafety of the government under which he lives; without being determined by the prejudices of education, the laws of the civil magiſtrate, or the decrees of councils, churches, or ſynods. See *Proteſtant* DISSENTERS.

Towards the latter end of queen Elizabeth's reign, there aroſe a party, which were firſt for ſoftening, and then for overthrowing,

overthrowing, the received opinions concerning predeſtination, perſeverance, free-will, effectual grace, and the extent of Chriſt's redemption. The clergy of the epiſcopal church began to lean towards the notions concerning theſe intricate points, which Arminius propagated ſome time after this; while on the other hand, the Puritans adhered rigorouſly to the ſyſtem of Calvin. Several epiſcopal doctors remained attached to the ſame ſyſtem in the reign of James I. &c. and all theſe abettors of Calvaniſm, whether epiſcopal or preſbyterian, were called *doctrinal* Puritans. At length, according to Mr. Fuller, (Church Hiſt. book ix. p. 97. book x. p. 100.) the name was extended to ſtigmatize all thoſe who endeavoured in their devotions to accompany the miniſter with a pure heart, and who were remarkably holy in their converſation; ſo that a Puritan was a man of ſevere morals, a Calviniſt in doctrine, and a Non-conformiſt to the ceremonies and diſcipline of the church, though he did not totally ſeparate from it.

Queen Elizabeth was violent in her oppoſition to the Puritans through the whole courſe of her reign; and beſides the ordinary courts of the biſhops, ſhe erected, as we have already obſerved, a new tribunal, called the court of high-commiſſion, which ſuſpended and deprived men of their livings, not by the verdict of twelve men upon oath, but by the ſolemn determination of three commiſſioners of her own nomination, founded not upon the ſtatute law of the realm, but upon the canon law; and inſtead of producing witneſſes in open court to prove the charge, they aſſumed a power of adminiſtering an oath *ex officio*, by which the priſoner was obliged to anſwer all queſtions the court ſhould put to him, though never ſo prejudicial to his own defence. If he refuſed to ſwear, he was impriſoned for contempt; and if he took the oath, he was convicted upon his own confeſſion.

During the reign of James I. from whom the Puritans expected more indulgent treatment, they were treated with great ſeverity, and many of them were obliged to leave the kingdom, and retire to Holland; and from thence conſiderable numbers migrated to America in the year 1620. All were Puritans, in the eſtimation of king James, who adhered to the laws of the land in oppoſition to his arbitrary government, though otherwiſe ever ſo good churchmen. Theſe were called *Puritans in the ſtate;* and thoſe who ſcrupled the ceremonies, and adhered to the doctrines of Calvin, were *Church* Puritans, who, though comparatively few, yet being joined by thoſe of the other claſs, became the majority of the nation. The ſucceſs that attended the firſt emigrators, who ſettled in that part of America afterwards called New Plymouth, engaged great numbers of Puritans, who groaned under the oppreſſion of the biſhops, and the ſeverity of a court, by which this oppreſſion was authoriſed, to follow the fortunes of theſe religious adventurers; and this produced a ſecond emigration in the year 1629, which gave birth to the ſecond grand colony, commonly known by the name of the Maſſachuſett's Bay. The colony of Connecticut was formed by emigrants of the ſame claſs in 1636, and that of New Haven in 1637, who fled from the perſecution of Laud, and the oppreſſions of the ſtar-chamber and high-commiſſion courts. Afterwards, when the Puritans were not allowed to tranſport themſelves to New-England, many of them removed, with their families, into the Low Countries.

After the reſtoration of Charles II. in the year 1662, the name of Puritans, ſays biſhop Burnet, was changed into that of Proteſtant Non-conformiſts, who were ſubdivided into Preſbyterians, Independents, Anabaptiſts, and Quakers. At this time a public law, called the Act of Uniformity, was enacted, by which all who refuſed to obſerve the rites, and ſubſcribe the doctrines of the church of England, were entirely excluded from its communion. From this period until the reign of king William III. the Non-conformiſts were in a precarious and changing ſituation, ſometimes involved in calamity and trouble, and at other times enjoying ſome intervals of tranquillity and certain gleams of hope, according to the varying ſpirit of the court and miniſtry, but never entirely free from perplexities and fears. But in the year 1689, their affairs took a favourable turn, when a bill for the toleration of all Proteſtant Diſſenters from the church of England, except the Socinians, paſſed in parliament, almoſt without oppoſition, and delivered thoſe who could comply with the conditions it impoſed, from the penal laws to which they had been ſubjected by the act of uniformity, and other acts paſſed under the houſe of Stuart. For the preſent ſtate of the toleration, ſee Toleration. See alſo Corporation *Act* and Test. Neal's Hiſt. of the Puritans, in 4 vols. 8vo. paſſim.

PURITY, in *Oratory*, is one of the conſtituent parts of elegance, and denotes the choice of ſuch words and phraſes as are ſuited and agreeable to the uſe of the language in which we ſpeak. Grammarians reduce the faults which they oppoſe to it to two ſorts, which they call barbariſm and ſoleciſm; the former of which reſpects ſingle words, and is an offence againſt etymology, and the reproach of it is incurred by the uſe of words entirely obſolete, by the uſe of words entirely new, or by new formations and compoſitions, from ſimple and primitive words in preſent uſe. The latter reſpects the conſtruction of words, and is an offence againſt ſyntax: to which Dr. Campbell adds a third claſs of faults, under the denomination of *impropriety*, which is an offence againſt lexicography, the buſineſs of which is to aſſign to every word of the language the preciſe meaning or meanings which uſe hath aſſigned to it. This impropriety occurs both in ſingle words and in phraſes. Dr. Ward recounts the principal things that vitiate the purity of language. It often happens, he ſays, that ſuch words and forms of ſpeaking, as were introduced by the learned, are afterwards dropped by them, as mean and ſordid, from a ſeeming baſeneſs contracted by vulgar uſe: and it is common to language, with all other human productions, that it is in its own nature liable to a conſtant change. (Hor. Art. Poet. v. 68.) We muſt, therefore, no leſs abſtain from antiquated, or obſolete words and phraſes, than from ſordid ones. On the other hand, we ſhould refrain from new ones, or ſuch, whoſe uſe has not been yet ſufficiently eſtabliſhed, at leaſt among thoſe of the beſt taſte. Beſides, any miſtake in the ſenſe of words or their conſtruction, is oppoſed to purity: for to ſpeak purely is to ſpeak correctly. And farther, a diſtinction ought to be made between a poetic diction, and that of proſe writers: for poets in all languages have a ſort of peculiar dialect, and take greater liberties, not only in their figures, but alſo in their choice and diſpoſition of words: ſo that what is a beauty in them, would often appear unnatural and affected in proſe. Ward's Or. vol. i. p. 308, &c. Campbell's Phil. of Rhet. vol. i. p. 409, &c.

PURKI, in *Geography*, a town of Hindooſtan, in Bahar; 33 miles N. of Ramgur.

PURLIEU. See Purlue.

Purlieu-*Woods*, ſuch as formerly conſtituted parts of the royal foreſts, but of which the owners have obtained grants from the crown, and permiſſion to diſforeſt them, and which not being now ſubject to any of the laws or regulations by which different intereſts in foreſt woods are conducted, may, Mr. Donaldſon ſays, be to all intents and purpoſes conſidered as private property. And, he adds,

that

that the manner in which theſe woodlands are occupied is exactly the ſame as that of many of the royal foreſts, with the exception of the right of paſturage, and for that reaſon much more productive and beneficial. See WOODS and ROYAL *Foreſts*.

PURLINS, in *Building*, thoſe pieces of timber that lie acroſs the rafters on the inſide, to keep them from ſinking in the middle of their length.

PURLUE, PURLIEU, or POURALLEE, formed from the French *pur*, *pure*, and *lieu*, *place*, is all that ground near any foreſt, which, being added to the ancient foreſt by our kings, was, by perambulation, granted by ſome of their ſucceſſors, ſevered again from the ſame, and made purlieu, *i. e.* pure and free from the laws and obedience of the foreſt.

A purlieu, or pourallee, is defined a circuit of ground adjoining to the foreſt, and circumſcribed with immoveable boundaries, known only by matter of record; which compaſs of ground was once foreſt, and afterwards was diſafforeſted by the perambulations made for ſevering the new foreſt from the old.

Purlieus, or pourallees, commenced after the manner following. King Henry I. at his acceſſion to the crown in 1154, took ſo much delight in the foreſts of this kingdom, that, not being contented with thoſe he found here, though many and large, he began to enlarge divers of them, and to afforeſt the lands of his ſubjects nearly adjoining to the ſame.

His ſucceſſors, Henry II. and Richard I., far from retrenching or reſtoring any thing, made ſtill farther encroachments: and thus did the lands continue till the 17th year of king John; at which time, the grievance being grown notorious, and generally felt by all degrees of people, divers noblemen and gentlemen beſought the king to grant, that they might have all thoſe new afforeſtations made by his predeceſſors aforeſaid, and by himſelf, diſafforeſted again; and the king, after much ſolicitation, was at length prevailed on to ſubſcribe and ſeal ſuch articles concerning the liberties of the foreſt, as they then demanded; being, for the moſt part, ſuch as are now contained in the Charter of the Foreſt.

Hereupon choice was made of divers noblemen, &c. to the number of twenty-five, who were ſworn, with others their aſſiſtants, to ſee the ſaid liberties, ſo granted and confirmed by the king, to be in every point obſerved.

But, before any thing was done to the purpoſe, king John died; and king Henry III. ſucceeding, freſh ſolicitations were made to him; who, for the better accompliſhing of the ſaid diſafforeſtation, ordered inquiſitions to be taken, by ſubſtantial juries, for ſevering all the new foreſts from the old: upon which, two commiſſioners were ſent to take thoſe inquiſitions; in virtue whereof, many great woods and lands were not only diſafforeſted, but were improved to arable lands by the owners thereof. After this charter was made and confirmed, ſome of theſe new afforeſtations were perambulated, and proper inquiſitions taken, and the certainty was determined by matter of record, which were the old, and which the new: though it appears, that the greateſt part of the new afforeſtations were ſtill remaining during the life of king Henry III.

Under Edward I. freſh petitions and ſolicitations being ſet on foot, three biſhops, three earls, and three barons, were at length appointed to ſee thoſe perambulations performed and continued; who cauſed them to be made accordingly, and inquiſitions to be taken thereupon, and returned into the court of chancery; and all thoſe that were ancient foreſt to be meered, and bounded with irremoveable boundaries, to be known by matter of record for ever.

Thoſe woods and lands, that had been newly afforeſted, the king likewiſe cauſed to be ſeparated from the old, and to be returned into the chancery by marks, meres, and bounds, to be known in like manner by matter of record for ever.

Thus it appears how the purlieus, or pourallees, had their firſt beginning; for all ſuch woods and lands as were afforeſted by Henry II. Richard I. or king John, and, by perambulations, ſevered from the ancient foreſts, were, and yet are, called *pourallees*, *q. d.* woods and lands ſevered from the old foreſts, and diſafforeſted by perambulation; *pourallee* being the ſame as *perambulatio*, in Latin.

But, notwithſtanding ſuch new afforeſtations were diſafforeſted by perambulation, whereby the ſame became pourallee, or purlieu, yet they were not thereby ſo diſafforeſted as to every man, but that they do, in ſome ſenſe, continue foreſt ſtill as to others. For, by the words of *Charta de Foreſta*, if the king has afforeſted any woods or lands of his ſubjects, to the damage of the proprietors, they ſhould forthwith be diſafforeſted again; that is, only as to thoſe perſons whoſe woods and lands they were: who, as the proper owners thereof, might fell and cut down their woods at their own pleaſure, without any licence from the king; as alſo convert their meadows and paſtures into tillage, or otherwiſe improve their ground to the beſt advantage. So alſo they might hunt, and chaſe the wild beaſts of the foreſt towards the ſame, &c. But no other perſon ſhould claim ſuch benefit of hunting in the pourallee, beſides the proper owner of the ſoil thereof, who is left at liberty to ſuffer the pourallee to remain foreſt ſtill, as ſome, in effect, have thought moſt expedient, becauſe hereby entitled to the benefit of the common within the foreſt, which otherwiſe they were excluded from. Hence, if the beaſts chance to wander out of the foreſt into the pourallee, the king hath a property in them ſtill, againſt every man, but the owner of the ground wherein they are, who hath a ſpecial property in them, *ratione ſoli*; yet ſo as he may only take them by hunting, or chaſing with his greyhounds or dogs, without any foreſtalling or foreſetting them in their courſe again towards the foreſt.

Beſide what hitherto has been ſaid of the difference between foreſt and purlieu, or pourallee, there is this farther diverſity, that all the woods and lands within the regard of the foreſt are abſolutely within the bondage or charge of the foreſt, as well in reſpect to the owners thereof, as of any other perſon; for no one may cut down his own woods, or improve his own lands, within the regard of the foreſt, without licence from the king or his chief juſtice in eyre of the foreſt. Neither ſhall any perſon hunt, chaſe, or moleſt the wild beaſts of the foreſt in his ground, within the regard of the foreſt, without licence or warrant from the king, or his chief juſtice of the foreſt ſo to do.

But thoſe, whoſe grounds are within the pourallees, are not ſubject to theſe reſtrictions. Yet are not the woods and lands in the pourallees abſolutely freed from the bondage of the foreſt, in reſpect of the wild beaſts having their haunts therein, when they happen to ſtray out of the foreſt; but as they were once abſolutely foreſt, ſo they are ſtill conditionally ſo.

PURLUE-*Man*, or *Purlieu-man*, or *Pourallee-man*, is one who has land within the purlue; and is allowed or qualified to hunt or courſe within the ſame, though under certain reſtrictions.

By ſtat. 13 Ric. II. he who may lawfully hunt in any pourallee, ought to have woods or lands of freehold within the pourallee, to the yearly value of 40*s*. By ſtat. Jac. 1. he ought to have lands of inheritance of the yearly value of 10*l*. or lands of freehold of the yearly value of 30*l*. or have

have goods worth 200*l.* or be the ſon of a knight or baron, or perſon of a higher degree, or ſon and heir apparent of an eſquire. But, by a later act, Car. II. no man may keep greyhounds within the pourallee, or elſewhere, within England or Wales, unleſs he have a free warren, or be lord of a manor, or ſuch a freeholder as is ſeiſed, in his own right, or in right of his wife, of lands, tenements, or hereditaments of the clear yearly value of 40*l.* over and above all charges and repriſes of ſuch eſtate of inheritance; or of lands, tenements, or hereditaments, in his own right, or in right of his wife, for term of life or lives, of the yearly value of 80*l.* over and above all charges and repriſes, or that is worth in goods or chattels 400*l.*

The pourallee, or purlieu, then, is ſaid to be for him that is ſo qualified: others, not qualified, and therefore not purlieu-men, yet having land in the pourallee, may, if they find any wild beaſts of the foreſts in their own grounds within the pourallee, chaſe them thereout with little dogs; but not with greyhounds, or other dogs.

Nor is the purlieu-man left at large to hunt at his own diſcretion; but he is tied down to ſeveral rules: as,

1. That he always begins his chaſe in his own ground; and, that, though he finds ſuch wild beaſts in his own pourallee, and in reſpect thereof, hath a property in them, *ratione ſoli*, againſt all perſons, but the king; yet ſuch his property is only on this condition, that he can ſtay them with his dogs in chaſe, without foreſtalling them, before they can recover the foreſt. If they be within the liſt of the foreſt, before the dogs faſten on them, they are the king's, or other owner of the foreſt.

2. But if the pourallee-man firſt make his chaſe in his own freehold, he may purſue the ſame through every man's ground within the pourallee, and his dogs faſten on a wild beaſt, before he can get within the bounds of the foreſt, and the beaſt draw the dogs into the foreſt, and is there ſlain by them; here the pourallee-man ſhall not enter into the foreſt, nor take the beaſt ſo killed, becauſe his courſe was irregular from the beginning, as he could claim no property in the beaſt, *ratione ſoli*.

3. A pourallee-man may hunt in his own pourallee with no more company than his own ſervants; neither may he appoint, licenſe, or warrant any other perſon, except his ſervants, to hunt by his commandment in his pourallee.

4. Every pourallee-man is forbidden, by the laws of the foreſt, to hunt in his own grounds within the pourallee every day, or oftener than three days in any one week, Sunday excepted.

5. Nor is any man to diſturb, or make a courſe after any deer found in his pourallee, within forty days after the king hath made a general hunting in the foreſt adjoining thereunto; becauſe then the wild beaſts of the foreſt come not into the pourallees of their own accord, but as they are forced into the ſame by the hunters, with clamours, and blowing of horns, ſo that they fly thither for refuge.

6. No man ſhall hunt within ſeven miles of the borders of the foreſt, or in his own pourallee, within forty days next before the king hath iſſued out his proclamation, declaring his royal will and pleaſure to make a general hunting in that foreſt.

Inaſmuch as the pourallees were once, and in ſome ſenſe ſtill are foreſt, it was neceſſary to have officers to attend, and take on them the charge of the preſervation of the game that may happen to wander out of the foreſt into the pourallees; ſince otherwiſe the laws of the pourallees could not be executed, but the foreſt itſelf would ſoon be deſtroyed by the pourallee-men.

For this reaſon, rangers were firſt appointed, who, though not officers in the foreſt, yet appertain thereto; for all officers in the foreſt have charge of the vert and veniſon of the foreſt; but a ranger hath no charge of the vert, but only of veniſon coming out of the foreſt, into the pourallees, his place of charge; from whence his office is to conduct the ſame back again into the foreſt.

This officer is appointed by the king, or his chief juſtice in eyre, and is made by patent, with a fee commonly of twenty, thirty, or forty pounds, or more, by the year, payable out of the exchequer, as alſo certain fee-deer, both red and fallow, to be taken annually, at proper ſeaſons, out of the foreſt.

The ſubſtance of his oath is, to rechaſe, and with his hounds drive back, the wild beaſts of the foreſt, as often as they range out of the ſame into his pourallee; to prevent all unlawful hunting and hunters of wild beaſts of venery and chaſe, as well within the pourallees, as within the foreſt; and to preſent thoſe and other offences, at the next court of attachments or ſwainmote, which ſhall firſt happen.

Rangers, it is to be obſerved, belong only to ſuch pourallees as were once the woods and lands of the ſubject, and were afterwards diſafforeſted again, and ſo became pourallees. Hence, as there are ſome foreſts in England, which never had any enlargement by new afforeſtations, and therefore have no pourallees at this day, there can be no rangers belonging to them. Manwood's Foreſt Laws, part 2. c. 20. 4 Inſt. 303, 4. 1 Jones's Rep. 278. Moor. 706. 987.

PURMALL, in *Geography*, a town of Hindooſtan; 15 miles W.S.W. of Allahabad.

PURMERENT, a town of North Holland, on a brook of the ſame name, governed by a council, bailiff, and burgomaſters. The town had a voice in the aſſembly of the ſtates; 10 miles N. of Amſterdam. N. lat. 52° 33′. E. long. 4° 46′.—Alſo, a ſmall iſland near the coaſt of Java, on which lies an hoſpital for the diſeaſed poor of Batavia.—Alſo, a ſmall iſland in a large bay on the N. coaſt of New Guinea. S. lat. 2° 16′. E. long. 135° 12′.

PURNA. See PANNAH.

PURNEAH, a circar of Bengal, bounded on the N. by Morung, on the E. by Dinagepour, on the S. by Rajemal, and on the W. by Bahar; about 80 miles long from N.E. to S.W., and 70 from N.W. to S.E. The capital of the ſame name is ſituated on a river which runs into the Ganges; 200 miles N. of Calcutta. N. lat. 25° 48′. E. long. 87° 40′.

PURNITZ, a town of Moravia, in the circle of Iglau; 7 miles S.E. of Iglau.

PURPARTY (Fr. *pour part*, i. e. *pro parte*) is that part or ſhare of an eſtate, firſt held in common by parceners, which is by partition allotted to any of them. To make purparty is to divide and ſever the lands that fall to parceners, which till partition they held jointly, and *pro indiviſo*. Old Nat. Br. 11.

PURPLE, PURPURA, πορφυρα, a red colour, bordering on violet; now dyed chiefly with cochineal.

Purple was much eſteemed among the ancients; eſpecially the Tyrian purple, which underwent more dyes than the reſt, and which was almoſt peculiar to the emperors and kings. Yet this purple did not exceed that now in uſe. The chief reaſons why the ancient purple dye has been diſuſed are, that the latter is both cheaper and finer.

The ancient purple was tinged or given with the blood or juice of a precious turbinated teſtaceous ſea-fiſh, called by the Greeks πορφυρα, and by the Latins *purpura*; of which we have deſcriptions in ſeveral authors, and ſhells in moſt of the cabinets of the curious. See PURPLE-*Fiſh*.

The

The method of obtaining the colour, Mr. Cole (ſee PURPLE-*Fiſh*) deſcribes thus:

The ſhell, which is very hard, being broken, (with the mouth of the fiſh downwards, ſo as not to cruſh the body,) and the broken pieces being picked off, there appears a white vein lying tranſverſely in a little furrow or cleft next the head of the fiſh.

In this vein is the purple matter lodged; ſome of which, being laid on linen, appears at firſt of a light green colour; and, if expoſed to the ſun, ſoon changes into a deep green, and in a few minutes, into a ſea-green, and, in a few more, into a blue; thence it ſoon becomes of a purpliſh-red, and, in an hour more, of a deep purple red.

And here the ſun's action terminates; but by waſhing in ſcalding water and ſoap, and drying it, the colour ripens to a moſt bright and beautiful crimſon, which will bear waſhing admirably without the addition of any ſtyptic. While the cloth marked with this colour lies in the ſun, it will yield a very ſtrong and fœtid ſmell, as if garlic and aſſa fœtida were mixed together.

The juice which gives this beautiful purple colour is, ſays M. du Hamel, while it remains in the body of the animal, and while that is in health, wholly white; but no ſooner is it expoſed to the ſun, than it begins to change colour, and in leſs than five minutes goes through the ſeveral changes of pale green, yellowiſh, and a beautiful emerald green; after this it becomes of a deeper and duſkier green, then blueiſh, reddiſh, and finally a deep and very beautiful purple. Sometimes the juice is found naturally green in the animal: this is probably from the creature's being in a diſeaſed ſtate. But when it is naturally thus, it immediately becomes red, and afterwards purple, on being expoſed to the ſun; its ſeveral preceding changes ſeeming to have been made already in the body of the animal.

If a piece of linen be rubbed over with this juice, and part of it expoſed to the ſun, part not, that only will turn red which is ſo expoſed, the other remaining green without any alteration; and it is obſerved, that the ſtronger the ſun ſhines, the quicker the change appears, and probably the colour is in proportion alſo the more beautiful and lively. And it is very remarkable, that if a needle, or any other opaque body, be laid upon the linen which is yet green, and is to become red on being expoſed to the ſun; after ſuch an expoſure, the whole ſhall be changed red or purple, excepting only that ſmall ſpot which is covered by the needle, which will ſtill remain green.

A plate of glaſs, though it be three inches thick, will not prevent the colour from changing purple by being laid over it; but the thinneſt piece of metal will keep it wholly green. The one being opaque, and the other pellucid, are evidently the only reaſons for this difference.

If the coloured linen be ſucceſſively covered by three pieces of paper, the one blacked with ink, the other in its natural ſtate, and the third rubbed over with oil, it will change colour on being expoſed to the ſun in different degrees; and that exactly in proportion to the degree of tranſparence in each of the papers: moſt of all in that which was covered with the oiled paper; ſomething leſs in that covered by the paper in its natural ſtate; and leaſt of all in that which was covered with the blacked paper, as that is leaſt tranſparent.

The common heat of a fire, or that of a red-hot iron, produces no change at all in the colour when green. The vapour of burning ſulphur produces a little; but the green, which had not changed to purple by theſe experiments, immediately changed to it on being expoſed to the rays of the ſun.

Theſe experiments were all made in the months of January and February, by M. du Hamel, in Provence; and the ſun having power to change the colour ſo ſpeedily there in theſe cold months, probably in a warmer climate or ſeaſon the air would have been ſufficient for the purpoſe, without the open ſun; ſince it ſeems, from experiment, that both the ſolar rays, and the light alone in a cloudy day, can act upon this colour. The light and heat of the ſun both act on this colour: light is always ſufficient to produce the effect, but the heat may eaſily be too great or too little; and to do the whole in perfection, it muſt be at a certain middle degree.

This beautiful purple, if it can ever be brought into uſe in dyeing, will have one very great advantage from its viſcoſity. The pieces of cloth that had been ſtained by it retained their colour, in ſpite of ſeveral boilings in different liquors, which M. du Hamel made them paſs through; and the colour, on examination, was found not to be ſuperficial, but penetrated the whole body of the ſtuff, which was tinged by it. There are many inconveniences which muſt naturally attend the uſe of this ſubſtance as a dye, but they may, perhaps, all be got over by care and application. It is very certain, that it is of too viſcid a nature eaſily to penetrate many ſubſtances; but it is alſo certain, that this might be obviated by diſſolving it in ſome proper liquor. It appears very plainly, that the ancients had a method of thus diſſolving their purple; but we neither know what was their purple, nor what was its diſſolvent; nor, which would be of much more conſequence to us at preſent, what is the proper diſſolvent for our own. Mem. Acad. Scien. Par. 1736.

M. Reaumur has alſo diſcovered another very different kind of purple. This is produced in oval grains about a quarter of an inch long, full of white liquor bordering on yellow, which cover certain ſtones or ſands, about which the buccina of Poictou uſually aſſemble.

By the experiments M. Reaumur has made, it appears that theſe grains are neither the eggs of the buccinum, nor the ſeeds of any ſea-plants, nor any riſing plants, but the eggs of ſome other unknown fiſh.

Theſe grains, being bruiſed on a white linen, at firſt only tinge it yellow, and that inſenſibly; but in three or four minutes they give it a very beautiful purple red, provided the linen be expoſed to the open air; for the air of a room, even though the windows be open, will not do. This colour fades, however, a little by repeated waſhings.

M. Reaumur concludes, from ſome experiments he made, that the effect of the air on the liquor does not conſiſt in its taking away any particles of it, nor in giving it any new ones, but only in its agitating it, and changing the arrangement of the parts that compoſe it. He adds, that the liquor of the buccinum, and that of the grains, ſeem to be nearly of the ſame nature; except that the latter is more watery, and only ſaline; whereas the other is hot, and pungent.

P. Labat gives us the deſcription of another purple dye, produced by a tree growing in the Antilles. The juice of this tree, when cut ſtanding, is of a blood-red, and communicates the ſame colour to cloths; though, like the former, it loſes much in often waſhing.

PURPLE, *Dyeing*. See DYEING.

PURPLE *Gold*. See GOLD *Precipitate*, &c.

PURPLE, in *Medicine*, an epithet applied to every diſeaſe, in which eruptions of purple ſpots, or *petechiæ*, appear, and theſe being uſually the accompaniments of fevers of every kind in their worſt and moſt dangerous forms, ſo *purple*

fever was nearly ſynonimous with *putrid*, or *malignant* fever. See PETECHIÆ, and PURPURA.

PURPLE *Apple*, in *Botany*. See ANNONA.

PURPLE *Fiſh*, *Purpura*, in *Natural Hiſtory*, the name of a genus of ſhell-fiſh, the characters of which are theſe: it is an univalve ſhell, jagged and beſet from head to tail with ſpines, tubercles, umbos, or ſtriæ. The mouth is ſmall and roundiſh; the tail is ſhort, and uſually the baſe runs out into a long beak. See DYEING.

It has been uſual with moſt authors to confound together the genera of the murex and purpura, and to uſe the words as ſynonimous: but though there is ſome external reſemblance between many of the ſhells of the two genera, yet they are eaſily diſtinguiſhed by this, that the mouth of the purpura is leſs long, and is leſs dentated and alated than that of the murex. The body and the head of the ſhells of this genus are not ſo elevated as thoſe of the murex kind, and are not covered with points or buttons at the mouth. If a ſhell is therefore found to have a ſmall, ſmooth, and round mouth, and a body covered with undulated leaves, as it were, like thoſe of ſavory or endive, and ſometimes with long points, and its tail, whether long or ſhort, be hollowed and ſomewhat bent, this may be called a purpura, and not a murex. Linnæus makes the purpura a ſpecies of the murex.

The ancients diſtinguiſhed three kinds of purpura; one which had a long and crooked tail, made hollow like a tube or pipe; a ſecond which had either no tail at all, or at the moſt a very ſhort one; and a third which had no ſpiral head, or, as we ſhould expreſs it, no clavicle.

On examining the whole family of the purpuræ, we may diſtinguiſh four remarkable ſpecific differences among them. The firſt of theſe comprehends thoſe purpuræ which have the body of the ſhell garniſhed with a ſort of undulated foliage in clouded ridges, and have a ſhort and crooked tail. The ſecond comprehends thoſe which have the body of the ſhell covered with acute points, and have a long tail. The third comprehends thoſe which have as long a tail as the former, but have a ſmooth body, or at the utmoſt have only a few ſlight protuberances and wrinkles on it. And the fourth takes in thoſe which are ſmall, and have an elevated clavicle, a ſhort crooked tail, and the body of which is covered either with ſlender ſpines or hairs.

This ſpecies of fiſh, as well as the murex, ſerved among the ancients to dye the fine purple colour they were ſo fond of, and ſome of the buccina (*e. g.* the *lapillus* of Linnæus) have been of late found to have the ſame juice. The purpura and murex are both fiſhed up in great plenty in the gulf of Tarentum; but the ſmall quantity of the coloured juice which each fiſh contains, and the neceſſity of uſing it before the animal dies, makes it impoſſible to bring it to any regular article of traffic. The ancients uſed this colour only on cotton and woollen ſtuffs; whereas our cochineal, which was unknown to the ancients, ſtrikes equally well on ſilks and ſtuffs. Theſe ſhells are alſo found in various parts of the Mediterranean.

In the ſeas of the Spaniſh Weſt Indies about Nicoya, is found a ſhell-fiſh, which perfectly reſembles the ancient purpura, and, in all probability, is the very ſame. This fiſh, Gage tells us, uſually lives ſeven years; it hides itſelf a little before the dog days, and continues to diſappear for three hundred days running.

They are gathered plentifully in the ſpring, and, by rubbing one againſt another, they yield a kind of ſaliva or thick glair, reſembling ſoft wax: but the purple dye is in the throat of the fiſh, and the fineſt part is lodged in a little white vein; the reſt of the body is of no uſe. He adds, that the chief riches of Nicoya conſiſt in this fiſh. Cloth of Segovia, dyed with it, is ſold for twenty crowns the ell; and none but the greateſt Spaniſh lords uſe it.

There are alſo found upon the coaſts of the South-ſea, near the equator, in the neighbourhood of point St. Helena, in the province of Guayaquil, certain ſea-ſnails, as Don Antonio de Ulloa calls them, ſticking to the ſtones, and covered by the ſea at high water, about the ſize of ſmall nuts, which contain a liquor or juice that has the true colour of purple. The colour is very bright, and ſo durable, that waſhing rather increaſes than diminiſhes its luſtre, nor does it fade or decay by uſe and wearing. Woven ſtuffs are not dyed with it, but only cotton threads. As ſoon as a ſufficient quantity of the liquor is ſqueezed from the fiſh, the cotton thread is drawn through it, and it takes and retains the tincture without any farther trouble; but the purple colour is not diſcovered till the thread is dry, the juice being of a milky colour at firſt, but it ſoon changes into green, and at laſt ſettles in a purple.

Beſides the Indian purple fiſhes, we have others much nearer home. In the Philoſoph. Tranſact. abr. vol. ii. p. 823, we have an account of purple fiſh diſcovered in 1684, by Mr. W. Cole, on the coaſts of Somerſetſhire, South Wales, &c. where it is found in great abundance. The modern purple fiſh, M. Reaumur obſerves, is a kind of buccinum, a name given by the ancients to all fiſhes whoſe ſhell bears any reſemblance to a hunting-horn; and it appears from Pliny, that part of the ancient purple was taken from this kind of ſhell-fiſh: ſo that this may be eſteemed a recovery of what had been ſuppoſed entirely loſt. See DYEING.

The fiſh, he obſerves, is good; and adds, that there are ſeveral kinds of it differing in ſize and ſhell, and alſo in the colour of the tinging liquor. There are ſome found on the coaſts of Poictou.

The Caribbee iſlands have likewiſe their purple fiſh. This is called *burgan*, being of the ſize of the end of the finger, and reſembling our periwinkles; its ſhell is of a browniſh azure, its fleſh white, its inteſtines of a very bright red, the colour of which appears through the body; and it is this that dyes the froth, which it caſts forth when taken, and which is at firſt of a violet hue, bordering on blue.

To oblige them to yield the greater quantity of froth, they lay them on a plate, and ſhake and beat them againſt one another; upon which the plate is immediately covered with the froth, which is received on a linen cloth, and becomes purple in proportion as it dries.

P. Labat obſerves, that if this be the real Tyrian purple, the ſecret of preparing and fixing it is loſt; this colour being found to dwindle and diſſipate, in proportion as the linen dyed with it is waſhed.

The purpura lives on other fiſh. It uſually hides itſelf at a ſmall depth in the ſand, ſometimes even in freſh-water rivers, and as it lies hid, it thruſts up a pointed tongue, which wounds and kills any thing that comes over it. We frequently find ſea-ſhells with round holes bored through them, as regularly as if made with a boring inſtrument: theſe are generally allowed to be made by the tongue of the purpura, in order to its feeding on the fiſh within.

The purpura has two horns like that of a ſnail; and Fabius Columna ſays, that they have eyes in theſe, not placed at the ends, as in the ſnail, but in the middle of each horn.

The purpura is a ſhell-fiſh very well known, and has been known alſo in almoſt all times to afford a purple liquor; but as there has been no method diſcovered of bringing this li-

quor into uſe in dyeing, the fiſh has been neglected, and its juice never attempted to be brought into uſe.

Purple-*Wort*, in *Botany*, a name given to ſeveral ſpecies of trefoil.

PURPRESTURE, in our *Ancient Law Books*. See Pourpresture.

PURPRISUM, of the French *pourpris*, denotes a cloſe, or incloſure: alſo the whole compaſs or extent of a manor or place.

"Donavi eis meum purpriſum de Kirkeham, & domos meas, & molendinum, & prata, &c." Charta Walteri Eſpec. Priorat de Kirkeham.

PURPURA, Persian, the ſame with the Perſian ſhell, a ſpecies of dolium.

Purpura, in *Medicine*, in the nomenclature of cutaneous diſeaſes propoſed by Dr. Willan, ſignifies an eruption of purple ſpecks and patches, that is of *petechiæ*, *ecchymomata*, and *vibices*, accompanied with general debility, but not always with fever.

Under this limitation, the purpura is ſynonimous with the "petechiæ ſine febre" of ſome medical writers, (ſee Rombergius, Ephem. Natur. Curioſ. dec. iii. ann. 9 and 10, obſ. 108; and Dr. Graaf, Diſſ. Inaug. de Petechiis ſine Febre, Gött. 1775); with the "hæmorrhæa petechialis" (ſee Dr. Adair, Diſſ. Inaug. Edin. 1789, and Dr. Bateman, Diſſ. Inaug. ibid. 1801); with the "land-ſcurvy," &c. of others. Riverius, Diemerbroeck, Sauvages, Cullen, and one or two others, appropriated the term *purpura* in like manner to *petechial* ſpots only, and rightly excluded from this appellation all other eruptions of a character eſſentially different.

In thus limiting the acceptation of the term, however, it is proper to mention, that in the writings of many phyſicians it is applied to various other eruptive diſeaſes, which have no affinity with petechial blotches, and very little with each other. Thus, under the name of purpura, the red-gum, or ſtrophulus, is deſcribed by Etmuller,—the ſcarlet fever by Schultz and Juncker,—the meaſles by Hafenreffer and Morton,—the nettle-raſh, miliary veſicles, and lichen, by Hoffmann and others. See Willan on Cutan. Diſ. p. 452.

The purpura occurs under various degrees of violence, which induced Dr. Willan to make two ſpecies, which he denominated *ſimplex* and *hæmorrhagica*, according as the eruption occurred alone, or with diſcharges of blood. It is impoſſible, however, to draw ſo diſtinct a line, where nature preſents no clear difference. We can only ſtate that, in the milder degrees, there is an eruption of petechiæ only, chiefly appearing on the extremities and breaſt, and ſeldom affecting the face. The complexion is generally pallid or ſallow, and there is a conſiderable degree of debility and languor, and ſometimes pains in the limbs.

In the more ſevere caſes of the diſeaſe, the failure of ſtrength is conſiderably greater, and often precedes, for ſome time, the appearance of the eruption. The ſpots commonly appear firſt on the legs, where they are uſually the largeſt and moſt numerous, and are often accompanied with anaſarcous ſwellings. When they firſt appear, they are of a bright red hue, but they gradually become purple or livid, and when about to diſappear, they change to a brown or yellowiſh hue; ſo that in the progreſs of the diſeaſe, as the ſpots appear and fade in ſucceſſion, the ſkin preſents a conſiderably variegated appearance. In the more ſevere forms, the petechiæ are intermixed with *ecchymoſes* and *vibices*, or livid patches and ſtripes, reſembling the effects of a bruiſe, or of the ſtrokes of a whip. In this ſtate, ſometimes, when theſe patches do not appear ſpontaneouſly, the gentleſt preſſure on the ſkin, ſuch as is applied in feeling the pulſe, will produce a purple blotch, like that which follows a ſevere blow.

When the diſeaſe is ſtill more ſevere, in addition to theſe effuſions of blood under the cuticle, conſiderable diſcharges of blood take place from thoſe parts which are defended by a very delicate cuticle; whence theſe hæmorrhages originate particularly from the internal paſſages and organs, and are occaſionally very profuſe, endangering, and occaſionally deſtroying life. Moſt frequently, however, the bleeding is ſlow, and in ſmall quantity, ſometimes almoſt a conſtant oozing, and ſometimes returning at intervals. Theſe hæmorrhages take place from the gums, noſtrils, throat, the inſide of the cheeks, the tongue, and lips; ſometimes from the lining membrane of the eye-lids, the urethra, and the external ear; and often from the internal cavities, the lungs, ſtomach, bowels, kidnies, uterus, and bladder. There is great variety, however, in the periods of the diſeaſe at which the hæmorrhages commence and ceaſe, and as to the proportion which they bear to the cutaneous efflorescence.

This ſingular diſeaſe occaſionally appears ſuddenly, in the midſt of good health, attacking during the night. It is always accompanied by great feebleneſs and depreſſion of ſpirits; and often by pains in the cheſt, loins, or abdomen, by irregularity of bowels, or by cough; and the pulſe is ſometimes ſlightly quickened and very feeble, as in a moderate hectic. But in ſome caſes theſe functions are not perceptibly diſturbed. The duration of the diſeaſe is equally uncertain: in ſome inſtances it has terminated in a few days, while in others it has continued not only many months, but years. When it terminates fatally, it is commonly in conſequence of a copious hæmorrhage, either ſuddenly from ſome important organ, or more ſlowly from ſeveral parts at the ſame time.

The cauſes of this diſeaſe are not clearly aſcertained, nor its pathology well underſtood. It occurs at every period of life, and in both ſexes; but moſt frequently in women, and in boys before the age of puberty, particularly in thoſe who are of a delicate habit, who live in cloſe and crowded ſituations, and on poor diet, or are employed in ſedentary occupations, and ſubject to grief, anxiety, fatigue, and want of ſleep. It has likewiſe attacked thoſe who are left in a ſtate of debility by previous acute and chronic diſeaſes, as after meaſles or ſmall-pox, or during confinement in the puerperal ſtate, or after a violent ſalivation from mercury. On the other hand, however, the diſeaſe appears occaſionally in its moſt ſevere and fatal form, where none of theſe circumſtances had previouſly exiſted: for inſtance, in young perſons living in the country, and ſuffering no privation of any of the comforts of life, and previouſly enjoying good health. This fact tends greatly to obſcure the pathology of the diſeaſe: for it renders the operation of theſe alleged cauſes extremely queſtionable, and ſeems to eſtabliſh an eſſential difference between purpura and ſcurvy, in the origin and nature of the morbid actions which conſtitute the diſeaſe. In ſcurvy (by which we mean the *ſcorbutus*, or true ſcurvy, formerly prevalent among ſeamen in long voyages, and among people in beſieged towns, and other ſituations, when living upon putrid, ſalted, dried, or otherwiſe indigeſtible food, yielding imperfect nutriment,) the reſtoration of the proper nouriſhment, with the uſe of freſh vegetables and acids, invariably removes the ſymptoms, and they never commence where ſuch diet can be obtained: while, in many caſes of purpura, this diet has been taken abundantly, without the ſmalleſt alleviation of the complaint, and the diſeaſe has come on, where there had been no deficiency. "On the other hand, the rapidity of

the attack, the acuteneſs of the pains in the internal cavities, the actual inflammatory ſymptoms that ſometimes ſupervene, the occaſional removal of the diſeaſe by ſpontaneous hæmorrhage, the frequent relief derived from artificial diſcharges of blood, (ſee two caſes of purpura by Dr. Parry, Edin. Med. and Surg. Journ. for Jan. 1809), and from purging, all tend to excite a ſuſpicion that ſome local viſceral congeſtion or obſtruction is the cauſe of the ſymptoms in different inſtances." (Bateman's Practical Synopſ. of Cutan. Diſ. p. 110.) Several facts in proof of theſe obſervations are ſtated in the work juſt quoted; but a ſufficient number has not yet been collected to afford any general inference reſpecting the nature of the diſeaſe.

The cure of purpura is, therefore, not eſtabliſhed upon any clear principle, and there has been conſiderable difference of opinion upon the ſubject. Dr. Willan has given a very imperfect view of this point. All that he ſays relative to the cure of the worſt form of purpura, is compriſed in theſe few lines. "In the treatment of this diſeaſe, we ſhould recommend moderate exerciſe in the open air, a generous diet, and the free uſe of wine, Peruvian bark, vitriolic acid, &c. Without air, exerciſe, and an eaſy ſtate of mind, the effect of medicines is very uncertain." (On Cutan. Diſeaſes, p. 461.) Of this, indeed, he has given an ample proof in the next ſentence, where he tells us that a patient "took for *two or three months* Peruvian bark in conſiderable quantities, the vitriolic and marine acid, and wine, without much advantage." In truth, the cure of purpura is, we believe, not to be effected by theſe means. In the ſlighter degrees of the diſeaſe, occurring in children who are ill fed and nurſed, and excluded from the air and from all exerciſe, theſe tonics may ſeem to do good, when combined with air and exerciſe. "But," as Dr. Bateman obſerves, "when it occurs in adults, eſpecially in thoſe already enjoying the benefits of exerciſe in the air of the country, and who have ſuffered no privation in reſpect to diet; or when it appears in perſons previouſly ſtout, or even plethoric; when it is accompanied with a white and loaded tongue, a quick and ſomewhat ſharp, though ſmall, pulſe, occaſional chills and heats, and other ſymptoms of feveriſhneſs, however moderate;—ſymptoms which may be preſumed to indicate the exiſtence of ſome local congeſtion; —then the adminiſtration of tonic medicines, particularly of wine, cinchona, and other warmer tonics, will be found inefficacious, if not decidedly injurious. In ſuch caſes, free and repeated evacuations of the bowels, by medicines containing ſome portion of the muriate of mercury, will be found moſt beneficial. The continuance or repetition of theſe evacuants muſt, of courſe, be regulated by their effects on the ſymptoms of the complaint, or on the general conſtitution, and by the appearance of the excretions from the inteſtines. If the pains are ſevere and fixed, and if the marks of febrile irritation are conſiderable, and the ſpontaneous hæmorrhage not profuſe, local or general bloodletting may doubtleſs be employed with great benefit, eſpecially in robuſt adults." Pract. Synopſis, before quoted, p. 114.

The importance of free purgation in purpura has been clearly ſtated in a ſhort but valuable communication from Dr. Harty, of Dublin, publiſhed in the Edinburgh Medical and Surgical Journal, for April, 1813: in more than a dozen caſes treated in this manner by Dr. Harty, the hæmorrhages ceaſed, and the purple ſpots diſappeared, after a few doſes of calomel and jalap had been taken. In the two caſes related in the ſame uſeful journal by Dr. Parry, of Bath, before alluded to, and which were ſpeedily cured by two bleedings from the arm, the blood drawn exhibited a tenacious contracted coagulum, covered with a thick coat of lymph, as in diſeaſes of an inflammatory nature. The patients were a lady and an officer, the latter of whom was accuſtomed to free living: in both caſes ſome degree of feveriſhneſs accompanied the purpura.

There is one variety of the diſeaſe, which Dr. Willan diſtinguiſhed as a third ſpecies, by the title of purpura *urticans*, becauſe the eruption commences in the form of rounded and reddiſh elevations of the cuticle, reſembling the wheals of nettle-raſh; but they are not accompanied by the ſame ſenſations, tingling and itching, which belong to the nettle-raſh. Theſe little tumours gradually dilate; but within one or two days they ſubſide to the level of the ſurrounding cuticle, and at the ſame time their hue becomes darker and at length livid, or purple. As theſe ſpots are not permanent, but appear in ſucceſſion in different places, they are commonly ſeen of different hues; the freſh and elevated ones being of a brighter red, while the level ſpots exhibit different degrees of lividity, and become brown as they diſappear. They are moſt common on the legs, where they are frequently mixed with petechiæ; but they ſometimes appear on other parts of the body.

The duration of the purpura urticans is various, from three to five weeks, in the courſe of which time the hands and ankles are affected with œdematous ſwellings: there is alſo a diſtreſſing degree of languor and debility, and a loſs of appetite, but ſeldom hæmorrhage. It generally appears in ſummer and autumn, affecting thoſe who are expoſed to fatigue, and live on poor diet, and delicate young women of indolent and luxurious habits. The ſame precepts, as to treatment, are applicable to this as to the other varieties of purpura.

When purple ſpots occur as ſymptomatic of bad fevers, they require no peculiar treatment. They are much leſs frequent concomitants of fevers than they were formerly; a circumſtance which is probably to be aſcribed partly to the more liberal uſe of purgatives at preſent in all febrile diſeaſes, and partly to the more free admiſſion of freſh air, to the ſuperior cleanlineſs, &c. now obſerved in theſe maladies. The appearance of theſe ſpots has been occaſionally noticed by various authors in agues, remittent fevers, palſies, dropſy, and atrophy. Dr. Willan obſerves, that in the laſt ſtage of pulmonary conſumption they ſometimes occur as the immediate forerunners of death. (See PETECHIÆ.) For hiſtories and caſes of purpura, ſee Duncan's Med. Comment. vols. xiv. and xx. and Med. Caſes and Obſerv. p. 90. Annals of Medicine, vol. ii. Memoirs of the Med. Society of London, vol. iii. art. 20; and vol. iv. art. 17. Medical Tracts and Obſ. vol. ii. Willan's Reports on the Diſeaſes of London.

PURPURATI, in our *Ancient Hiſtorians*, denote the ſons of emperors and kings.

PURPURE, POURPRE, or *Purple*, in *Heraldry*, according to ſome, is one of the five colours of armories, mixed or compounded of gules and azure, bordering on violet; and, according to others, of a little black and much red colour. It is, by the heralds, ſuppoſed a ſymbol of temperance, liberality, dignity, authority, faith, and picty. Moſt authors in heraldry, as Favyn, Geliot, Monet, and Meneſtrier, do not allow purple for a colour, in regard it is not ſimple, but compoſed of a mixture of other colours. They rather eſteem it a kind of intermediate tincture, ſometimes metal, and ſometimes colour: hence the Spaniards call it *una miſtion*: ſo that one cannot lay it on metal and colour without falſifying the arms.

Add, that many take the purple, as it is accounted, on many ancient bearings, by which ſome of the moderns would

evince the regularity and legitimacy of this colour in armory, to be no other than ſilver tarniſhed.

Spelman, however, in his Aſpilogia, allows purple the preference before all other colours, as having been an enſign of royalty for many ages; yet even he allows it to have been excluded, by the ancient heralds, as only an imperfect colour.

It is repreſented in engraving, by diagonal lines drawn from the ſiniſter chief to the dexter baſe point. In the coats of noblemen it is called *amethyſt*; and in thoſe of princes, *Mercury*.

PURPURINA, a name uſed by Caneparius, and ſome other authors, for the aurum moſaicum, or aurum muſivum of the ſhops, the preſent preparation of which differs from that of that author only in the proportions of the ingredients.

PURPURISSUS, in the *Ancient Writers*, both Greek and Roman, the name of a compound colour or fucus of a fine purpliſh red, uſed to paint women's cheeks.

It ſeems by the compoſition to have been ſomewhat like our roſe pink, as it is called by the colourmen. It was made of the creta argentaria, or fine white kind of chalk, diſſolved in a ſtrong purple tincture of ſome of the roots of wood which dyed red; and when the coarſer part was ſubſided to the bottom of the veſſel, the liquor, while yet thick, was poured off into another veſſel; and what ſubſided from this, which was as fine as flour, was of a beautiful pale purple, and was the purpuriſſus ſaved for uſe.

PURREL, anno 35 Eliz. cap. 10. a liſt ordained to be made at the ends of kerſeys, to prevent deceit in diminiſhing their length.

PURRONGUR, in *Geography*, a town of Hindooſtan, in the circar of Bilſa; 20 miles S.E. of Bilſa.

PURROWNAH, a town of Hindooſtan, in Oude; 28 miles E. of Gooracpour. N. lat. 26° 57′. E. long. 84° 17′.

PURRUAH, a ſmall circar of Bengal, about 16 miles in circumference; N. of Mauldah.—Alſo, a town of Bengal, and chief town of the ſaid circar; 26 miles E.S.E. of Burdwan. N. lat. 23° 4′. E. long. 88° 25′.

PURSAH, a town of Hindooſtan, in Bahar; 18 miles N.W. of Chuprah.

PURSAUMMAH, a town of Hindooſtan, in Bahar; 35 miles E. of Durbungah.

PURSE, a manner of accounting; or, as ſome call it, a ſpecies of money of account, much uſed in the Levant, particularly at Conſtantinople, where it is 500 aſpers; three aſpers being equal to a para, and forty paras equal to a piaſtre, called by the Turks grouch, and by the Engliſh dollar. By the regulations of 1780, the purſe of 500 piaſtres was to weigh 2812½ Turkiſh drams. A ſingle piaſtre weighed 5⅝ drams, or 277 Engliſh grains; and the other pieces in proportion. Their ſtandard of fineneſs was reduced at the ſame time to 50 carats (or hundredth parts) of fine ſilver, and 50 of alloy: which gave the value of the piaſtre at 19¼*d.* ſterling, and the other ſilver coins in proportion. But ſince that period the Turkiſh coins have undergone a deterioration, ſo that a piaſtre of the lateſt coinage being weighed and aſſayed by the king's aſſay maſter of the Mint, appeared to be in weight 8 dwt. 6 gr.; in fineneſs, 5 oz. 6 dwt. worſe than the Engliſh ſtandard. This gives its fineneſs 47 carats 2 grains Turkiſh, and its value, in ſterling, 13⅛*d.* Kelly's Un. Cambiſt.

This money of account is called purſe, becauſe all the grand ſignior's treaſure in the ſeraglio is kept in leather bags of this value.

In this, however, there is ſome difference; for the purſe in Egypt is 25,000 medinis, or 75,000 aſpers; and in other parts of Turkey it is only 20,000.

This method of accounting the Turks derive from the Greeks, and they from the Romans; the emperors of which brought it to Conſtantinople, as appears from a letter of Conſtantine to Cecilian, biſhop of Carthage, quoted by Euſebius and Nicephorus. See FOLLIS.

PURSE-*Net*, in *Rural Economy*, a net uſed for taking both hares and rabbits at certain times; and three or four dozen of them are ſufficient to lay over their holes: they are to be faſtened, by tying ſtrings to ſticks thruſt into the earth, otherwiſe when the rabbits bolt out, they will run away and get out of the nets; but when the nets are fixed, and all things are in order, there muſt be one or two perſons to lie cloſe, to ſee what game comes home; while, in the mean time, you beat the buſhes, to force them homewards. But another way to take rabbits with theſe nets is, at their coming out of their parraces: and they ſhould be ſecreted in this manner. Firſt hunt them up and down, to force them all in, then put in a ferret, with a bell about her neck, which gives the rabbit notice of her coming, who, in endeavouring to avoid the ferret, runs into the net.

PURSER, an officer aboard a man of war, appointed by the lords of the admiralty, who receives her victuals from the victualler; and is to take care that it be in good condition, and well laid up and ſtowed. He is alſo to ſee that they are carefully diſtributed to the officers and crew, according to the inſtructions which he has received from the commiſſioners of the navy for that purpoſe. To him alſo belongs the diſtribution of ſlops, &c.

He is alſo to keep a liſt of the men and boys belonging to the ſhip, and to ſet down, exactly, the day of each man's admittance into pay; that the paymaſter or treaſurer of the navy may iſſue out his diſburſements, and pay off the men according to the muſter-book.

PURSIVENESS, or PURSINESS, among *Farriers*, *thickneſs of wind*, a name common to all theſe diſeaſes in horſes which ariſe from obſtructions in the paſſages of the lungs.

Purſiveneſs, ſometimes alſo called *broken wind*, may proceed from an ulcer, or ſome inward waſting of the lungs, in which the ſmall veſſels are worn or abraded by the ſharpneſs or acrimony of the common diſcharges.

The like diſorder may alſo ariſe from a ſtagnation, hindering the air from penetrating ſo as to lift up the lungs in the act of reſpiration; or from ſome tough and mucilaginous matter ſeparated in the branches of the wind-pipe.

The uſual occaſions are cold, ſurfeits, and other diſeaſes not thoroughly carried off. Purſive diſorders may alſo ariſe from unwholeſome food, bad air, and hard riding when a horſe is full. The ſigns are commonly a heaving and beating of the flanks; a wheezing and rattling. Sometimes the kernels about the throat will ſwell, and there will be a glandulous running at the noſe, which is the utmoſt ſtage of the diſeaſe, and uſually reputed deſperate.

PURSLANE, in *Botany*. See PORTULACA.

PURSLANE, *Horſe*. See TRIANTHEMA.

PURSLANE, *Sea*. See ATRIPLEX.

PURSLANE *Tree*. See PORTULACARIA.

PURSLANE, *Water*. See PEPLIS.

PURSOTTUMPOUR, in *Geography*, a town of Hindooſtan, in Bahar; 35 miles W.S.W. of Arrah.

PURSOYAH, a town of Hindooſtan, in Bahar; 25 miles W.S.W. of Gayah.

PURSUIVANT. See POURSUIVANT.

PURSUR, in *Geography*, a town of Hindooſtan, in Oude; 13 miles N. of Mahomdy.

PURVER, ANTHONY, in *Biography*, was born at Up-

Hurſborn, in Hampſhire, about the beginning of the 18th century. His education was extremely limited, but he exhibited a ſtriking proof of his capacity for learning while he was very young; for, being prevented by illneſs from attending ſchool almoſt ſix weeks, he applied, by himſelf, during that time, with ſuch diligence and ſucceſs to the ſtudy of arithmetic, that upon his return to ſchool he was able to explain the proceſſes of evolution to his maſter, whoſe attainments had not carried him ſo far. At this time of life he exhibited great powers of memory, by committing to it twelve of the longeſt chapters in the bible in as many hours. He was put apprentice to a ſhoe-maker, who was alſo a dealer in ſheep, and employed Anthony a good deal in looking after his flock. This was not by any means an irkſome buſineſs, as it afforded him an opportunity for reading the ſcriptures, to which he was particularly attached. As he advanced in years, he found that his favourite book contained doctrines that were very differently interpreted by different perſons, and he was reſolved to ſtudy the Old and New Teſtament in their original languages. Having renounced the occupation for which he was originally intended when he was about twenty years of age, he commenced teacher in a ſchool, but afterwards removed to London, for the ſake of more eaſily acquiring the means of proſecuting his ſtudies. Here he probably reſided in 1727, when he publiſhed his work, entitled "The Youth's Delight." While at London he became a Quaker, and officiated among the friends in the character of a miniſter. He returned to Hurſborn, and reſumed his ſchool in 1727, and probably continued it for ſome time, during which he began to tranſlate the books of the Old Teſtament, from the original Hebrew. While thus employed, he felt it his duty to become a miſſionary, and travelled through ſeveral counties of the kingdom, till he came to Stambrook, near Briſtol, towards the latter part of the year 1738. Here he reſided at the houſe of a maltſter, whoſe ſon he inſtructed in claſſical learning, while he devoted his leiſure to his favourite employment of tranſlating the ſcriptures. In 1746 he made an attempt to publiſh his tranſlation of the Old Teſtament in numbers; but for want of encouragement he did not proceed beyond two or three numbers. When he had completed the tranſlation of the whole bible, he could find no bookſeller who would embark in the publication. Thus was the labour of thirty years likely to be loſt, till Dr. Fothergill made him a preſent of 1000*l.* for the copy, and took upon himſelf the expence of printing the work. Under his auſpices, it made its appearance in the year 1764, with the title of "A new and literal Tranſlation of all the Books of the Old and New Teſtament, with Notes critical and explanatory," in 2 vols. folio. It was the author's intention to have publiſhed a ſecond edition, with various corrections and alterations, but he did not live to accompliſh the deſign. He died in 1777, about the age of 75. Purver was deſcribed by Dr. Fothergill as "a man of great ſimplicity of manners, regular conduct, and a modeſt reſerve: he is ſteadily attentive to truth, hates falſehood, and has an unconquerable averſion to vice; and to crown the portrait, he is not only greatly benevolent to mankind, but has a lively ſenſe of the divine attributes, and a profound reverence of, and ſubmiſſion to, the Supreme Being." Gent. Mag.

PURVEYANCE. See POURVEYANCE.

PURVEYOR. See POURVEYOR.

PURVIEW, from the French, *pourveu, a gift, grant, proviſion*, &c. a term frequently uſed, by ſir Edward Coke, for the body of an act of parliament, or that part which begins with *Be it enacted*, &c. as contradiſtinguiſhed from the *preamble*.

The ſtatute of 3 Hen. VII. ſtands upon a preamble and a purview. 12 Rep.

PURULENT, PURULENTUS, in *Medicine*, ſomething mixed with, or partaking of, pus or matter.

Phthiſical people frequently ſpit a purulent matter. In a dyſentery, the ſtools are purulent: when there is an ulcer in the reins or bladder, the urine is purulent.

PURUSHA, in *Mythology*. See PARUSHA.

PURUZ, in *Geography*, a river of La Plata, which riſes about S. lat. 17° 20′, taking the name of "Rio Beni," and afterwards called "Amaru-Mayu," or "The Serpent:" from S. lat. 12° its courſe is not aſcertained till it comes to S. lat. 6°, after which it aſſumes the name of Puruz, and runs into the river of the Amazons, or Maranon, S. lat. 3° 44′. W. long. 45° 6′. Its whole courſe is northerly about 800 miles.

PURWAR, a town of Hindooſtan, in Lahore; 14 miles S. of Sealcot.

PURYSBURG, a handſome town of South Carolina, in Beaufort diſtrict, which diſtrict contains 25,887 inhabitants, on the E. ſide of Savannah river, 37 miles from the ocean, and 20 from Savannah. It derives its name from a Swiſs, John Peter Pury, who ſettled a colony of his countrymen here about the year 1735, with a view to the culture of ſilk. The mulberry-trees are ſtill ſtanding, and ſome attention is paid to the raiſing of ſilk. The town contains between 40 and 50 dwelling-houſes, and an epiſcopal church; 64 miles W.S.W. of Charleſtown. N. lat. 32° 23′. W. long. 81° 12′.

PUS, from πυον, *matter*, the fluid contained in abſceſſes, and diſcharged from ulcerated ſurfaces, and ſometimes from membranous ſurfaces which are merely inflamed, and quite free from ulceration, as is illuſtrated in caſes of gonorrhea, empyema, &c. Pus is formed by a peculiar proceſs, which is termed *ſuppuration*, of which we ſhall have occaſion to ſpeak in a future volume of this work.

In the preſent place, we ſhall content ourſelves with inſerting a few obſervations on the qualities and uſes of pus, chiefly taken from the writings of Mr. Hunter.

True pus has certain properties, which, when taken ſingly, may belong to other ſecretions, but which, conjointly, form the peculiar character of this fluid, *viz.* globules ſwimming in a fluid, which is coagulable by a ſolution of ſal ammoniac, which no other animal ſecretion is, and, at the ſame time, a conſequence of inflammation.

The colour and the conſiſtence of pus are the two qualities which firſt attract the notice of every, the moſt ſuperficial, obſerver. The colour ariſes from the largeſt portion of this fluid being compoſed of very ſmall round bodies, very much like thoſe little globules which, ſwimming in a fluid, make cream. The fluid in which the globules of pus ſwim, we might at firſt ſuppoſe to be the ſerum of the blood, for it coagulates with heat, like the latter fluid. Pus is alſo probably mixed with a ſmall quantity of coagulating lymph; as it partly coagulates after it is ſecreted.

The fluid part of pus, however, is known to have properties which ſerum has not. There being a ſimilarity between pus and milk, experiments have been made to aſcertain whether the fluid of pus could be coagulated with the gaſtric juice of animals; but no coagulation could be effected in this manner: a ſolution of ſal ammoniac made the fluid part of pus coagulate; but not any other ſecretion,

or

or natural fluid; and hence it was concluded, that whenever globules were found ſwimming in a fluid, coagulable by ſal ammoniac, the matter was to be conſidered as pus.

The proportion which the white globules bear to the other parts of pus, depends on the health of the parts producing the diſcharge. When the globules are very abundant, the matter is thicker and whiter, and is called healthy pus; the meaning of which is, that the ſolids, which produced it, are in good health; for theſe appearances in the matter are no more than the reſult of certain ſalutary proceſſes going on in the ſolids, the effect of which proceſſes is to produce the diſpoſition, on which both ſuppuration and granulation depend.

Pus is ſpecifically heavier than water, and is probably about as heavy as blood.

Beſides the above properties, pus has a ſweetiſh mawkiſh taſte, very different from that of moſt other ſecretions, and the ſame taſte takes place, whether it is pus from a ſore, or an irritated inflamed ſurface.

Pus has a ſmell in ſome degree peculiar to itſelf; but this differs in different caſes. Some diſeaſes, it is ſaid, may be known by the ſmell, as, for inſtance, a gonorrhœa.

Pus ſinks in water; mucus floats. Pus communicates to water an uniformly troubled white colour; mucus gives the appearance of ſtringy portions floating in it. Mucus is ſaid to be more readily diſſolved by ſulphuric acid than pus is. It has alſo been aſſerted, that if water be added to ſuch ſolutions, the pus is precipitated to the bottom of the veſſel; while the mucus, inſtead of being completely precipitated, forms ſwimming flakes. A ſolution of cauſtic alkali diſſolves both pus and mucus; but when water is added, the pus is ſaid to become ſeparated, but not the mucus.

Though ſolutions in chemical menſtrua and precipitations have been thought a teſt of the diſtinction between theſe two fluids; yet the method has been thought abſurd and unphiloſophical. It has been conceived, that all animal ſubſtances whatever, when in ſolution, either in acids or alkalies, would be in the ſame ſtate, and therefore, that the precipitation would be the ſame in all. Calcareous earth, when diſſolved in muriatic acid, is in that acid in the ſame ſtate, whether it has been diſſolved from chalk, limeſtone, marble, or calcareous ſpar, and precipitations from all are the ſame. Hence experiments were made on organic animal matter, ſuch as muſcle, tendon, cartilage, liver, and brain; and on inorganic, ſuch as pus and the white of an egg. All theſe ſubſtances were diſſolved in ſulphuric acid, and precipitated with the vegetable alkali. Each precipitation was examined with ſuch magnifiers as plainly ſhewed the forms of the precipitates, all which appeared to be flaky ſubſtances. The precipitate by the volatile alkali had exactly the ſame appearance. The ſame appearances were ſeen when the above kinds of animal matter were diſſolved in the vegetable cauſtic alkali, and precipitated with the muriatic acid. A flaky ſubſtance, void of any regular form, compoſed each precipitate.

Pus does not irritate the particular ſurface which ſecretes it, though it may be irritating to any other. Hence no ſuppurating ſurface, of any ſpecific kind, can be kept up by its own matter. If this had not been the caſe, no ſore of a ſpecific quality, or producing matter of an irritating kind, could ever have been healed. This is ſimilar to every other ſecretion of ſtimulating fluids, as the bile, tears, &c. which fluids do not ſtimulate their own glands or ducts, but are capable of ſtimulating any other part of the body.

Whenever a real diſeaſe attacks either the ſuppurating ſurface or the conſtitution, the production of true pus ceaſes, and the fluid becomes changed in ſome meaſure, in proportion to theſe morbid alterations. In general it becomes thinner and more tranſparent, and it partakes more of the nature of the blood, as is the caſe in moſt other ſecretions under ſimilar circumſtances. *Sanies* is the term uſually applied by ſurgeons to pus in this degenerated ſtate. This unhealthy ſort of matter has more of the ſerum, and frequently more of the coagulating lymph in it, and leſs of the combination, which renders it coagulable by a ſolution of ſal ammoniac. It has alſo a greater proportion of the extraneous parts of the blood, which are ſoluble in water, ſuch as ſalts; and it has a greater tendency than true pus to become putrid. Such unhealthy matter may even be irritating to the ſurface which produces it.

The diſcharge, when of an irritating ſort, is more ſtimulating to the adjoining parts with which it comes in contact, than to its own ſecreting ſurface. In this manner it frequently produces excoriation of the ſkin and ulceration. Thus the tears excoriate the ſkin of the cheek, in conſequence of the quantity of ſalts which they contain. From this effect, matter has been called corroſive, a quality which it has not; the only property which it poſſeſſes being that of irritating the parts which it touches, ſo as to cauſe their abſorption.

When the veſſels thus loſe the power of producing good pus, they alſo loſe more or leſs the power of forming granulations. This may depend on ſome deviation from the due ſtructure and action which ſuch veſſels ſhould poſſeſs, in order to be qualified for the performance of theſe two operations.

Pus, from ſeveral circumſtances, would appear in general to have a greater tendency to putrefaction than the natural juices have; but, perhaps, this is not the caſe with pure pus, which, when firſt diſcharged from an abſceſs, is commonly perfectly ſweet. There are, however, ſome exceptions to this, but theſe depend on circumſtances entirely foreign to the nature of pus itſelf. Thus, if the abſceſs had any communication with the air, while the matter was confined in it; or if the collection has been ſo near the colon, or rectum, as to have been infected by the feces, then we cannot wonder that the matter ſhould become putrid. When blood is blended with pus; when ſloughs are mixed with it; when the parts forming the ſeat of the abſceſs are in a gangrenous ſtate from an eryſipetalous affection; the matter has a greater tendency to putrify than the pure pus diſcharged from ſound abſceſſes, or healing ſores. Pure matter, though eaſily rendered ſuſceptible of change by extraneous additions, is in its own nature tolerably uniform and immutable. It appears ſo unchangeable, that we find it retained in an abſceſs for weeks, without having undergone any alteration. Theſe qualities, however, only belong to perfect pus.

In the preceding paragraph it is ſtated, that matter remains very often unchanged in abſceſſes for weeks. This expreſſion of Hunter's is not ſtrictly correct; for it is well known, that the ſurfaces of the cavities of abſceſſes are always abſorbing, as well as ſecreting ones; conſequently there muſt be a continual mutation going on in the contained matter.

When there are diſeaſed bones, or other extraneous bodies, exciting irritation, ſometimes even to ſo great a degree as to make the veſſels bleed, and often wounding the veſſels of the part, the matter is always found to be very offenſive. This ſtate of the diſcharge is one mark of a diſeaſed bone.

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The discharge of an unhealthy fore blackens silver probes, and preparations of lead. This effect is imputed by Dr. Crawford to the sulphurated hydrogen gas generated in the matter. Phil. Trans. vol. lxxx. for the year 1790. p. 391, &c.

Use of Pus.—By some it is supposed to carry off humours from the constitution. Suppuration is sometimes regarded as a constitutional disease, changed into a local one, which constitutional malady is discharged, or thrown out of the body, either in the form of pus, or together with this fluid. Critical abscesses have been thought to be cases of this sort. Suppuration has also been imagined to carry off local complaints from other parts of the body, on the old principle of derivation or revulsion. For this reason, sores or issues are made in sound parts before allowing other sores to be dried up. Suppuration is sometimes excited with a view of making parts, such as indurated swellings, dissolve into pus; but we have endeavoured to shew that no dissolution of the solids is concerned in the production of pus.

A secretion of pus is looked upon as a general prevention of many, or of all, the causes of disease. Hence issues are made to keep off both universal as well as local diseases. However, the use of pus is perhaps unknown; for it is formed most perfectly from healthy sores, and in healthy constitutions; and large discharges from parts not very essential to life, produce very little change in the constitution, and as little upon being healed up, whatever some may suppose to the contrary.

This is certainly the case with many old ulcers, the suppuration from which seems to have little or no effect in impairing the health. Nor is there any real reason to be afraid of healing such ulcers, when possible, lest a worse disease should follow from the stoppage of the discharge, to which the system is supposed to be habituated so much, that the continuance of such discharge is essential to health.

Every one knows, that when there is no interference of art, that is, when the surface of a sore is left uncovered, the thin part of the matter evaporates, and the thick part dries and forms a scab. Nature, therefore, seems to have designed, that one use of pus should be to make a cover or protection for ulcerated surfaces.

Among the secondary uses of suppuration may be mentioned, opening a communication between a disease and the external surface of the body; forming a passage for the exit of extraneous bodies, &c.

PUSA, in *Geography*, a town of Hindoostan, in Bahar; 32 miles E. of Hajypour.

PUSBACH, a town of Germany, in the principality of Culmbach; 12 miles S. of Culmbach.

PUSCHENGA, a river of Russia, which rises in lake Urus, in the government of Archangel, and runs into the Pinega near Kevrol.

PUSCHIAVO, a town of Switzerland, in the Grisons, from which is derived the name of one of the jurisdictions ceded by the duke of Milan, in the year 1436. The greater number of the inhabitants consists of Roman Catholics. The town lies three miles N. of a lake of the same name, abounding in fish, and distant 14 miles S.W. of Bormio, and is situated 17 miles W.S.W. of the same town, and 20 miles E. of Chiavenna.

PUSCHIMA, a town of Russia, in the government of Novgorod; 40 miles N.N.E. of Bielozersk.

PUSHAN, in *Mythology*, a name for Surya, a personification of the sun, among the Hindoos, and a name also of their god Siva.

PUSHENG, in *Geography*. See KOOSHINJEE.

PUSHERS, a name given to Canary birds when new flown. See BRANCHER, and CANARY *bird*.

PUSHING, in *Geography*, a considerable town of Persia, in the province of Khorasan, a little to the N. of Herat, built on the banks of the Herirood, and celebrated for the beauty of the cypress trees which grow in its vicinity.

PUSHPADANVA, in *Mythology*, one of the names of the Hindoo deity Kama, the cupid of their mythology. It means with a flowery bow; his bow, which is made of a sugar cane, having its string composed of flowers and bees. See KAMA.

PUSHPAKA, the name of a flowery car, in which the Hindoo Plutus, named Kuvera, is conveyed. See KUVERA.

PUSILLATUM, a word used by some medical writers to express a coarse powder, or any medicinal substance, beat into small pieces for infusion, or the like purposes.

PUSTING, in *Geography*, a town of Hungary, on the Waag; eight miles N.N.W. of Leopoldstadt.

PUSTOMERZ, a town of Moravia, in the circle of Brunn; 16 miles E.N.E. of Brunn.

PUSTOZIRSK, a town of Russia, in the government of Archangel, near the Petchora. N. lat. 67° 15′. E. long. 51° 14′.

PUSTULE, PUSTULA, in *Medicine*, a small elevation of the cuticle, upon an inflamed base, containing *pus*.

Pustules originate from an inflammation of the skin, and the consequent partial effusion of purulent matter under the cuticle, by which the latter is elevated into small circumscribed tumours. Pustules are of various sizes, sometimes very minute, and sometimes extending to half an inch in diameter; and they terminate either in small ulcerations, or more commonly in scabby crusts. Dr. Willan constituted an order of cutaneous diseases under the head of *pustules*, including five genera, impetigo, porrigo, ecthyma, variola, and scabies; but he never completed this part of his work, a brief compendium of which has been drawn up by Dr. Bateman. (See his Practical Synopsis of Cutaneous Diseases, 1813.) See also IMPETIGO, PORRIGO, SMALL-POX, and ITCH.

By many writers the use of the word *pustule* is very general, including not only *purulent* elevations of the skin, but vesicles and even pimples; and it must be admitted that the best ancient authority sanctions even a more extensive acceptation of the word, including even wheals, "quæ ex urticâ vel sudore nascuntur." (Celsus, lib. v. cap. 28.) But not only the etymology (quasi *pus tulit*), but accuracy of language would lead us to limit the term to *purulent* eruptions, as in the above definition, and as some correct writers have done. See Prof. Arnemann, Comment. de Aphthis. Linnæus, Gen. Morbor. class xi. ord. 4, &c.

PUSTVOLA, in *Geography*, a river of Asiatic Turkey, which runs into the sea of Marmora; 16 miles W. of Artaki, in the province of Natolia.

PUSU, in *Botany*, the name of a famous plant growing in China, and greatly esteemed there. This and the ginseng these people a long time kept to themselves; but at length it was discovered, that the one was esteemed a certain prolonger of life, and the other a preservative against all diseases.

They, in their manner of speaking, say, that the pusu gives immortality. We have not been so happy to obtain any of this famous plant for the trial, but the ginseng having been brought over, and found not to possess those great virtues they ascribe to it, and the people in China, who are possessed of the pusu, dying, as well as those who have it not, we find, that the virtues of both are so greatly exaggerated

exaggerated by the eaſtern dialect, that there is not much to be expected from them.

PUSULA, in *Geography*, a town of Sweden, in the province of Nyland; 37 miles N.N.W. of Helſingfors.

PUT, in the *Manege*, called in French *mettre*, is uſed for the breaking or managing of a horſe: thus,

To put a horſe to corvets, or caprioles, is to teach him thoſe parts of the manege.

To put a horſe upon his haunches, called in French *aſſeoir*, is to make him bend them handſomely in galloping in the manege, or upon a ſtop. See HAUNCHES.

To put a horſe to the walk, trot, or gallop, is to make him walk, trot, or gallop.

To put a horſe under the button, ſee BUTTON.

PUTAGE, PUTAGIUM, in our old *Law Books*, denotes whoredom or fornication on the part of a woman.

The word is formed from the French *putte*, *whore*; *putagium*, q. d. *putam agere*. "Quod autum generaliter ſolet dici, putagium hæreditatem non adimit; illud intelligendum eſt de putagio matris; quia filius hæres legitimus eſt, quem nuptiæ demonſtrant." Glanv. lib. vii. cap. 12.

PUTALA, in *Geography*. See PATELI.

PUTALLOM, a town on the coaſt of Ceylon, near Calpenteen, remarkable for its ſalt-pans. This place, before the arrival of Europeans on the iſland, ſupplied the natives with ſalt; and on account of its convenient ſituation, was pitched upon by the Dutch for the manufacture of the ſalt with which they ſupplied the king of Candy's dominions, according to the articles of their treaty with him. The ſalt-pans are formed by an arm of the ſea which overflows part of the country between Putallom and Calpenteen. A very large quantity of ſalt was manufactured here by the Dutch; they looked upon it as of the higheſt importance to their intereſts in the iſland, and the moſt formidable weapon which it was in their power to employ againſt the native king, as it was impoſſible for him to procure any but through their means. Since the Britiſh have obtained poſſeſſion of the iſland, this manufacture has been almoſt entirely neglected. It is capable, however, of being rendered very profitable, as it is the only one of the kind on this ſide of the iſland, and the moſt conveniently ſituated for ſupplying the king of Candy's dominions. The Dutch enacted very ſevere laws to prevent individuals from manufacturing or trading in this article; the government taking upon itſelf the management of the works, and the care of ſupplying both its own ſubjects and the Candians. In order to keep a conſtant check on the latter, the Dutch were careful not to allow them too great a quantity at once; and whatever remained at Putallom, after ſupplying the demands of each year, they deſtroyed, that it might not be ſeized upon by ſurpriſe.

PUTANGES, a town of France, in the department of the Orne, and chief place of a canton, in the diſtrict of Argentan; nine miles N.W. of Argentan. The place contains 502, and the canton 11,934 inhabitants, on a territory of 212½ kiliometres, in 31 communes.

PUTANISM, PUTANISMO, an Italian term, naturalized by ſome Engliſh writers, ſignifying *whoredom*, or the life or condition of a courtezan.

The word we borrow immediately from the French, *putaniſme*; and they from the Italian *puttana*, *whore*; of *putta*, *girl*.

PUTAO, in *Geography*, a town on the S. coaſt of the iſland of Luçon. S. lat. 13° 6′. E. long. 123° 28′.

PUTATIVE, SUPPOSITIVE, ſomething reputed to be what it really is not.

The word is ſeldom uſed but in the phraſe putative father. Thus we ſay, Joſeph was the putative father of Jeſus Chriſt.

PUTAVERI, in *Biography*, a native of Otaheite, brought into France by the circumnavigator Bougainville: of whom a gentleman, who had reſided a conſiderable time in Italy, and was an excellent judge of muſic, aſſured us that the effects of French muſic, when fairly tried upon him immediately on his arrival, were not thoſe of rapture, but ridicule. He danced to it, indeed, as we would to a marked meaſure beat on a drum or a table; for as ſoon as he returned from the great opera, whither he was carried, he mimicked what he had heard and ſeen in the moſt natural and ridiculous manner poſſible; giving the company a ſpecimen of the French opera, which was the moſt admirable parody imaginable of French ſinging, or rather of the ſcreams and howlings at the Académie Royale de la Muſique in the time of Louis XV. Our friend wiſhed to try the effects of Italian muſic upon this demi-ſavage native of Otaheite; but there was no opportunity, for how could it be properly executed at Paris? However, according to the late lord marſhal, the experiment had been fairly made on another occaſion.

A young Greek lady being brought from her own country to Paris, ſome years ſince, was, ſoon after her arrival in that city, carried to the opera by ſome French ladies, ſuppoſing, as ſhe had never heard cultivated muſic, that ſhe would be in raptures at it; but, contrary to thoſe expectations, ſhe declared that the ſinging only reminded her of the hideous howlings of the Calmuc Tartars, and as to the machinery, which it was thought would afford her great amuſement, ſhe proclaimed her diſlike of many parts of it, and was particularly ſhocked by what ſhe called the impious and wicked imitation of God's thunder. Soon after this experiment ſhe went to Venice, where another trial was made on her unprejudiced ears, at an Italian opera, in which the famous Gizziello ſung, at whoſe performance ſhe was quite diſſolved in pleaſure, and was ever after paſſionately fond of Italian muſic.

PUTAWATAMES, or POOTOOTAMIES, in *Geography*, Indians who inhabit between St. Joſeph's and Detroit in North America, and can furniſh about 500 warriors. There are two tribes of this name, the one of the river St. Joſeph, and the other of Huron. At the treaty of Greenville, Auguſt 3d, 1795, they ceded lands to the United States, who paid them a ſum of money, and engaged to give them goods to the value of 1000 dollars *per annum*, for ever.

PUTBUS, a town and fort of the iſland of Rugen; five miles S. of Bergen.

PUTCABARY, a town of Hindooſtan, in Bengal; 45 miles S.E. of Moorſhedabad.

PUTEA, in *Ancient Geography*, a town of Africa propria, S. of Adrametum, between Campſa and Caraga, according to Ptolemy.—Alſo, a town of Syria, in the Palmyrene, between Oriza and Abada. Ptol.

PUTEAL, among the Romans, a ſmall kind of edifice raiſed in the place where a thunder-bolt had fallen. See BIDENTAL.

PUTELKAW, in *Geography*, a town of Pruſſia, in the province of Ermeland; ſix miles S.W. of Frawenburg.

PUTEMAHRY, a town of Hindooſtan, in Bengal; 16 miles N. of Kiſhenagur.

PUTEOLANUS PULVIS. See POZZOLANA.

PUTHLOSE, or PUTLOS, in *Geography*, a town of the duchy of Holſtein; four miles N.W. of Oldenburg.

PUTI, or POTI, a town of the principality of Guriel,

at

at the mouth of the Rione, on the Black ſea; 80 miles W.S.W. of Cotatis. N. lat. 42°. E. long. 41° 28′.

PUTICULI, among the Romans, ditches or holes in the earth, a little without the Eſquiline gate, in which the poorer ſort of people were buried.

PUTIGNANO, in *Geography*, a town of Naples, in the province of Bari; 33 miles S.E. of Bari.

PUTIVLI, a town of Ruſſia, in the government of Kurſk, on the Sem; 72 miles W.S.W. of Kurſk. N. lat. 51° 20′. E. long. 34° 14′.

PUTLACH, a town of Bavaria, in the biſhopric of Bamberg; five miles E. of Goſſweinſtein.

PUTLITZ, or Pudlitz, a town of Brandenburg, in the Mark of Pregnitz; 10 miles N. of Perleberg. N. lat. 53° 16′. E. long. 12° 3′.

PUTLOGS, or Putlocks, in *Building*, ſhort pieces of timber, about ſeven feet long, uſed in building ſcaffolds. They lie at right angles to the wall, with one of their ends bearing upon it, and the other upon the ledges or poles which ſtand parallel to the ſide of the wall of the building.

PUTNA, in *Geography*, a town of Moldavia; 32 miles W. of Suczava.—Alſo, a river of Moldavia, which runs into the Milcow, at Focſani.

PUTNAM, a county of America, in the ſouthern diſtrict of Georgia, containing 6809 free perſons, and 3220 ſlaves. Its chief town is Eatonton.

PUTNEY, a town of America, in Windham county, and ſtate of Vermont, containing 1607 inhabitants.

Putney, a village and pariſh in the weſt half hundred of Brixton, and county of Surrey, England, is ſituated on the ſouth bank of the river Thames, at the diſtance of four miles from Hyde Park corner, London. The pariſh contains 1630 acres, of which the greater proportion is an open common or heath. In the time of the civil wars it was the ſcene of ſome very intereſting tranſactions. The parliamentary army lay at Putney, for a conſiderable time, in the year 1747; and here the general officers, after long debates in the church, completed their propoſitions for the future government of the kingdom, and ſent them to the king at Hampton Court. Here alſo were born two celebrated ſtateſmen, Nicholas Weſt, biſhop of Ely, and Thomas Cromwell, earl of Eſſex, the protegée of Wolſey, and the ſucceſſor to his power and misfortunes. In this pariſh are many agreeable villas; in one of which the late illuſtrious William Pitt breathed his laſt. The church was originally built as a chapel of eaſe to Wimbledon, not long after the conqueſt; but was, in a great meaſure, re-erected in the reign of Henry VII. It is a ſmall edifice, with a ſtone tower at the weſt end. A little chapel at the eaſtern extremity of the ſouth aiſle, built by biſhop Weſt, is, however, its chief ornament. Monuments and inſcriptions are numerous, but few of them deſerve notice. Over the Thames, in this pariſh, is a wooden bridge, conſtructed in the year 1729, at the expence of 23,975*l.* and yielding a revenue, by tolls, to the proprietors, of above 3000*l. per annum*. A fiſhery here was poſſeſſed by the lord of the manor, previous to the conqueſt; and is now rented for a conſiderable ſum. All ſturgeons and porpuſes are claimed by the lord mayor of London, but the fiſhermen receive 13*s.* for each of the former, and a guinea for each of the latter, when delivered to the water bailiff. On the common ſtands an obeliſk, erected, in 1786, in memory of Hartley's invention for ſecuring buildings againſt fire.

According to the parliamentary returns of 1811, this pariſh contains 492 houſes, and 2881 inhabitants. Lyſons's Environs of London, vol. i. 1795. Supplement, 1811.

PUTNOK, a town of Hungary; 36 miles W.N.W. of Tokay.

PUTORIUS, in *Zoology*, the *Pole-cat*, a ſpecies of *Muſtela*; which ſee. See alſo Pole-cat.

Putorius *Serpens*, a name given by ſome to that ſpecies of ſerpent called by others *dryinus*.

PUTREFACTION, or Putrifaction, in *Chemiſtry*, is a ſpecies of *fermentation* (which ſee); being the laſt ſtage of the fermentatory proceſs, and conſiſting not merely in the decompoſition and tranſpoſition of the particles of putrefying ſubſtances, whether animal or vegetable, by which new combinations are produced, but alſo in the extrication and expulſion of ſome of the conſtituent parts of theſe ſubſtances.

This decompoſition or derangement of the conſtituent parts of vegetable ſubſtances is uſually called *fermentation*, and that of animal bodies, is denominated *putrefaction*. The agents that produce both kinds of decompoſition, and the circumſtances that attend them are, in various reſpects, very ſimilar, and the chief difference of the products that are obtained from both depends upon the diverſity of their conſtituent parts. The proceſs of putrefaction, and its effect in diſſolving the combination of the conſtituent parts of bodies, are ſufficiently obvious to ſenſe; but the rationale of the proceſs, and the mode in which gaſeous and volatile compounds are ſeparated from bodies that are diſorganized and afterwards form new combinations, are ſtill involved in conſiderable obſcurity; and different writers have diſagreed in their explication of them. Several facts, however, are univerſally acknowledged; and of theſe we ſhall give a brief account in the ſequel of this article, together with a detail of ſome of thoſe principles and theories that have been adopted for explaining them. Becher long ago obſerved, in his "Phyſ. Subt. l. i. §. 5." that air is the principal agent of decompoſition, but that water and heat very much facilitate its action. Thus he ſays, "Fermentatio ergo definitur quod ſit corporis denſioris rarefactio, particularumque aërearum interpoſitio; ex quo concluditur debere in aëre fieri nec nimium frigido, ne rarefactio impediatur; nec nimium calido, ne partes raribiles expellantur."

An animal ſubſtance may be preſerved from putrefaction by depriving it of the contact of the air; and this proceſs may be accelerated or retarded by varying or modifying the purity of the ſame fluid. When we obſerve putrefaction occurring without the acceſs of atmoſpherical air, the effect is produced by the water which impregnates the animal ſubſtance, becomes decompoſed, and affords the element and the agent of putrefaction. Hence it appears, that moiſture is an indiſpenſible requiſite to facilitate putrefaction. A moderate degree of heat is alſo a condition favourable to animal decompoſition.

Dr. Hales, it is well known, aſcribed the cohefion and ſolidity of bodies to the air, which exiſts in them in a fixed ſtate, and forms, as he expreſſes it, the cement or bond of union between their ſeveral conſtituent particles. To this purpoſe he obſerves, that air abounds much more in ſolid than in liquid bodies; and that ſolid bodies being generally denſer than water, the attraction of the air of theſe ſolid bodies in a fixed ſtate, and its repulſion when in an elaſtic ſtate, are greater than the attraction and repulſion of the lighter watery particles in a fixed and in an elaſtic ſtate; and hence the particles of air are fitter to be the principal bond of union in ſolid bodies, than the particles of water. This opinion was afterwards adopted by baron de Haller, who maintains, that air is the *vinculum elementorum primarium*, or the true cement which binds together the earthy

particles of bodies. Mr. Macbride, as we have elſewhere ſhewn, has taken occaſion, by a variety of experiments, to illuſtrate and eſtabliſh this opinion; and in ſupport of it he alleges, that the preſervation of firmneſs and ſoundneſs in bodies depends on reſtraining the eſcape of that principle, ſince known by the name of fixed air, and which he ſuppoſes to be the immediate cauſe of coheſion: for the moment it flies off and reſumes its elaſticity, the other conſtituent particles, *viz.* the earthy, the ſaline, the oily or inflammable, and the aqueous, being thereby put in motion, immediately begin to exert their ſeveral peculiar attractive and repulſive powers, and run into new combinations, which firſt change, and at length altogether deſtroy the texture of the ſubſtance they formerly compoſed; provided that this ſubſtance contained in itſelf a ſufficient quantity of water to allow of the inteſtine motion, by giving the proper degree of fluidity; for without fluidity there can be no inteſtine motion; and without inteſtine motion there can be no change of combination: becauſe we ſee that ſuch animal and vegetable bodies as are ſuddenly deprived of their water, or naturally contain very little, are almoſt as durable and unchangeable in their texture as minerals. Hence Acoſta obſerves, that in Peru, and others have obſerved the ſame in Egypt, where it very rarely rains, every thing will continue a long time uncorrupted; unleſs we ſhould rather aſcribe this effect to the abundance of nitrous ſalt in the air of thoſe places, which is known to reſiſt putrefaction. Indeed all putrefactions, both of animal and vegetable bodies, are affirmed by the learned Boerhaave to be performed by means of water alone. Take, ſays he, a pound of freſh fleſh, and keep it in a heat like that of our body, and, in a few days the putrefaction will be completed; but if you firſt drain out, or exhale, all the watery part from the ſame in ſome chemical veſſel, though the ſalt and oil remain, the fleſh will harden like a ſtone, and may be kept for ages without putrefaction. Though when thus hardened, water poured on it, or even the common dew, will ſoon ſet it a putrefying. Thus Villaris and Cazalet of Bourdeaux, as Chaptal informs us, dried meat by means of ſtoves, which was preſerved for ſeveral years without contracting any bad flavour.

By ſuch means, bread, fleſh, or the like foods, may be preſerved for many ages; provided regard be had to the place. Hence it is that in dry countries, as Egypt, dead carcaſes never putrefy, but dry and harden uncorrupted: as we ſee alſo in the mummies found buried under the ſand.

The ſands and light porous earths preſerve human bodies by exhauſting their juices and drying the ſolid parts. Hence it is, that entire caravans have been diſcovered in Arabia, conſiſting of men and camels, preſerved in the ſands under which the impetuous winds have buried them. In the library of Trinity college, Cambridge, a human body may be ſeen in a perfect ſtate, which was found under the ſand in the iſland of Teneriffe. Hence ſubſtances putrefy much more ſlowly when expoſed to a drying wind, than in a ſheltered place.

Nevertheleſs, too much humidity impedes putrefaction. To this purpoſe Becher obſerves: "Nimia quoque humiditas a putrefactione impedit, prout nimius calor; nam corpora in aqua potius gradatim conſumi quam putreſcere, ſi nova ſemper affluens ſit, experientia docet: unde longo tempore integra interdum ſubmerſa prorſus a putrefactione immunia vidimus; adeo ut nobis aliquando ſpeculatio occurreret, tractando tali modo cadavera anatomiæ ſubjicienda, quo diutius a fœtore et putrefactione immunia forent." Accordingly it is neceſſary, that in order to a body's putrefying by moiſture, that the water ſhould impregnate but not inundate it. It is alſo neceſſary, that it ſhould remain in the texture of the animal body, without being renewed; for thus the lymph is diſſolved, and the moſt putreſcible ſubſtance is preſented to the air with the greateſt extent of ſurface; and the water itſelf is decompoſed, and by this means affords the putrefactive principle.

Even human blood, which, naturally, is ſo prone to putrefaction, if you deprive it of its watery part, may be kept for fifty years. Goat's blood, we actually find kept ſo long in the ſhops, without corrupting; though, if you diſſove it in water, and expoſe it to a gentle warmth, it will putrefy immediately. Blood is ſaid to be the moſt putreſcent animal ſubſtance that is known; and this property is aſcribed partly to its fluidity and partly to the large quantity of fibrin and uncondenſed albumen, which it contains, and eſpecially to the former. See BLOOD.

We ſhall here add, that animal ſubſtances ſeem to be (cæteris paribus) more putreſcent in proportion to the number of conſtituent parts which they contain. The ſubſtances either abſolutely or nearly imputreſcible are bone and condenſed albumen, the latter being ſuch as exiſts in cuticle, nail, hair, &c. which long remain unaltered in the midſt of putrefying ſubſtances. Animal oil alſo putrefies with great difficulty, and hence the people that live in the moſt northern parts of America, the Eſquimaux and others, preſerve fiſh and meat to a certain degree from putrefaction by immerſion in fiſh-oil.

In putrefaction there is a great inteſtine motion, which, when carried to an extreme, and when the putrefying ſubſtance is much compreſſed, is accompanied with heat and ſmoke, and ſometimes flame. However, M. Beaumé affirms, that putrefaction is not attended with any ſenſible heat: when, indeed, it proceeds ſlowly, and the quantity of putrefying matter is but ſmall, the heat, if any, is very little. That putreſcent ſubſtances emit light, is an unqueſtionable fact; and on this principle philoſophers account for the luminouſneſs of the ſea, the ignis fatuus, &c. To this purpoſe M. Ant. Martin (Swed. Abhad. vol. xxiii. p. 225, cited by Dr. Prieſtley, in his Hiſtory of Light, &c. p. 576.) obſerves, that human bodies have ſometimes emitted light about the time they begin to putrefy; and that the walls and roof of a place in which dead bodies had often been expoſed, had a kind of dew or clammineſs upon them, which was ſometimes luminous. And he imagines, that the lights which are ſaid to be ſeen in burying grounds may be owing to this cauſe. It has been obſerved, that heat extinguiſhes the light of putreſcent ſubſtances; Mr. Canton, attending to this circumſtance in ſome experiments for aſcertaining the cauſe of the luminouſneſs of the ſea, remarks, that though the greateſt ſummer-heat is well known to promote putrefaction, yet twenty degrees more than that of the human blood ſeems to hinder it; for putting a ſmall piece of luminous fiſh into a thin glaſs ball, he found that water of the heat of one hundred and eighteen degrees would extinguiſh its light in leſs than half a minute; but that on taking it out of the water, it would begin to recover its light in about ten ſeconds: but it was never afterwards ſo bright as before. See LIGHT.

It has been obſerved, that a temperature from about forty degrees to the higheſt natural heat is favourable to the putrefaction of animal matter, whereas a freezing temperature is known to ſtop putrefaction, as it is the cuſtom in cold countries to bring victuals frozen to market, and in this ſtate they are kept for any length of time without any other preparation; and beſides, bodies of men or of other animals remain unaltered under ice for many weeks. We

might

might allege many other circumſtances of a ſimilar nature. On the other hand, a ſcorching heat alſo prevents putrefaction; probably by expelling the moiſture which is eſſential to the proceſs, becauſe by an inferior degree of heat putrefaction is promoted. The influence of temperature on animal putrefaction is thus ſtated by Becher: "Aër calidus et humidus maximè et putrefactionem facit—corpora frigida et ſicca difficulter, imo aliqua prorſus non putreſcunt: quæ ab imperitis proinde pro ſanctis habita fuere; ita aër frigidus et ſiccus, imprimis calidus et ſiccus, a putrefactione quoque preſervat: quod in Hiſpania videmus, et locis aliis calidis, ſicco, calido aëre præditis, ubi corpora non putreſcunt et reſolvantur; nam cadavera in oriente in arena, imo apud nos arte in furnis, ſiccari, et ſic ad finem mundi uſque à putredine præſervari, certum eſt: intenſum quoque frigus à putredine præſervare: unde corpora Stockholmiæ tota hyeme in patibulo ſuſpenſa ſine putredine animadvertimus." From the facts already ſtated, we may deduce the moſt effectual means of preventing, and increaſing putrefaction, and alſo of modifying it at pleaſure. A body may be preſerved from putrefaction by depriving it of the contact of atmoſpherical air: for this purpoſe nothing more is required than to place the body in a vacuum, or to envelope it in a covering, which may defend it from the immediate action of air; or alſo to envelope it in an atmoſphere of ſome gaſeous ſubſtance, which does not contain vital air. Putrefaction may alſo be favoured by keeping bodies at a ſuitable temperature. A degree of heat from between ſixty-five and ninety degrees diminiſhes the adheſion of the parts, and favours the action of the air; but if the heat be greater, ſays Chaptal, it volatilizes the aqueous principle, dries the ſolids, and retards the putrefaction. Hence it is inferred, that for the decompoſition of an animal ſubſtance, it is neceſſary that it ſhould have the contact of atmoſpheric air, and that the purer the air is, the more ſpeedy will be the putrefaction: that it be expoſed to a moderate degree of heat: and that its texture be impregnated with humidity.

The moſt ſudden and remarkable changes produced upon a body by putrefaction, are upon its colour, ſmell, and taſte. Fleſh beginning to putrefy, is well known to exhale very ſoon after a penetrating fœtid ſmell, its colour becomes pale, then inclining to blue, and afterwards livid and black, and its taſte nauſeous. Tranſparent liquor, as urine and broth, during putrefaction, becomes alſo turbid: as the putrefaction advances, the ſmell becomes more and more fœtid, and it alſo acquires great pungency, which is cauſed by a large quantity of volatile alkali, diſengaged from thoſe ſubſtances that are completely putrefied. Solid bodies, whilſt they are putrefying, ſwell, become ſoft, loſe the coheſion of their parts, and are laſtly reduced to a very diſagreeable putrid pulpy maſs: the fluids become turbid, and the effluvia are loathſome and ſickening, and after a time a putrid gas is diſengaged in a ſlow but ſenſible efferveſcence. A foul and brown ſerum then ſweats out from the pulpy maſs, and about this time the effluvium is very ſenſibly ammoniacal, which is indicated by its effects on the eyes and throat, and by forming a white vapour with muriatic acid gas. For ſome time a large part of the putrid ſubſtance is evaporated, and carried off in the putrid gas and diſperſed in the atmoſphere, after which the extreme fœtor ſubſides; and finally the proceſs of putrefaction ceaſes, and leaves a kind of fat fœtid earthy matter. All the gaſes certainly known to be produced by putrefaction, are carbonic acid, carburetted hydrogen, ſulphuretted and phoſphuretted hydrogen, and ammonia; but either theſe, or ſome of theſe, muſt be conſiderably changed by the ſolution of the animal matter; or ſome compound not yet examined, muſt be produced in that ſtate of putrefaction, when the gas evolved occaſions ſuch dreadful effects upon thoſe that have the misfortune to fall in the way of it, even when diluted conſiderably with common air. This is ſaid to be the caſe when the abdomen of a large animal is firſt burſt, after ſome days or perhaps weeks of putrefaction; the gas from which cauſes inſtant fainting, and ſometimes death, and even when the perſon expoſed to it receives the firſt ſhock, it leaves exceſſive debility and other alarming ſymptoms for a conſiderable time. The moſt deleterious gas that is known is, perhaps, carburetted hydrogen, but the effects of this, as obtained by chemical means, are far ſhort of thoſe above-mentioned, when equally diluted. The generation of ammonia has been ſatisfactorily accounted for, ſince the diſcovery of the conſtituent parts of the volatile alkali, by the new combination formed between the azote of the animal matter, and the hydrogen, of which latter there are many ſources, and particularly that of the decompoſition of water. As ammonia is always produced during putrefaction, it ſeems rational to ſuppoſe, that one important purpoſe of the moiſture neceſſary to the proceſs, is to afford, by its decompoſition, the hydrogen of the volatile alkali. The nitrous acid is alſo an undoubted product of putrefaction; but farther experiments and facts are neceſſary for explaining the reaſon, why in ſome caſes the azote tends to unite with oxygen to form this acid, and in others with hydrogen to form ammonia. For an account of the peculiar changes which animal fleſh undergoes, by which it is converted into a ſpermaceti-like ſubſtance, inſtead of paſſing through the uſual proceſs of putrid decompoſition, we refer to the article ADIPOCIRE.

Sir John Pringle has obſerved, that, as all the humours of all animal bodies become thinner by putrefaction, ſo the ſolid or fibrous parts are thereby relaxed, and rendered more tender: and hence the extraordinary bulk of the heart, liver, and ſpleen, incident to perſons labouring under putrid diſeaſes, may be accounted for. It is remarkable, that in diſſections of perſons who die of the plague, the heart is almoſt always found of an uncommon magnitude; and as to the ſcurvy, the liver and ſpleen are ſometimes enlarged to ſuch a degree, that the tumour may be ſeen outwardly.

From matters completely putrefied may be obtained by diſtillation volatile alkali, ſome liquid and ſome ſolid; a pungent fœtid oil, which at firſt is thin, and afterwards becomes more thick; and a reſiduum of coal, not eaſily reducible to aſhes. Some writers on this ſubject have apprehended, that putrid ſubſtances are not to be regarded as alkaline. Sir John Pringle, finding from the experiments which he made in the year 1750, that ſyrup of violets was not changed into a green colour by the ſerum of putrid blood; that this ſerum did not make any efferveſcence, when ſpirit of vitriol was poured upon it; that water, in which corrupted fleſh had been for ſome time infuſed, neither efferveſced nor changed the colour of the ſyrup; and that alkaline ſalts, both fixed and volatile, powerfully oppoſe putrefaction; was led to adopt this opinion. But when he became acquainted with the experiments made by M. J. Bapt. Gaber of Turin (Acta Taurinenſ. vol. i. p. 78, &c.) he embraced with the liberality of a true philoſopher, the firſt opportunity of acknowledging his miſtake. M. Gaber, having poured a drop or two of aqua fortis upon bile, taken out of the gall-bladder of a perſon who had died of an inveterate jaundice without a fever, and whoſe body had lain about twenty-four hours in a cold place in winter, found, that the mixture immediately efferveſced, became ſenſibly warm, and that ſeveral air-bubbles roſe to the ſurface. He alſo expoſed the remainder of this bile in three open glaſſes

to the thirty-fifth, twenty-fifth, and tenth degrees of heat, indicated by Reaumur's thermometer, and at the end of twenty-four hours mixed them with acids; and he found, that the bile which had been placed in a degree of heat anſwering to thirty-five, was moſt dilated, and gave very ſlight indications of efferveſcence; that which had ſtood in twenty-five was alſo dilated, and the acid produced a more ſenſible efferveſcence, but ſtill very ſlight; and the bile which had been expoſed only to the temperament of the air, varying from ſeven to ten, preſerved its tenacity, and fermented as much as that in his firſt experiment. Having mixed ſome blood, taken out of a vein of the dead body at the ſame time, and which appeared to be of the yelloviſh-red, with ſpirit of nitre, the mixture efferveſced, but in a much leſs degree than the bile: this mixture, being left to digeſt for ſome hours, a yellow ſerum ſeparated from the blood, and covered its whole ſurface; and the blood, being ſubjected to the ſame heat as the bile, and for the ſame time, appeared more diſpoſed to efferveſce than the bile, though this diſpoſition afterwards gradually diminiſhed. From theſe experiments the ingenious writer infers, that in diſeaſed bodies the humours may become ſo alkaleſcent as to efferveſce with acids: that a very ſlight degree of putrefaction and fœtor, which is not ſufficient to produce alkaleſcence out of the body, will produce it in the body; that alkali formed in the body, and contained in the bile, is extremely volatile, ſince the heat of twenty-five degrees made a great part of it evaporate; and that the ſame alkali contained in the blood, being a little more entangled with other elements, is conſequently leſs volatile, ſince the ſame degree of heat continued for the ſame time, diſſipated but a very inconſiderable part of it: and, therefore, that the different phenomena taken notice of by thoſe who have proſecuted experiments of this kind, ſome of whom affirm that they have ſeen undoubted proofs of the preſence of an alkali, and others that they have ſcarcely diſcovered any ſuch indications at all, are the effects of different degrees of heat, the ſtaleneſs of the ſubſtance expoſed to the heat, or the different volatility of the alkali ariſing from its coheſion with other principles. Having made ſimilar experiments upon healthy bile, blood, and ſerum, and ſubmitted them to the action of mineral acids, he found the bile moſt diſpoſed to efferveſce; that human bile was more diſpoſed to efferveſce than the bile of an ox; that corrupt blood ferments with acids ſtill ſlower; and that ſerum ferments ſlower than blood. He alſo obſerved, that putreſcent humours not only efferveſce with mineral acids, but with very weak diſtilled vinegar: and that thoſe humours that have been expoſed to artificial heat, become fœtid and efferveſce ſooneſt, and ſooneſt arrive at the laſt ſtage of fermentation; in which caſe the fermentation ceaſes, though the heat is continued; and the ſmell, which till then is intolerably fœtid, becomes herbaceous, and is not diſagreeable. The fœtor, he ſays, manifeſts itſelf ſooner and laſts longer than the alkaleſcence.

M. Gaber farther obſerves, in relation to the experiments of ſir John Pringle, that at the degree of heat to which he expoſed putreſcent ſubſtances, and which was equal to the hundredth degree of Fahrenheit, correſponding nearly to the thirtieth degree of Reaumur, animal humours very ſoon become putrid; but that they as ſoon loſe the alkaleſcence which they derive from putrefaction, if this degree of heat is continued: ſo that as the corrupting humours manifeſt their alkaleſcent quality only for a very ſhort time, it might eaſily happen that no ſign of alkaleſcence appeared in his experiment, if it was not made in the critical moment, *i. e.* if he examined the putreſcent humours a little before the alkali was formed, or a little after it had evaporated. And he, therefore, apprehends, that if ſir John Pringle's experiments were made with a degree of heat juſt equal to his own, the reſult, *cæteris paribus*, muſt have been the ſame.

From other experiments this writer infers, that blood received from the arm, agitated and left to putrefy, does not putrefy ſo ſoon, nor ſo ſoon manifeſt ſigns of alkaleſcence, as the red part ſeparated from the ſerum, becauſe the ſerum putrefies more ſlowly than any other animal humour; and that the alkali, which evaporates with a degree of heat from twenty-five to twenty-eight of Reaumur, being collected in a receiver, will efferveſce, and that the reſiduum is a maſs extremely fœtid, wholly deſtitute of alkali, and, conſequently, that no efferveſcence is to be expected by pouring acids upon it. Having kept ſome blood in a glaſs veſſel cloſe ſtopped, he found that it retained its alkaleſcence a long time, though expoſed to a degree of heat equal to twenty-five; but upon unſtopping the veſſel, it flew off with great violence, in an extremely fœtid vapour. Theſe exploſions he attributes to the expanſion of the air, in conſequence of the putrefaction; and hence he deduces the reaſon, why the humours that are contained in the veſſels of a human body become alkaleſcent while they are yet ſcarcely fœtid, although when drawn from the body, and kept in open veſſels, they become fœtid, before they give ſigns of alkaleſcence. As ſoon as they begin to form alkali in the veſſels, the alkali is retained; but as it exhales from veſſels expoſed to the air, a greater quantity muſt be formed than exhales before it can become ſenſible. Having collected the diſtilled liquor of blood in ſuch a ſtate of putreſcence as to efferveſce with acids, and expoſed it to the action of various acids, a violent efferveſcence enſued; and when poured upon ſyrup of violets, it produced as fine a green as ſpirits of hartſhorn; and this tincture, having been changed into a red by the effuſion of a few drops of aqua fortis, became again blue, upon pouring into it ſome more of the diſtilled liquor; whence he concludes, that putreſcent humours form a true alkali, which exhales with a very ſlight heat. From other experiments he infers, that the alkali of putreſcent ſubſtances is not the productive cauſe of their fœtor, becauſe the latter remains when the former is departed. But as both appear in the ſame degree of heat, when long continued, it appears, he ſays, that this fœtor is produced by the effluvia of parts extremely volatile, but different from volatile alkali, which, though ſooner produced, are more ſlowly diſſipated. Alkaleſcence, however, may be ſometimes connected with a ſlight fœtor; and, on the contrary, extreme fœtor may ſubſiſt without alkaleſcence. And this fact confirms the obſervation of ſir John Pringle, who found a difference between the fœtid and alkaline particles; ſince the exhalations of freſh urine are not pernicious, though they contain more alkali than any ſubſtance in a ſtate of putrefaction, the odour of which is pernicious in the higheſt degree; and, therefore, putrid effluvia are of a different nature from alkaline falts. M. Gaber farther adds, by way of inference from this fact, that a volatile alkali is not a neceſſary product of putrefaction, and that the degree of alkaleſcence is not equal to that of putrefaction. Dr. Crell, profeſſor of chemiſtry at Brunſwick, has objected to this doctrine, as not conformable to the phenomena (Phil. Tranſ. vol. lxi. part i. art. 39.); for he ſuppoſes, that as all ſmell depends on a ſaline matter joined with phlogiſton, and the ſaline matter producing the putrid ſtench was very probably not an acid, it muſt be a volatile alkali, which, involved in phlogiſtic matter, might fly off before the alkali was developed. From ſome experiments made with a view of aſcertaining this fact, he infers that the volatile alkali is preſent as long, at leaſt, as the putrid ſmell continues, and that this volatile alkali is the baſis of it; becauſe, as this was

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diſtilled over in his experiments, the reſidue, being ſtill in inteſtine motion, required only the herbaceous ſmell. The reaſon why the volatile alkali has been diſtinctly obſerved at a certain period of putrefaction, and not in the other, he apprehends to be this: the volatile alkali has, it ſeems, a tendency to diſentangle itſelf, by inteſtine motion, of all ſuch matter as it is involved with; but if it is not combined with ſuch fixed matter as retains it till it has gone through all its evolutions, it is, being itſelf volatile, carried off by the ſtill more volatile phlogiſtic matter with which it is commonly joined. For this reaſon, he ſuppoſes the putreſying matter ſhews in its beginning no ſigns of volatile alkali, becauſe its ſmell depends only on thoſe particles which have been on the ſurface, without any ſtrong coheſion with the ſubſtance. In the farther progreſs of putrefaction, the matter involving the alkali, or forming it, is intermixed, and in coheſion with the ſolid particles of the ſubſtance, and is by theſe means retained till the alkali is come to its purer ſtate. Towards the end of putrefaction, the coheſion of the particles being almoſt entirely taken off, the volatile alkali is carried off before it can go through all its ſtates.

Dr. Macbride made ſeveral experiments with putrid blood and putrid bile, which aſcertain the fact, that as ſoon as an animal ſubſtance begins to putrefy, it begins to diſcover an alkaline quality; and this volatile matter, now produced in it, may be ſeparated by diſtillation in a very gentle warmth; but he obſerves, that the volatile alkali obtained from putrid ſubſtances is not exactly ſimilar to that obtained by violent heat from animal ſubſtances not putrid. It differs remarkably in the flavour, which is nauſeous and diſagreeable, is not ſo pungent, and is much weaker than the common volatile alkali; and this latter is capable of diſpoſſeſſing the putrid alkali, and of driving it off from any body to which it has been united. But to return from this digreſſion. As to the cauſe and proceſs of putrefaction, it has been generally believed, that the contact of atmoſpherical air is neceſſary for this purpoſe, and that bodies become putrid, becauſe air communicates ſomewhat to them: accordingly it has been alleged, that bodies buried deep under the earth, or in water, out of the reach of any air, have remained entire for ages; which, when expoſed to the open air, have ſoon rotted and mouldered away. It is alſo well known, that bodies are preſerved from putrefaction by covering them with wax, ſuet, &c.; and Mr. Boyle relates, that he has preſerved lemons, oranges, and other fruits, from putrefaction, during ſeveral years, by including them in an exhauſted receiver. Experiments of the ſame kind have been lately made by M. Eller of Berlin, which ſhew that ſubſtances, even of the moſt putreſcent nature (ſuch as blood) may be kept ſound *in vacuo* for many years. But Dr. Macbride has urged a variety of facts and conſiderations to prove, that putrefaction enſues in conſequence of the loſs of ſome principle, which cemented the conſtituent particles of bodies, and that, when this is diſengaged from them, they ſeparate, and are diſunited. This principle he diſcovered to be air, which, in putrefaction and fermentation, is extricated and thrown off, from a fixed and non-elaſtic ſtate, into one that is volatile and elaſtic; but which immediately, upon meeting with a proper recipient, returns again to its former nature. Thus he found, that cauſtic alkali and quicklime may be rendered mild by abſorbing this air, extricated from putrefying and fermenting ſubſtances; that without the extrication of this air no putrefaction can happen; and that even by abſorption of it, putrefied ſubſtances may be corrected and rendered ſweet. To the ſame purpoſe Dr. Alexander has endeavoured to prove, that putrid matter will preſerve other ſubſtances from putrefaction; which is not improbable, becauſe, being already ſaturated with the putrid effluvium, they cannot readily take any more. Dr. Macbride, having expoſed putrid matters to the vapours ariſing from fermenting mixtures, or from alkaline ſubſtances effervеſcing with acids, found that the putrid quality was deſtroyed; and hence he conſiders the fixed air as powerfully antiſeptic. And it appears alſo from the experiments of Dr. Prieſtley, that fixed air corrects and renders wholeſome air tainted with reſpiration or putrefaction. Hence he infers, that lime-kilns, which diſcharge great quantities of this air, may be wholeſome in the neighbourhood of populous towns, the atmoſphere of which muſt abound with putrid effluvia. Sir William Lee, in a hot ſeaſon, contrived, by impregnating water with fixed air, in the manner deſcribed under PYRMONT *water*, and waſhing meat with it two or three times a-day, not only to preſerve it as perfectly ſweet and good to the extent of ten days, as at the firſt killing, but alſo to recover ſome meat that had begun to change. And it is farther well known, that fixed air, or carbonic acid, has been lately introduced into the materia medica, and adminiſtered with ſucceſs in a variety of putrid caſes. Dr. Macbride has alſo proved, that putrefaction is accelerated by taking off the preſſure of the atmoſphere; and from ſome experiments he was led to conclude, that it will take place ſooner in vacuo than in the open air; but making a more complete vacuum by means of two braſs hemiſpheres joined together, he found that the obſervation of Mr. Boyle and others was agreeable to fact. It appeared alſo, by incloſing fleſh in condenſed air, that increaſing the preſſure of the ſurrounded air, retarded putrefaction; and hence he deduces, what he deems to be a demonſtrative proof, that bodies do not putrefy, becauſe the air adds ſomewhat to them; for if they did, then a piece of fleſh which lay in condenſed air ought to have putrefied the ſooneſt, becauſe it had the greateſt quantity of air applied to its ſurface. But the reaſon why, according to his ſyſtem, condenſed air prevents putrefaction is, that the preſſure of every ſide muſt force the conſtituent particles cloſer together, thus increaſe their coheſion, and prevent the inteſtine motion; and without inteſtine motion there can be no change of combination. However, it is obſerved by ſir John Pringle, that the putrefaction of meat and other ſubſtances, advances quicker in a confined than free air; for as the moſt putrid parts are alſo the moſt fugitive, they inceſſantly iſſue from a corruptible ſubſtance, and diſperſe with the wind; but in a ſtagnation of air they remain about the body, and in the nature of a ferment excite its corruption.

It has been long obſerved, that putrefaction generates air. Hence, though fleſh, as well as blood, be ſpecifically heavier than water, yet dead bodies are found to float, after lying ſome time at the bottom, from air generated in the bowels by putrefaction. And ſince it has been found by experiments, that the blood and other animal ſubſtances begin to emit air before they are ſo far corrupted, as they frequently are in putrid diſeaſes, it is probable that ſeveral of the ſymptoms in deep ſurfeits may be owing to the action of the confined air. As dead bodies become putrid from the loſs of their fixed air, according to Dr. Macbride's theory, he ſuggeſts, that the immediate cauſe of putrefaction in living bodies may be the detachment of too large a proportion of their fixed air. This fact he endeavours to evince by an enumeration of the ſymptoms that occur in the ſcurvy, and other highly putrid diſeaſes, which ſhew that the air is actually detached from the blood in ſuch caſes; as well as from an examination of the principal and prevailing cauſes of ſuch diſorders. And ſince the air tainted with animal or vegetable putrefaction is the ſame with air rendered noxious by animal reſpiration; ſince both equally extinguiſh flame,

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are equally noxious to animals, are equally and in the ſame way offenſive to the ſmell, equally precipitate lime in lime water, and are reſtored by the ſame means, Dr. Prieſtley ſuggeſts, that one uſe of the lungs is to carry off the putrid effluvia, without which, perhaps, a living body might putrefy as ſoon as a dead one. See BLOOD and RESPIRATION.

We ſhall here obſerve, that putrefying and fermenting ſubſtances have been found, by the experiments of Mr. Cavendiſh, Dr. Prieſtley, &c. to yield not only *fixed* but *inflammable* air. From an experiment of Dr. Prieſtley, intended to determine the proportion of each of the kinds of air in the different ſtages of the putrefactive proceſs, it appears that a piece of mutton weighing four penny-weights ſix grains, yielded in all $2\frac{11}{24}$ meaſures of air, of which $2\frac{15}{96}$ was fixed, and the reſt inflammable; and that all the inflammable part was exhauſted a conſiderable time before the fixed air. The ſame ingenious writer has obſerved, that the diminution of common air, by means of putrefaction, amounts to a complete fourth part of the whole, notwithſtanding the production of ſome permanent air from the putrefying ſubſtance, and has, in all reſpects, the appearance of being produced ſolely by the precipitation of fixed air. It muſt occur to every reader, in any way acquainted with this ſubject, if the phlogiſtic theory be admitted, (which indeed is now generally diſcarded,) that if inflammable air be the ſame with phlogiſton, as Dr. Prieſtley ſeemed to have diſcovered, many of the phenomena of putrefaction, depending on this principle, ſuch as the ſmell, colour, light, &c. will probably from hence admit of an eaſy explication.

We ſhall here ſubjoin ſome obſervations with reſpect to the decompoſition of animal bodies that are interred in burying-grounds. In this ſituation, the decompoſition is four times as ſlow as when the putrefying animal is expoſed to the air. It is not perfectly ended, according to Mr. Petit, till three years after the body has been interred, at the depth of four feet; and it is ſlower in proportion as the body is buried at a greater depth. Theſe facts agree with the principles which we have already eſtabliſhed for bodies buried in the earth, and ſubjected to laws of decompoſition very different from thoſe which take place in bodies expoſed to the open air. In this caſe, the decompoſition is favoured by the waters which filter through the earth, and diſſolve and carry with them the animal juices. It is alſo favoured by the earth, which abſorbs the juices with more or leſs facility. Meſſrs. Lemery, Geoffroy, and Hunaud, have proved that argillaceous earths exert a very ſlow action upon bodies; but when the earths are porous and light, the bodies then dry very ſpeedily. The ſeveral principles of bodies abſorbed by the earth, or carried by the vapours, are diſperſed through a great ſpace, imbibed by the roots of vegetables, and gradually decompoſed. This is what paſſes in burying-grounds in the open air; but it is very far from being applicable to the ſepulchres which are made in churches and covered places. Here is neither water nor vegetation; and conſequently no cauſe which can carry away, diſſolve, or change the nature of the animal fluids: and we cannot but applaud the wiſdom of government, which has prohibited the burying in churches; a practice which was once a ſubject of horror and infection.

The accidents which have happened at the opening of graves and vaults are but too numerous, to render any apology neceſſary for our ſpeaking a few words reſpecting the method of preventing them.

The decompoſition of a body in the bowels of the earth can never be dangerous, provided it be buried at a ſufficient depth, and that the grave be not opened before its entire and complete decompoſition. The depth of the grave ought to be ſuch that the external air cannot penetrate it; that the juices, with which the earth is impregnated, may be conveyed to its ſurface; and that the exhalations, vapours, or gaſes, which are developed or formed by decompoſition, ſhould not be capable of forcing the earthy covering which detains them. The nature of the earth in which the grave is dug, influences all its effects. If the ſtratum which covers the body be argillaceous, the depth of the grave may be leſs, as this earth difficultly affords a paſſage to gas and vapour; but in general it is admitted to be neceſſary that bodies ſhould be buried at the depth of five feet, to prevent all theſe unhappy accidents. It is likewiſe neceſſary to attend to the circumſtance, that a grave ought not to be opened before the complete decompoſition of the body. This decompoſition, according to Mr. Petit, is not perfect until the expiration of three years, in graves of four feet depth; or four years, when they are ſix feet deep. This term affords many varieties, according to the nature of the earth, and the conſtitution of the ſubjects buried in it; but we may conſider it as a medium. The pernicious cuſtom, which allows a ſingle grave to families more or leſs numerous, ought therefore to be ſuppreſſed; for in this caſe, the ſame grave may be opened before the time preſcribed. Theſe are abuſes which ought to occupy the attention of government; and it is time that the vanity of individuals ſhould be ſacrificed to the public ſafety. It is likewiſe neceſſary to prohibit burying in vaults, and even in coffins. In the firſt caſe, the principles of the bodies are ſpread into the air, and infect it; in the ſecond, their decompoſition is ſlower and leſs perfect.

If theſe precautions be neglected; if the dead bodies be heaped together in too confined a ſpace; if the earth be not proper to abſorb the juices, and decompoſe them; if the grave be opened before the entire decompoſition of the body;—unhappy accidents will no doubt be produced; and theſe accidents are but too common in great towns, where every wiſe precaution is neglected. An inſtance of this happened, when the ground of the church of St. Benoit at Paris was dug up a few years ago: a nauſeous vapour was emitted, and ſeveral of the neighbours were affected by it. The earth which was taken out of this grave was unctuous, viſcid, and emitted an infectious ſmell. Meſſrs. Maret and Navier have left us ſeveral ſimilar obſervations. Chaptal's Elem. of Chem. vol. iii.

Putrefaction is one of the inſtruments in nature by which many great changes are brought about. In the proceſs of vegetable putrefaction, if we throw together any of the tender, green, and ſucculent parts of recent vegetables, whether acid or alkaline, in a large heap, in the warm open air, and preſs them down with an additional weight, if their own be inconſiderable; the middle part of the heap will, in a little time, ſpontaneouſly conceive a ſmall degree of heat, and paſs ſucceſſively through the other degrees, till it arrive at a ſtate of ebullition, and be perfectly putrefied.

In the ſpace of three days, from the firſt putting them together, they will yield a heat, perceivable by the hand, equal to that of a human body in a healthy ſtate; by the fifth, the heat will be too great for the hand to bear without pain; and, laſtly, by the ſixth, ſeventh, or eighth day, the juices will generally appear ready to boil; and ſometimes the matter will even flame, and burn away.

By this ſpontaneous operation, the vegetable acquires an abominably putrid, ſtercoraceous, or cadaverous, taſte and odour; and turns entirely into one ſoft, ſimilar, pulpy maſs, or craſſamentum, greatly reſembling fœtid human excrements in the ſcent, and putrefied fleſh in the taſte.

If

If now this fœtid matter, thus obtained, be directly, whilſt it remains in its fœtid ſtate, committed to a glaſs retort, and diſtilled with proper degrees of fire, there will come over, 1. A water impregnated with an urinous ſpirit, perfectly like that obtainable from animal ſubjects, and ſeparable by a freſh diſtillation ſlowly made in a tall glaſs, into elementary water, and a large quantity of pure, white, volatile, dry, alkaline ſalt, not to be diſtinguiſhed from animal ſalts. 2. A volatile, alkaline, oily ſalt, that ſhoots into globes. 3. An exceedingly volatile and thick fœtid oil, both which are entirely like thoſe of animals. And, laſtly, the remainder, being calcined in an open fire, affords not the leaſt particle of fixed ſalt; juſt as if the ſubject had really been of the animal, and not of the vegetable kingdom.

This proceſs is truly univerſal, and holds equally in all kinds of vegetables, though ever ſo different in their nature and virtue.

Experiments have been made in the coldeſt and moſt ſucculent, or watery, plants; ſuch as purſlane, ſorrel, &c. as well as with the hotteſt or moſt acrimonious, ſuch as the ſpurges, &c. and it was always found to ſucceed; but that the ſooner, as the vegetable employed contained the greater quantity of oil; though with the ſame phenomena.

It will likewiſe ſucceed with dry vegetables, provided they be moiſtened with water before they are thrown into heaps; and thus we ſometimes ſee, that ſtacks of hay will ſpontaneouſly take fire, and burn away; eſpecially if the hay was not well dried in the making.

The conditions neceſſary for the putrefaction of vegetables are ſimilar to thoſe required in the putrefaction of animal ſubſtances. It is neceſſary that the organization be impregnated with water; the contact of air is neceſſary, as is alſo a certain degree of heat; and for the due effect of this kind of decompoſition, the vegetables ſhould be heaped together, and their juices be abundant. In theſe circumſtances, the phenomena of decompoſition are as follow: the colour of the vegetable is changed; the green leaves become yellow, the texture becomes lax, and the parts leſs coherent; the colour of the vegetable itſelf changes to black or brown; the maſs riſes, and perceptibly ſwells up; the heat becomes more intenſe, and is perceived on approaching the heap; and the fumes which ariſe have already a ſmell, which ſometimes is not diſagreeable; at the ſame time bubbles ariſe, and break at the ſurface of the liquid, when the vegetables are reduced to a magma. This gas is a mixture of nitrogene, hydrogene, and carbonic acid. At this epocha, likewiſe, an ammoniacal gas is emitted, which is formed in theſe circumſtances: and, in proportion as theſe appearances diminiſh, the ſtrong and offenſive odour is ſucceeded by another which is fainter and milder, and the maſs becomes dry. The internal part ſtill exhibits the vegetable ſtructure, when the ſtem is ſolid, and the fibrous matter has been the predominating principle; and it then conſtitutes manure or ſoil. Hence it ariſes that the herbaceous plants of a looſe texture, and abounding in juices, are not capable of forming manure by their decompoſition, but are reduced into a brown maſs of little conſiſtence, in which neither fibre nor texture are obſerved; and this is what, for the moſt part, forms vegetable mould.

Vegetable mould uſually conſtitutes the firſt covering or ſtratum of our globe; and in ſuch caſes wherein it is diſcovered at a depth in the earth, there is no doubt but it has been buried by ſome revolution.

When a vegetable is converted into earth by this tumultuous fermentation, it ſtill retains the remains of the vegetable, mixed and confounded with the other ſolid earths and metallic products; and by diſtillation it affords oil, nitrogene gas, and often hydrogene. It may, therefore, be conſidered as an intermediate ſubſtance between crude and organic bodies, which participates of the inertia of the one, and the activity of the other; and which in this ſtate is ſtill ſubject to an inſenſible fermentation, that changes its nature ſtill more, and deprives it of all its organic contents. Theſe remains of vegetables, ſtill contained in vegetable earth, ſerve as food for other plants that may grow in it. The inſenſible progreſs of fermentation, and the ſuction of vegetables, impoveriſh the vegetable earth, deprive it of all its organic matter, and there remain only the earths and metallic reſidue which form the ſtiff poor ſoils, and ochres when the ferruginous principle is very abundant.

As this muddy earth is a mixture of all the primitive earths, and ſome of the metals which are the product of vegetation, as well as the oils, the ſalts, and other products we meet with in it; we may conſider it as the reſidue of vegetable decompoſition, as the great agent and means by which nature repairs the continual loſſes the mineral kingdom undergoes. In this mixture of all the principles the materials of all compounds exiſt; and theſe materials are ſo much the more diſpoſed to enter into combinations, as they are in a more divided and diſengaged ſtate. It is in theſe earths that we find diamonds, quartz-cryſtals, ſpars, gypſum, &c. It is in this matrix that the bog ores, or ochreous ores of iron, are formed; and it appears that nature has reſerved the impoveriſhed reſidue of vegetables for the reproduction or reparation of the earthy and metallic ſubſtances of the globe, while the organic remains are made to ſerve as nouriſhment for the growth of other ſucceeding vegetables.

Some have taken occaſion to apply the proceſs of putrefaction to that of digeſtion, or the change which the aliment ſuffers in the human body. (See DIGESTION.) For the change our vegetable foods undergo in the body, being ſuch as brings them to be of the ſame nature, and to afford the ſame principles, with the change induced by putrefaction, is a preſumption, that digeſtion is nothing elſe. Beſides, as we know that neither animal nor vegetable ſubſtances can become aliment, without undergoing ſome degree of putrefaction, many diſtempers muſt proceed from a deficiency of this action: the criſis of fevers ſeems to depend upon it; and even animal heat, according to Dr. Stevenſon, does the ſame.

Now, that the concoction of the humours is nothing elſe but putrefaction, ſeems probable from hence, that whenever they are in that ſtate, they are always more fluid, and fitter to paſs through the ſmaller veſſels, where they ſtagnated before. Again, the offenſiveneſs of the ſweats, or other excretions conſequent on a criſis, is likewiſe a ſure ſign of a high degree of corruption. The time of reſolution or putrefaction depends on the degree of heat, the habit of the patient, and on the part obſtructed. Reſolution is the putrefaction of the impacted humour only, but ſuppuration implies a corruption of the veſſels alſo. This manner of ſpeaking, indeed, has been diſuſed, from the prejudice that nothing was putrid but what was offenſively ſo; whereas, in fact, every fibre becoming more tender, and humour thinner, may be conſidered as putrid in ſome degree, whether the change tends to the better health, or to the deſtruction of the perſon, or whether it becomes grateful or offenſive to the ſenſes.

Mr. Boyle has uſed the words *fermentation* and *putrefaction* of the blood promiſcuouſly, in his Treatiſe on the Human Blood. Stahl and other celebrated chemiſts likewiſe uſe the term putrid *ferment*; which ſee.

It

It is, therefore, juſtly obſerved by lord Bacon (Nat. Hiſt. cent. iv.) that an enquiry into the means of preventing or ſtaying putrefaction is of excellent uſe in phyſic. Sir John Pringle has made many curious experiments with a view of determining the power of certain ſubſtances to promote or to prevent putrefaction, together with remarks on this ſubject, which are publiſhed in the Phil. Tranſ. vol. xlvi. p. 480. 525. 550, and by way of appendix to his Obſervations on the Diſeaſes of the Army. From the experiments of this learned and judicious phyſician, it appears, that ſalts of every kind, whether acid, alkaline, or neutral, fixed or volatile, as well as the aſtringent and gummy-reſinous part of vegetables, all of them reſiſt and moſt of them correct putrefaction; and he purſued this branch of enquiry ſo far as to enable him to form a table ſhewing the comparative antiſeptic power of the ſeveral ſubſtances, that of ſea-ſalt being the ſtandard. See this table under the article ANTISEPTIC.

Of all reſinous ſubſtances, he found that camphor reſiſted putrefaction moſt powerfully; its antiſeptic power being three hundred times greater than that of ſea-ſalt. Decoctions of wheat, barley, and other farinaceous grains, checked putrefaction, by becoming ſour. He alſo made experiments to diſcover the effects of mixing vegetable with animal matters.

Two drams of raw beef, as much bread, and an ounce of water, being beat to the conſiſtence of pap, and expoſed to 90° of heat, according to Fahrenheit's thermometer, began to ferment in a few hours, and continued in a fermentation two days. When it began to ferment and ſwell, the putrefaction had begun; and in a few hours afterwards the ſmell was offenſive. Next day the putrid ſmell ceaſed, and an acid taſte and ſmell ſucceeded. Freſh alimentary vegetables, as ſpinach, aſparagus, ſcurvy-graſs, produced ſimilar effects as bread on fleſh, but in a weaker degree. From ſeveral other experiments, he found that animal ſubſtances excite the fermentation of vegetable ſubſtances; and that the latter ſubſtances correct the putreſcency of the former.

By adding ſaliva to a ſimilar mixture of fleſh, bread, and water, the fermentation was retarded, moderated, but rendered of twice the uſual duration, and the acid produced at laſt was weaker than when no ſaliva was uſed.

By adding an oily ſubſtance to the common mixture of fleſh, bread, and water, a ſtronger fermentation was produced, which could not be moderated by the quantity of ſaliva uſed in the former experiment, till ſome fixed alkaline ſalt was added, which ſalt was found, without ſaliva, to ſtop ſuddenly very high fermentations.

He did not find that ſmall quantities of the following ſalts, ſal ammoniac, nitre, vitriolated tartar, ſal diureticus, ſalt of hartſhorn, ſalt of wormwood, were ſeptic, as ſmall quantities of ſea-ſalt were.

Sugar was found to reſiſt putrefaction at firſt, as other ſalts do, and alſo to check the putrefaction after it had begun by its own fermentative quality, like bread and other fermentative vegetables.

Lime-water made ſome ſmall reſiſtance to putrefaction.

Port-wine, ſmall beer, infuſions of bitter vegetables, of bark, and the juice of antiſcorbutic plants, retarded the fermentation of mixtures of fleſh and bread. But an unſtrained decoction of bark conſiderably increaſed that fermentation.

Lime-water neither retarded nor haſtened the fermentation of ſuch a mixture; but when the fermentation ceaſed, the liquor was neither putrid nor acid, but ſmelt agreeably.

Fleſh pounded in a mortar was found to ferment ſooner than that which had not been bruiſed.

The tough inflammatory cruſt of blood was found to be moſt putreſcent, next to which the craſſamentum, or red coagulated maſs, and laſtly the ſerum.

Charcoal is a powerful antiſeptic: hence all ſorts of glaſs-veſſels and other utenſils may be purified from long retained ſmells of every kind, in the eaſieſt and moſt perfect manner, by rinſing them out well with charcoal powder, after the groſſer impurities have been ſcowered off with ſand and potaſh. Rubbing the teeth and waſhing out the mouth with fine charcoal powder will render the teeth beautifully white, and the breath perfectly ſweet, when an offenſive breath has been owing to a ſcorbutic diſpoſition of the gums. (Crell's Journal, vol. ii.) Meat alſo, which is a little tainted with putridity, may at once be made ſweet by charcoal; and it has been ſaid, that common raw ſpirits agitated with charcoal will be deprived of their bad flavour, but they are apt to reſume their old flavour, if kept in the caſk only a few weeks.

The experiments of the author of the "Eſſai pour ſervir à l'Hiſtoire de la Putrefaction," ſhew that metallic ſalts, reſinous powders, extracts of bark and opium, are very powerfully antiſeptic, and that ſalts with earthy baſes are leſs antiſeptic than any other ſalts.

The ſame ingenious phyſician made ſome attempts towards the ſweetening of corrupted fleſh by means of mild ſubſtances. For this purpoſe he put a piece of putrid fleſh into an infuſion of chamomile flowers, which was renewed twice or thrice in as many days, and its ſweetneſs and firm texture were recovered. Several pieces of putrid fleſh were alſo ſweetened by repeated affuſions of a ſtrong decoction of the bark; and he conſtantly obſerved, that not only the corrupted ſmell was removed, but a firmneſs reſtored to the fibres. The corrupt yolk of an egg, diluted with water, was ſweetened by mixing it with a ſtrong infuſion of chamomile flowers. He found alſo that decoctions of wormwood, of the bark, and infuſions of chamomile flowers, and of ſnake-root, preſerved yolks of eggs for a longer time than water, even with the addition of a conſiderable quantity of ſea-ſalt; and that they were preſerved better by ſalt of hartſhorn than by four times the weight of ſea-ſalt. Ox-gall was kept for ſome time from putrefaction by ſmall quantities of ley of tartar, ſpirit of hartſhorn, crude ſal ammoniac, and the ſaline mixture; and ſtill longer by a decoction of wormwood, infuſion of chamomile flowers and of ſnake-root, and by ſolutions of myrrh, camphor, and ſalt of amber. The ſerum of human blood was preſerved by a decoction of the bark, and an infuſion of ſnake-root, as effectually as fleſh. See ANTISEPTIC.

For an account of ſir John Pringle's experiments and obſervations with reſpect to thoſe ſubjects that haſten or promote putrefaction, ſee SEPTICS.

Dr. Macbride's experiments confirm many of thoſe above related, eſpecially thoſe which ſhew that the fermentation of vegetable ſubſtances is increaſed by a mixture of animal or putreſcent matter, that the putreſcency of the latter is corrected by the fermentative quality of the former; and that the putrefaction and fermentation of mixtures of animal and vegetable ſubſtances were accelerated by additions of abſorbent earths and of Peruvian bark. He alſo found, that although unburnt calcareous earths were ſeptic, quick-lime and lime-water prevented putrefaction, but that they deſtroyed or diſſolved the texture of fleſh.

From his experiments we learn alſo, that acids, even when greatly lowered, have a ſtrong degree of power to reſiſt putrefaction, and alſo to correct it; but that they deſtroy the texture of the ſubſtance whoſe ſoundneſs they were ſuppoſed to reſtore; that ſalts in general, by a property which is common to them all as ſalts, have the ſame power,

power, but that they exceed the acids in their efficacy for correcting putrefaction; that fermenting and effervescent mixtures are the moſt powerful of all known antiſeptics; and, in general, that whatſoever hath a power to reſtrain the eſcape of the fixed air, or hinder the inteſtine motion, muſt of courſe prevent putrefaction; and that fixed air, when transferred from a ſound body to one that is putrid, appears to reſtore to that body the principle which has been deſtroyed or loſt.

Dr. Macbride objects againſt the adminiſtration of acids in putrid diſeaſes, for the following reaſons; becauſe, if they came unchanged to the abſorbent veſſels, they would not admit of them, and if they did, they would be dangerous, and they are quite changed before they leave the primæ viæ. Dr. Crell (Phil. Tranſ. vol. lxi. part i. p. 340.) has replied to this reaſoning, and propoſed experiments to prove, that acids, though changed in the alimentary canal ſo far as not to effervesce with alkalis, may, notwithſtanding, check putrefaction, and, therefore, that their uſe is of great conſequence, and ought not to be omitted in putrid diſeaſes.

With regard to the exhibition of alkalis, Dr. Macbride obſerves, that the point is not yet ſatisfactorily ſettled. There can be no doubt of their power to reſiſt and correct putrefaction in dead bodies; but whether, upon the preſumption of this virtue, they can be given with propriety as antiſeptics, he adds, is not ſo clear. Dr. Crell affirms, that they can never be uſed in living bodies as antiſeptics; for, laying aſide their ſtimulating quality, which muſt prevent their uſe in moſt of the putrid diſeaſes, they would, he apprehends, increaſe the morbific matter, by being intimately mixed by circulation with phlogiſtic matter, which they find abundantly in ſuch bodies. Aſtringents, ſays Dr. Macbride, prevent putrefaction very powerfully, but they have not the leaſt degree of efficacy in correcting it; and as antiſeptics, they can be of importance only in thoſe caſes where, from extreme relaxation and reſolution of the ſolids, the diſſolved fluids are ſuffered to tranſude, and either form ſpots of different hues, or run off by actual hæmorhage; and he apprehends, that acids act in thoſe caſes where they have been adminiſtered with ſucceſs, merely as aſtringents. The antiſeptic virtue of the gummy-reſinous vegetables, judging of their effect by that of the bark, appears to depend on their fermenting in the body, and parting with fixed air in the courſe of their fermentation, and throwing a great quantity of it into the blood; and attending to the things that prevent putrefaction in living bodies, we ſhall find that the dependence is on the quantity of air. Thus, vegetable food prevents the putrefactive diatheſis; and to the frequent uſe of freſh vegetables and ſugar, in the diet of the European nations, it is owing that putrid diſeaſes or plagues are now ſo uncommon. And what proves almoſt to a demonſtration the antiſeptic power of the fermentable ſubſtances, is the cure of the ſea-ſcurvy.

Dr. Crell diſagrees with the opinion of Dr. Macbride, that putrid diſeaſes may be cured with fermentable ſubſtances only; nor is he convinced that putrefaction depends only on the loſs of fixed air. This, he apprehends, is an effect rather than the cauſe of putrefaction. We ſhall here only add, that Dr. Macbride recommends, in the putrid yellow fever of the Weſt Indies, to give the patient repeated doſes of the alkaline ſalts, in freſh lime-juice, or the like, and to let it be ſwallowed during the effervescence; and to order the patient's drink to be ſomewhat of the highly fermentable kind; ſuch as the juice of the green ſugar-cane, diluted and acidulated with ſome of the recent ſour juices. The natives on the coaſt of Africa give in fevers of this kind, with good ſucceſs, a drink prepared by macerating in water a fruit of the plum kind, that grows there in great plenty. He adds, that by throwing in ſuch a quantity of antiſeptic vapour as would be furniſhed from this kind of materials, the putrefactive acrimony, which at firſt ſeems chiefly to affect the biliary ſyſtem, might be corrected and ſaturated. See on the ſubject of this article Dr. Macbride's Eſſays, 1776, paſſim.

Putrefaction, in *Phyſiology*, the ſpontaneous changes which animal ſubſtances undergo, when deprived of life. See Death.

Putrefaction, in *Agriculture*. It is by means of putrefaction, as ſtated under its appropriate article, that various ſubſtances and bodies are decompoſed, reduced, and brought into the ſtate proper for being applied to lands for the ſupport of crops; but this is more fully explained, in ſpeaking of the nature of the different materials that are capable of being made uſe of in ameliorating land for the growth of crops. See Manure.

Putrefaction *of Water*. It is ſaid to be the peculiar quality of the Thames water, that it will ſtink and yet be wholeſome; and after this will recover itſelf again. Many ſailors have been obliged to drink it ſtinking, ſo that they held their noſes while they poured it down their throats, yet no ſickneſs enſued from it. It generates a ſort of ſpirit alſo in this ſtinking ſtate, which will take fire at the approach of a lighted candle, as if ſpirit of wine were touched by the ſame.

It appears from the article Putrefaction, that though a volatile alkali may be obtained from putrid ſubſtances by diſtillation, ſuch ſubſtances muſt not be ſuffered to remain too long before they are diſtilled, unleſs they are kept in cloſe veſſels; becauſe the volatile alkali, which is the offspring of putrefaction, is diſſipated as faſt as it is generated, inſomuch that, at length, nothing is left behind but an inſipid water, or a ſolid matter, being an earth ſimilar to common mould. It is in this way, ſays Dr. Macbride, that ſtinking water, after ſome time, becomes ſweet: the volatile alkali, generated by the putrefaction of the animal and vegetable ſubſtances at firſt contained in the water, being, after a while, entirely diſſipated, leaves the remainder without any diſagreeable ſmell.

Putrid water is immediately deprived of its offenſive ſmell by charcoal. If putrid water be agitated with a ſmall quantity of magneſia, it will loſe its bad taſte and ſmell in a few minutes. See Crell's Journal, and Prouſt, Journal de Phyſique.

A method of preſerving water free from putrefaction was ſome years ſince propoſed by Dr. Alſton. It conſiſted in adding a quantity of lime to every caſk of water; and as lime is known to have a ſtrong antiſeptic property, water, as long as it retains the impregnation of lime, never putrefies.

In order to free the water, at the time of uſing it, from the lime, Dr. Alſton propoſes the precipitation of the latter by throwing a quantity of magneſia alba, on this principle, that as lime-ſtone is rendered ſoluble in water by the deprivation of its fixed air, and has a greater affinity with that air than magneſia has, the particles of quicklime diſſolved in the water would attract the air from the magneſia, and thereby becoming no longer ſoluble, would fall to the bottom, and leave the water taſteleſs and fit for economical uſes. See Lime-*water* and Magnesia.

The expence, however, attending this proceſs prevented the execution of the propoſal. Mr. Henry has not long ago ſuggeſted a cheap and eaſily practicable method of precipitating the lime, and thus of reſtoring the water to its original taſte. The following is a ſhort ſketch of the author's proceſs. To preſerve

preſerve the water from putrefaction, two pounds of good quicklime are directed to be added to each caſk of water of a hundred and twenty gallons. To free the water afterwards from the lime with which it has been impregnated, it is to be drawn off into a ſtrong caſk, containing about ſixty gallons, with an aperture at one end large enough to admit a veſſel, which is to be let down into it by means of ſtrings, and which contains a proper quantity of effervescent materials, that is, of marble or chalk, and vitriolic acid. Eight ounces of mild calcareous earth, and ſix ounces of ſtrong vitriolic acid, will be ſufficient for ſixty gallons of lime-water. The mouth of this laſt veſſel is to be ſtopped with a tubulated ſtopper, through which the fixed air, let looſe from the marble, paſſes up through the body of the water. The lime is thus rendered inſoluble, and is ſoon precipitated in the form of an impalpable powder of chalk; the water being thus reſtored to the ſame ſtate of purity as when it was firſt ſhipped on board; or, as Mr. Henry believes, to a ſtate of ſtill greater purity; ſeveral hard waters having, in conſequence of this proceſs, been rendered as ſoft as rain water, and freed from different impregnation. For farther particulars, and the deſcription and drawing of an apparatus for this operation, ſee Henry's Account of a Method of preſerving Water at Sea, &c. p. 10, &c. 1781.

PUTRESCENT Matters, in *Agriculture*, ſuch ſubſtances as are in a ſtate of putridity. Various materials of this kind are capable of being made uſe of by the farmer. It has been lately ſuggeſted by Dr. Hunter, of York, in a paper in the third volume of the Farmer's Magazine, that different materials of this nature may form a ſubſtitute for the folding of ſheep.

The trouble and expence of keeping a flock of ſheep for the purpoſe of folding, may probably be avoided by forming large ponds, ſo conſtructed as to receive and hold water. Into theſe ponds let drains from the ſtables, cow-houſes, ox-ſtalls, pigeon and waſh-houſes be directed; and, in order to enrich the water, let all kinds of vegetable and animal ſubſtances be thrown in, particularly the contents of the neceſſaries and ſlaughter-houſe. It is preſumed, that this putrid water, when put upon the land by means of water-carts, will prove as beneficial as a flock of ſheep kept for the expreſs purpoſe of folding; and where no ſheep are kept for that purpoſe, ſuch will prove an excellent manure for meadow land. A pond of ſixty feet diameter, by ſix feet deep, which will contain upwards of 700 hogſheads of water and putreſcent bodies, may be equal in its effects to a conſiderable fold of ſheep. The putreſcency of the water may be greatly increaſed, by occaſionally ſupplying the ponds with the refuſe of fiſh, and ſea-weed, where they can be conveniently procured; and in all places within a reaſonable diſtance of ſea-ports, where ſhips are employed in the Greenland fiſhery, the farmer will find a ſeaſonable ſupply of putreſcent matter by the purchaſe of the whale blubber, after the oil has been taken from it. Such is the ſtrength of the laſt named ſubſtance, that it is well worth the farmer's while to be at the expence of carrying it in caſks to a conſiderable diſtance, for the purpoſe of giving vigour to his compoſt dunghills. The ancients were ſcrupulouſly nice in the formation of their dunghills; and it is a reproach to the preſent race of farmers, that ſo material a branch of their buſineſs ſhould, at this day, be ſo imperfectly known or attended to. And in many large cities, and eſpecially Edinburgh, it would be a great improvement, if a well-conſtructed reſervoir was made to receive the excrementitious matter, the baſon being occaſionally repleniſhed with earth and ſmall rubbiſh. In this manner, many thouſands of loads of rich manure might be ſaved from the ſea, to which place the excrementitious matters are upon their paſſage.

PUTRID, Putridus, ſomething rotten, or putrefied. See Putrefaction.

Thus we ſay, putrid fleſh; a putrid humour: putrid limbs, *i. e.* mortified ones, are to be cut off.

Putrid *Diſeaſes*. See Putrid *Fever*, &c.

Putrid *Ferment*. See Ferment.

Putrid *Fever*, *&c.* in *Medicine*, an epithet originating in the chemical ſchool of phyſic, in which the true operations and phenomena of *life* were miſtaken for the fermentations and decompoſitions of the laboratory. This miſtake was probably the reſult of the offenſive ſmell, and actual putrefactive odour of ſome of the diſcharges from the living body, in the laſt ſtages of ſevere fevers; but farther obſervation has demonſtrated that, however the excretions may undergo the proceſs of putrefaction after they are thrown out of the living ſyſtem, no degree of putrefaction can exiſt for a moment in the circulating blood, without occaſioning inſtant death.

The ſymptoms which were formerly aſcribed to putrefaction, but which are now believed to originate from a great deficiency of the vital or nervous power derived from the brain and nervous ſyſtem, are ſuch as occur in typhus gravior, the hoſpital and gaol fever, and in the worſt caſes of dyſentery, and ſmall-pox; among which are a black tongue and mouth, extreme proſtration of ſtrength, fœtid evacuations from the ſtomach, bowels, and bladder, hæmorrhages, petechiæ, and purple blotches, &c. See Fever, and Typhus.

Putrid *Ulcer*. See Ulcer.

PUTRINE, in *Geography*, a town of Pruſſia, in Oberland; ſix miles W. of Paſſenheim.

PUTT, in *Rural Economy*, a provincial word, applied commonly in ſome diſtricts to the mole-hill. Alſo, ſometimes to animals which put or thruſt with their horns.

Putt, or *Pitne*, in *Geography*, a town of Anterior Pomerania; eight miles S.W. of Stralſund.

PUTTAN-SUMNAUT, a town of Hindooſtan, in Guzerat; near which was a famous pagoda, much venerated and frequented by devotees from all parts of the country. In the year 1002 this town and temple were taken by Mahmood, king of Ghizni, and plundered of their great wealth. In the temple was found a ſtatue, in which, on being broken, was found a vaſt quantity of precious ſtones. The Hindoos believed that the ſouls of deceaſed perſons came to this place to be transferred to other bodies; 80 miles S. of Noanagur. N. lat. 21° 1′. E. long. 69° 40′.

PUTTEN, Vander, Henry, in *Biography*, was born at Vandloo in 1574: after ſtudying at the univerſities of the Low Countries, he viſited Italy, and for a conſiderable time was profeſſor of rhetoric at Milan, where he took the degree of doctor of laws. He was nominated hiſtoriographer to his Catholic majeſty, and received the honour of citizenſhip at Rome. In 1606 he was invited to the chair of Lipſius, who had been his tutor. He was alſo made a counſellor to the archduke Albert, and entruſted with the government of the citadel of Louvain. When a truce was negotiating between the Dutch and the king of Spain, in 1633, he publiſhed a work, entitled "Statera Belli et Pacis," in which he ſhewed how important a peace would be to the Spaniſh Netherlands. This work gave great offence, and the author had nearly experienced the uſual fate of thoſe who counſel pacific meaſures, at a time when paſſion, prejudice, and intereſt, urge the continuance of war. He died at Louvain in 1646, age 72. Beſides his "Statera," mentioned above, he publiſhed "Hiſtoria Infubrica;" "Orcheſtra

"Orcheſtra Burgundica;" "Theatrum Hiſtoricum Imperatorum;" "Comus, ſeu de Luxu;" "De uſu Bibliothecæ," with a catalogue of the Ambroſian library; beſides ſeveral tracts relative to claſſical antiquities, printed among the collections of Grævius and Gronovius. Moreri. Bayle.

PUTTEN, in *Geography*, a ſmall iſland of Holland, in the Meuſe, E. of Voorn.

PUTTERAHEE, a town of Hindooſtan, in the circar of Gohud; 27 miles E.N.E. of Gohud.

PUTTOCKS, or PUTTOCK-*Shrouds*, otherwiſe called *futtock* or *foot-hook ſhrouds*, in a *Ship*, are ſmall ſhrouds which go from the ſhrouds of the main-maſt, fore-maſt, and mizen-maſt, to the top-maſt ſhrouds; and if there be any top-gallant maſt, there are puttocks to go from the top-maſt ſhrouds into theſe. Theſe puttocks are at the bottom ſeized to a ſtaff, or to ſome rope which is ſeized to a plate of iron, or to a dead-man's eye, to which the laniards of the fore-maſt ſhrouds come. See SHROUDS.

PUTTY ſometimes denotes a white powder of lead and tin calcined together, in the proportion of two parts of lead to one of tin; uſed in poliſhing, and giving the laſt gloſs to works of iron, ſteel, ſtone, and glaſs. This is alſo the baſis of white enamels, and glazings for earthen-ware.

PUTTY is alſo uſed to denote ſpodium.

PUTTY, in its popular ſenſe, denotes a kind of paſte, compounded of whiting, with or without a little white lead, and linſeed oil, beaten together to the conſiſtence of a tough dough; uſed by glaziers for faſtening the ſquares of glaſs in ſaſh-windows, &c. and by painters, to ſtop up the crevices and clefts in timber and wainſcot, to prevent the wet from getting in, and ruining the work.

PUTTYRAM, in *Geography*, a town of Hindooſtan, in Bengal; 18 miles E.S.E. of Dinagepour.

PUTUAY, a ſmall iſland on the coaſt of Bengal. N. lat. 22° 41′. E. long. 89° 28′.

PUTUMAYO, a river of South America, which riſes about 80 miles S. of Popayan, purſues an eaſtern courſe, inclining to the ſouth, about 300 miles, and after being joined by a branch of the Caquet, takes the name of Ica, and running S.E. about 200 miles, joins the river of the Amazons in S. lat. 3° 30′. W. long. 50° 40′.—Alſo, a town of South America, in the government of Popayan, on a river of the ſame name; 50 miles E. of Paſto.

PUTURA, a cuſtom claimed by the keepers of foreſts, and ſometimes by bailiffs of hundreds, to take man's meat, horſe's meat, and dog's meat, of the tenants and inhabitants, gratis, within the perambulation of the foreſt, hundred, &c.

"Johannes clamat unam puturam in prioratu de Penevoſtham, qui eſt quædam cella abbatiæ de Eveſham, pro ſe & miniſtris, equis, & garcionibus ſuis, per unum diem & duas noctes, de tribus ſeptimanis, in tres ſeptimanas, *viz.* de victualibus, ut & eſculentis & potulentis, ad coſtas prioratus prædicti indebite." Placit. apud Præſton. 17 Edw. III.

This cuſtom, within the liberty of Knareſburg, was long ſince turned into the payment of four-pence, *pro putura*.

The land ſubject to this ſervice is called *terra puturata*. The learned Somner has erred in his expoſition of this word.

PUTYAJURY, in *Geography*, a town of Bengal; 30 miles S.S.W. of Silhet.

PUTZIG. See PAUZK.

PUVIGLIO, a town of the duchy of Parma; nine miles N.E. of Parma.

PUWAKHAGA, in *Botany*, the name by which ſome authors call the fauſel-tree, of whoſe fruit the expreſſed juice called terra Japonica, or Japan earth, is made.

PUXUANAIRO, in *Geography*, a town of Mexico, in the province of Mechoacan; 25 miles N.W. of Mechoacan.

PUY, PETER DU, in *Biography*, the third ſon of Claude du Puy, a magiſtrate in the parliament of Paris, was born in that city in 1582, and was educated with great care under his father. While a youth, he made extraordinary proficiency in literature, and ſtill further improved himſelf by a journey to Holland, whither he accompanied the French ambaſſador. After his return he laboured with great aſſiduity in aſcertaining the rights of the crown of France over ſome of the neighbouring diſtricts, and for that purpoſe was indefatigable in his examination of ancient charters, and thereby acquired a profound knowledge of French hiſtory. The reward of this, and other labours of the ſame ſort, were the places of king's counſellor, and keeper of the royal library, in both of which he was diſtinguiſhed by his patriotiſm and love of letters. His works were numerous and valuable. In almoſt all of them he aims at repreſſing the eccleſiaſtical authority, and the claims of the ſee of Rome; hence they were not well received at the papal court. They are, however, ſaid to contain a rich treaſure of facts relative to all the matters on which he treats. He died at Paris in 1651, at the age of 69, and his life was written by his intimate friend Nicholas Rigault. Some of his writings are as follow: "Preuves des Libertès de l'Egliſe Gallicane;" "Hiſtoire Veritable de la Condemnation de l'Ordre des Templiers;" "Traité de la Loi Salique;" "Du Concordât de Bologne entre le Pape Léon X., et le Roi Francis I;" "Apologie de l'Hiſtoire de M. le Préſident de Thou." He had a brother, James, prior of St. Sauveur, who became keeper of the king's library after the death of Peter, whom he aſſiſted in all his works, of the greater part of which he was the publiſher. He died in 1656, leaving behind him a high character for learning and probity. Another brother, Chriſtopher du Puy, was prothonotary to the cardinal de Joyeuſe, and by his remonſtrances he prevented the congregation of the Index from putting the firſt of De Thou's hiſtory in the liſt of heretical books. He was king's almoner, and, while attached to cardinal du Perron, he made a collection entitled "Perroniana." He became a Carthuſian, and died at Rome in 1554, proctor-general of his order.

PUY, LOUIS DU, a man of letters, was born at Clarey, in Bugey, in 1709; he ſtudied in the college of Lyons, and came to Paris in 1732. He was for a conſiderable time principal editor of the Journal des Sçavans, and during thirty years enriched this collection with a great number of critical diſſertations. He was well verſed in the learned languages, and in the mathematics, and acquired an extenſive knowledge of hiſtory and antiquities. The prince of Soubiſe entruſted him with the management of his library, and by his care it was rendered one of the moſt valuable in the metropolis. In 1753 he was nominated ſecretary to the Academy of Inſcriptions, in which ſituation he pronounced the eulogies of twelve of his aſſociates, and edited from the 36th to the 41ſt vols. of its memoirs. He died in 1795. He was author of "Obſervations on infinitely ſmall Quantities, and the metaphyſical Principles of Geometry," inſerted in the Journal des Sçavans for 1759; "A Tranſlation of four Tragedies of Sophocles," 1762; "A Tranſlation of the Greek Fragments of Anthemius on mechanical Paradoxes, with Notes;" ſome memoirs on the Roman coin, the ſilver denier of Charlemagne, and other antiquarian and literary ſubjects. Du Puy was highly eſteemed for ſtrict probity,

ſincerity, and an obliging diſpoſition, which diſplayed itſelf in uſeful advice and information to thoſe who conſulted him on literary topics.

Puy, *Mademoiſelle du*, a celebrated performer on the harp, who had acquired a conſiderable fortune by the exerciſe of her talents in different parts of Europe. She died at Paris in 1777, and made a will that ſeemed dictated by inſanity. Among other articles, ſhe ordered that no blind, lame, or deformed perſon ſhould attend her funeral. She ordered that her houſe ſhould be let to none but nobility. She left a large piece of ground to be formed into a public garden, upon condition that no ſtunted trees ſhould be allowed a place in it. And laſtly, ſhe bequeathed an annuity for the maintenance of cats, of which ſhe was fond, and for a perſon to take care of them. But the annuity depended wholly on the life of the cats. The harp upon which ſhe had acquired her poſſeſſions, was left to a blind harper in the Hoſpital des Quinze Vingts, who played tolerably well on many different inſtruments. Great pains were taken to ſet this will aſide, but without effect. It was declared valid by law, and obliged to be executed. Laborde.

Puy, *Le*, in *Geography*, a town of France, and principal place of a diſtrict, in the department of the Upper Loire, and capital of the department, ſituated on a ſmall river near the Loire; before the revolution, the ſee of a biſhop; a place of conſiderable trade, eſpecially in lace; 38 miles S.W. of Lyons. The place contains 15,915 inhabitants, in two cantons, the one containing 13,396, and the other 14,100, on an extent of 185 kiliometres, in 16 communes. N. lat. 45° 2′. E. long. 3° 57′.

Puy-*Laurens*, a town of France, in the department of the Tarn, and chief place of a canton, in the diſtrict of Lavaur; 12 miles S.E. of Lavaur. This place contains 5648, and the canton 9817 inhabitants, on a territory of 125 kiliometres, in 9 communes.

Puy-*l'Evêque*, a town of France, in the department of the Lot, and chief place of a canton, in the diſtrict of Cahors; 14 miles W. of Cahors. The place contains 2082, and the canton 12,127 inhabitants, on a territory of 285 kiliometres, in 11 communes.

Puy-*Mirol*, a town of France, in the department of the Lot and Garonne, and chief place of a canton, in the diſtrict of Agen. The place contains 1263, and the canton 8072 inhabitants, on a territory of 125 kiliometres, in 11 communes.

Puy *de Belliard*, a town of France, in the department of La Vendée; 18 miles N.W. of Fontenay le Comte.

Puy *Caſquier*, a town of France, in the department of the Gers; nine miles N.E. of Auch.

Puy *de Dome*, a mountain of France, near Clermont en Ferrand, 810 toiſes in height.

Puy *de Dome* is alſo the name of one of the nine departments of the central region of France, ſo called from the mountain that is ſituated in it; it is bounded on the N. by the department of the Allier, on the E. by that of the Rhône and Loire, on the S. by the departments of the Cantal and Upper Loire, and on the W. by thoſe of the Correze and Creuſe; formerly Lower Auvergne, in N. lat. 45° 40′, containing 8450 kiliometres, or about 35 French leagues in length, and 22 in breadth, or 447 ſquare leagues, and 508,444 inhabitants; divided into five diſtricts, *viz.* Riom, including 126,640; Thiers, 61,530; Ambert, 73,535; Clermont, 158,449; and Iſſoire, 88,290 inhabitants; 50 cantons, and 438 communes. The circles, according to Haſſenfratz, are 8, the cantons 71, and the population 516,593. Its capital is Clermont. The general total of its contributions in the 11th year of the new French era, was eſtimated at 3,656,547 francs; and its expences for adminiſtration, juſticiary, and for public inſtruction, at 374,681 francs, 37 cents. The ſoil of this department, diverſified with hills and plains, is remarkably fertile, producing abundantly grain, wine, fruits, hemp, and paſtures. It has mines of ſilver and lead, mineral ſprings, &c.

Puy *le Garde*, a town of France, in the department of the Lot; 15 miles N.E. of Montauban.

Puy *Guillaume*, a town of France, in the department of the Puy de Dome; eight miles N.E. of Lezoux.

Puy *Laurens*, a town of France, in the department of the Aude; ſeven miles S.E. of Quillan.

Puy *Marin*, a town of France, in the department of the Upper Garonne; 17 miles N. of St. Gaudens.

Puy *Mielan*, a town of France, in the department of the Lot and Garonne; ſix miles E. of Marmande.

Puy *Moiſſon*, a town of France, in the department of the Lower Alps; 15 miles S. of Digne.

Puy *Notre Dame*, or *Puy en Anjou*, a town of France, in the department of the Mayne and Loire; 10 miles S.W. of Saumur.

Puy *de la Poix*, a town of France, in the department of the Puy de Dome; 18 miles E. of Clermont.

Puy *la Roque*, a town of France, in the department of the Lot; 17 miles N.E. of Montauban.

Puy *St. Martin*, a town of France, in the department of the Drôme; 11 miles N.E. of Montelimart.

Puy *Val d'Or*, a town of France, in the department of the Eaſtern Pyrenées; 10 miles N.W. of Montlouis.

PUYA, in *Botany*, the vulgar name, in Chili, of a plant, which is figured in Feuillée, v. 3. 59. t. 39, and adopted as a genus, after Molina, in Juſſieu's Genera 447, under the above barbarous appellation, with the following character.

"Calyx in ſix deep ſegments; the three innermoſt largeſt, and vaulted. Stamens ſix, inſerted into the lower part of the calyx; their filaments formed like a ſcale at the baſe, and bearing honey. Germen ſuperior, triangular; (ſtyle and ſtigma unknown). Capſule of three cells, with numerous minute ſeeds, (doubtful whether furniſhed with down.")

Feuillée's deſcription is to the following effect. The roots are fibrous, throwing up ſeveral ſtems, about nine feet high, as thick as a man's body at the bottom, where they are clothed with the ſcaly imbricated veſtiges of old leaves, above which ſtand the numerous leaves of the preſent year. Theſe are three or four feet long, and about two inches wide, reſembling the foliage of the Pine-apple, their margins being fringed with very ſharp hooked prickles, five lines long, and about an inch and a half aſunder; the ſurface of the leaves is ſmooth, ſhining, of a fine bright green. The Indians make uſe of theſe prickles as fiſh-hooks. The part of the ſtem above the leaves is round, two inches or more in thickneſs; of a blueiſh-green externally; white and watery within, clothed with very ſhort, alternate, claſping leaves, or ſcales. The ſummit conſiſts of a large pyramid of flowering branches, or ſpikes, the lowermoſt a foot long; all clothed with ſimilar ſcales, or bracteas, each of which is accompanied by a ſeſſile axillary flower. Each flower is compoſed of ſix leaves, three large and three ſmall, in a double row. The latter are three quarters of an inch long, (Feuillée ſays, apparently by miſtake, three inches,) and three lines and a half broad, covered with minute white down: the three larger are of a greeniſh-yellow, two inches and a half long, and nine lines broad, terminating like a Gothic arcade. The flowers roll up ſpirally as they fade. Six ſtamens ſpring from the bottom of each flower, ſurrounding a triangular piſtil, which extends beyond them, and becomes

a fruit of three cells, filled with an infinite number of ſeeds. Feuillée met with ſeveral ſpecimens of this plant in the kingdom of Chili. He refers it to his genus of *Renealmia*, the *Tillandſia* of Linnæus. Juſſieu juſtly ſuſpects its being the ſame genus with l'Heritier's PITCAIRNIA, ſee that article; of which therefore the plant in queſtion may be preſumed to conſtitute an additional ſpecies to the four we have deſcribed; agreeing moſt with *P. bracteata* in habit, ſize and colour, but differing in having more ſpinous leaves, as well as a more compound inflorescence.

The reader will obſerve that Juſſieu, according to the principles he had aſſumed, calls the whole integument of the flower a calyx, while we follow other writers in taking the three inner parts for petals; a meaſure juſtified, if we miſtake not, by their habit, and mode of withering. The little differences reſpecting the ſcales or nectaries may eaſily be reconciled.

PUYCERDA, in *Geography*, a town of Spain, in Catalonia, and capital of the county of Cerdagne, ſurrounded with walls and baſtions, and defended by a caſtle; 19 miles E.N.E. of Urgel. N. lat. 42° 30′. E. long. 1° 48′.

PUYO, a town of France, in the department of the Landes; nine miles S.W. of Aire.

PUYS, a term uſed for the poles with which the keels on the Tyne river are ſtowed along.

PUYSEGUR, JAMES DE CHASTENET, *Lord of*, in *Biography*, lieutenant-general under Lewis XIII. and XIV., was born in 1600. He entered the army at the age of ſeventeen, and ſerved, without intermiſſion, during forty-three years. He was preſent at above thirty battles, and one hundred and twenty ſieges, without ever having been ſick or received a wound, but he had not the good fortune to riſe in his profeſſion, being more zealous for the king's ſervice, than complaiſant to the miniſters. He drew up "Memoirs," compriſing the period from 1617 to 1658, in which are contained various remarkable particulars relative to the campaigns in which he ſerved, with uſeful military inſtructions. They were printed at Paris and Amſterdam in 1690, 2 vols. 12mo. under the inſpection of Du Cheſne, hiſtoriographer of France, and they have the character of narrating with freedom and fidelity. He died at his country ſeat in 1682. Moreri.

PUYSEGUR, JAMES DE CHATELET, *Marquis de*, was ſon of the preceding, born at Paris in 1655, and entered into the army under his father, and gradually roſe to the poſt of commander-in-chief in the French Netherlands, and finally, to the ſtill more important one of a marſhal of France in 1734. He died at Paris in the year 1743, at the age of 88. He was author of a work "On the Art-Military," publiſhed by his only ſon the marquis of Puyſegur. Moreri.

PUZZALO, in *Geography*, a town of the iſland of Sicily, in the valley of Noto, near the S. coaſt of the iſland; 12 miles S.W. of Noto.

PUZZLING BAY, a bay in the ſtraits of Magellan, on the coaſt of Patagonia. N. lat. 53° 35′. W. long. 74° 28′.

PUZZOLANA. See POZZOLANA, and *Calcareous* CEMENT.

PUZZUOLI, in *Geography*. See POZZUOLI.

PWLLHELI, a borough, market, and ſea-port town in the pariſh of Denio, cwmmwd of Cannologion, cantref of Lleyn, now called the hundred of Gyfflogion, county of Caernarvon, South Wales, is ſituated on the ſouth ſide of the promontory of Lleyn, in St. George's Channel, at the diſtance of 27 miles S.S.W. from Caernarvon, and 243½ miles W.N.W. from London. This town conſiſts chiefly of a ſingle ſtreet, running parallel to the ſhore. It was conſtituted a free borough by Edward the Black Prince, at the requeſt of Nigel de Lohareyn, and had its privileges confirmed by king Edward III. The government is veſted in a mayor, recorder, and two bailiffs, who have the powers of juſtices. The market days here are Wedneſday and Saturday, weekly; and there are beſides ſix annual fairs. This port has a conſiderable trade; and upwards of eighty ſhips, of different burthens, belong to it. Along the coaſt to Bardſea iſland, an extenſive and valuable herring fiſhery has been lately eſtabliſhed. The harbour is good, and well ſheltered from the winds; and the bay, to which the town gives name, affords excellent anchorage ground. Pwllheli is one of the contributary boroughs with Caernarvon, in returning one member to parliament, and is likewiſe the ſeat of the petty ſeſſions for the diſtrict of Lleyn, which extends about twenty-two miles in length, and from three to ten in breadth, projecting into the ſea in a manner ſimilar to the county of Cornwall. According to the parliamentary returns of 1811, the pariſh contains 312 houſes, and 1383 inhabitants, of which number, above one-half are reſident in the town of Pwllheli.

At the diſtance of five miles from this town is Carn-Madryn, a ſtrong fortreſs, which formerly belonged to the ſons of Owen Gwynedd. The bottom, ſides, and top are filled with cells, varying in ſize and ſhape, many of which are ſtill nearly entire. Cloſe to the ſea-coaſt is an entrenchment, called Dinas Dinlle, which conſtitutes an object of great attraction from the road to Caernarvon by Clynnog Fawr, a neat romantic village, boaſting one of the largeſt and handſomeſt churches in Wales. Near it is the valley called Nant-y-Gwrtheyrn, or the valley of Vortigern, where that prince is ſaid to have concealed himſelf, to avoid the perſecution of his ſubjects. It is bounded on two ſides by ſtony ſteps, only productive of heath and ſtunted gorſe, and on a third by a tremendous precipice. The only opening to this ſecluded ſpot is towards the ſea, "a northern aſpect, where chilling winds exert all their fury, and half freeze, during winter, its few inhabitants." Nicholſon's Cambrian Traveller's Guide, 1813. Carliſle's Topographical Dictionary of Wales, 1811, 4to.

PYANEPSIA, Πυανεψια, in *Antiquity*, a feaſt celebrated by the Athenians in the month Pyanepſion; which, according to the generality of the critics, correſponded to our September.

Plutarch refers the inſtitution of this feaſt to Theſeus; who, at his arrival from Crete, made a kind of ſacrifice to Apollo of all the proviſions remaining in his veſſel; putting them all into a kettle, boiling them together, and eating them with his ſix companions; which cuſtom was afterwards continued. The ſcholiaſt of Ariſtophanes ſays, this was done to acquit himſelf of a vow he made to Apollo in a tempeſt.

M. Baudelot writes the word *Puanepſia*, and takes it to be a feaſt inſtituted in memory of Theſeus's return after killing the Minotaur.

The Greeks vary as to the origin and ſignification of the word Pyanepſion, whence the feaſt is denominated. Harpocration calls it *Pæanoptia;* he adds, that others call it *Panopſia*, becauſe then the fruits all appear to the eye. Heſychius writes *Pyanepſia;* and derives it from πυανον, *bean*, and εψω, *coquo;* becauſe in this feaſt the Athenians gathered their beans, and made a kind of broth of them.

PYANEPSION, Πυανεψιων, in the Athenian *Chronology*, a month of thirty days, in which the feſtival Pyanepſia was celebrated, and called by the Bæotians Damatrius.

PYAPOUR, in *Geography*, a town of Hindooſtan, in Bahar; 13 miles E. of Bahar.

PYBO-

PYBOLOWO, a town of Lithuania; 25 miles E. of Minſk.

PYCIELT, in *Botany*, a name given by Hernandez, and ſome other authors, to a peculiar ſpecies of tobacco, diſtinguiſhed by Mr. Tournefort by the name of nicotiana major lato et rotundo folio, the broad roundiſh-leaved great tobacco.

PYCNANTHEMUM, a name contrived by Michaux, from πυκνος, *denſe*, and ανθος, *a flower*, to expreſs the denſe inflorefcence.—Michaux Boreali-Amer. v. 2. 7. Ait. Hort. Kew. v. 3. 376. Purſh v. 2. 409. (Brachyſtemum; Michaux Boreali-Amer. v. 2. 5.)—Claſs and order, *Didynamia Gymnoſpermia*. Nat. Ord. *Verticillatæ*, Linn. *Labiatæ*, Juſſ.

Gen. Ch. *Cal.* Perianth of one leaf, inferior, tubular, ſtriated, erect, permanent, with five awl-ſhaped, acute, nearly equal teeth; the mouth naked. *Cor.* of one petal, ringent; tube cylindrical, the length of the calyx; upper lip nearly erect, oblong, ſlightly convex, rounded, ſcarcely notched; lower lip much the largeſt, widely ſpreading, channelled, three-lobed; the lateral lobes ſemi-elliptical; the middle one longeſt. *Stam.* Filaments four, awl-ſhaped, diſtant, various in length; two of them ſhorter than the reſt; anthers with two parallel cells. *Piſt.* Germen ſuperior, four-cleft; ſtyle briſtle-ſhaped, rather ſhorter than the corolla; ſtigmas two, ſpreading, acute. *Peric.* none, except the permanent calyx. *Seeds* four, roundiſh.

Eſſ. Ch. Calyx five-cleft. Middle ſegment of the lower lip of the corolla longer than the reſt. Stamens diſtant. Anthers with parallel cells.

Obſ. This genus ſeems to differ from *Satureja* principally in the form of its corolla. The ſpecies, as far as we know, are all American.

Sect. 1. *Stamens prominent. Pycnanthemum* of Michaux.

1. P. *incanum*. Hoary Tufted Savory. Michaux v. 2. 7. Purſh n. 1. Ait. n. 1. (Clinopodium incanum; Linn. Sp. Pl. 822. Willd. Sp. Pl. v. 3. 132. C. menthæ folio, incanum et odoratum; Dill. Elth. 87. t. 74. C. Serpentaria dictum, &c.; Pluk. Mant. 51. t. 344. f. 1.)—Leaves oblong-ovate, acute, ſlightly ſerrated, downy. Heads compound; the lateral ones ſtalked. Bracteas ſetaceous. —Found in low fields and copſes, from Virginia to Carolina; flowering from July to October. It was cultivated in Sherard's garden at Eltham before the year 1732, but has ſcarcely been attended to by recent amateurs. The *root* is perennial. *Stem* three feet high, erect, ſomewhat branched, leafy, bluntly quadrangular. *Leaves* about two inches long, on ſhort ſtalks; their under ſide moſt hoary or downy. *Flowers* white, tinged with red, in denſe ſtalked hoary whorls, with a terminal head; their inner *bracteas* briſtle-ſhaped. The whole herb is clothed with fine ſoft pubeſcence; the *leaves* marked with pellucid dots; their ſcent aromatic, partaking of the common, as well as ſweet, Marjoram.

2. P. *ariſtatum*. Briſtly Tufted Savory. Michaux v. 2. 8. t. 33. Purſh n. 2. Ait. n. 2. (Nepeta virginica; Linn. Sp. Pl. 799. Willd. Sp. Pl. v. 3. 56. Clinopodium amaraci folio, flore albo; Pluk. Phyt. t. 85. f. 2.)—Leaves ovato-lanceolate, ſomewhat hoary, ſlightly ſerrated. Heads ſeſſile. Bracteas and calyx awned.—Native of dry woods, on a limeſtone ſoil, from Maryland to Carolina, flowering in July and Auguſt. Miller appears to have cultivated this ſpecies in 1752. It is perennial, with altogether the herbage and aſpect of an *Origanum*. The *leaves* are not an inch long, nearly ſeſſile, dotted, veiny, thick-edged, very minutely, and ſcarcely perceptibly, hoary. *Flowers* white, ſmall, in numerous, denſe, terminal, hoary, compound heads. *Bracteas* lanceolate, entire, with long, rigid, awn-like points.

3. P. *montanum*. Mountain Tufted Savory. Michaux v. 2. 8. Purſh n. 3.—"Leaves oval-lanceolate, ſerrated. Head ſeſſile. Calyxes crowded, erect, with ſhort teeth." —Native of high mountains in Carolina, according to Michaux, the only perſon who appears to have gathered this plant. The *ſtem*, and part of the reſt of the herb, are uſually tinged with purple. We have ſeen neither ſpecimen nor figure.

4. P. *Monardella*. Monarda Tufted Savory. Michaux v. 2. 8. t. 34. Purſh n. 4. (Origanum incanum; Walter Carolin. 165.)—Somewhat hairy. Leaves ovate, taper-pointed, ſerrated. Outer bracteas ovate, coloured, longer than the flowers; inner lanceolate, fringed. Calyx bearded. —Found on the mountains of Virginia and Carolina, but as yet a ſtranger to our gardens. It flowers from June to Auguſt, and is perennial. The habit of the plant, and its coloured *bracteas*, reſemble *Monarda fiſtuloſa*. The *flowers* are ſmall, and pale red, according to Mr. Purſh, on whom we depend for the ſynonym of Walter.

5. P. *linifolium*. Flax-leaved Tufted Savory. Purſh n. 5. Ait. n. 3. (Brachyſtemum virginicum; Michaux v. 2. 6. B. linifolium; Willd. Enum. 623. Thymus virginicus; Linn. Syſt. Veg. ed. 13. 453. Willd. Sp. Pl. v. 3. 145. Satureja virginiana; Linn. Sp. Pl. 793. Herm. Parad. 218. t. 218. Pulegium virginianum anguſtifolium, &c.; Pluk. Phyt. t. 54. f. 2.)—Stem erect, much branched, corymboſe, roughiſh. Leaves lanceolate, entire. Heads crowded, nearly globular. Bracteas ovate, fringed.—Found in rather dry and mountainous meadows of North America, from New England to Carolina, flowering in July and Auguſt. Miller had it in cultivation in the year 1739, and it is ſtill preſerved in curious gardens, being a tolerably hardy, ſomewhat ſhrubby, perennial, of a buſhy corymboſe habit, about eighteen inches or two feet high. The whole plant ſmells ſtrongly of Penny-royal. The *ſtem* is ſquare, pale, downy chiefly at the angles; its upper branches riſing all nearly to a level, and forming a *corymbus* of numerous, globoſe or hemiſpherical, downy heads, of ſmall white *flowers*. The *bracteas* are numerous, all ovate; the outer ones large, the inner very downy. Such is the plant intended by Linnæus under the above ſynonyms, and which is perhaps rather the *P. lanceolatum* of Purſh, than his *linifolium*. In the latter the *ſtamens* are longer than the *corolla*; in the former they are ſhorter; but this is evidently, as in Mints, a variable circumſtance; and therefore the *Pycnanthemum* and *Brachyſtemum* of Michaux, are certainly one and the ſame genus. We are confident alſo that there is no ſpecific difference between Purſh's and Willdenow's *linifolium* and *lanceolatum*.

Sect. 2. *Stamens within the tube. Brachyſtemum* of Michaux.

6. P. *muticum*. Pointleſs Tufted Savory. Purſh n. 7. (Brachyſtemum muticum; Michaux v. 2. 6. t. 32.)—Leaves ovate, pointed, ſmoothiſh, ſomewhat ſerrated. Heads terminal, ſeſſile, ſolitary. Bracteas lanceolate, acute, awnleſs.—Gathered by Michaux in Upper Carolina. Mr. Purſh never found this ſpecies. The former writer is incorrect in his definition of the *leaves*, which are by no means "lanceolate-oval," nor are they "dentate," but truly ſerrated, at leaſt in his plate. The *heads* bear ſome reſemblance to thoſe of our fifth ſpecies, but are leſs globoſe.

7. P. *verticillatum*. Whorled Tufted Savory. Purſh n. 8. (Brachyſtemum verticillatum; Michaux v. 2. 6. t. 31. Origanum clinopodioides; Walt. Carol. 165.)—Leaves ovate, pointed, entire. Flowers capitate and whorled. Bracteas lanceolate, pointed.—Native of mountains in North America, from Pennſylvania to Carolina, flowering

in

in July and Auguſt. *Purſh.* This, like the reſt, is perennial. It nearly reſembles the laſt, but differs in having entire *leaves*, and one or two denſe axillary whorls of *flowers*, beſides the ſolitary terminal heads. The *bracteas* are alſo ſaid to be more pointed.

PYCNI, πυκνοι, in the *Ancient Muſic*, was uſed for ſuch ſounds or chords of a tetrachord as might enter the ſpiſſum, or πυκνον.

Theſe were the hypatæ, the parypatæ, and the lichani, of the ſeveral tetrachords. The hypatæ were called *barypycni*, βαρυπυκνοι; the parypatæ, *meſopycni*, μεσοπυκνοι; and the lichani, *oxypycni*; οξυπυκνοι; becauſe the firſt were the loweſt notes; the ſecond, the middle notes; and the third, the higheſt of the ſpiſſum. Such chords as could never enter the ſpiſſum were called *apycni*, απυκνοι, υπατοειδεις, παρυπατοειδεις, λιχανοειδεις.

Hence, in the Greek ſcale or diagram, containing eighteen chords, there were five barypycni, as many meſopycni, and an equal number of oxypycni, together with three apycni. The apycni and barypycni were ſtabiles or fixed chords; but the meſopycni and oxypycni were moveable, or mobiles.

PYCNITE, in *Mineralogy*, is the mineral called ſchulite by Klaproth, leucolite by Daubenton, and ſchorlous beryl by Werner, who firſt claſſed it as a ſubſpecies of beryl. It is now arranged with the topaz, to which its conſtituent parts bear a nearer reſemblance. It is remarkable for containing, like the topaz, a portion of fluoric acid. Pycnite is generally found cryſtallized in long ſix-ſided priſms imbedded in granite rocks. Small four-ſided priſms may be obtained by a careful mechanical diviſion from the large cryſtals; the baſes of theſe are rhombs with angles of 120° and 60°. Bucholz conſiders this to be the primitive form of pycnite. The colour of this mineral is either various ſhades of white, paſſing on one ſide from greyiſh and yellowiſh-white to ſtraw-yellow, or from reddiſh-white to a peach bloſſom and crimſon red. Some ſpecimens are marked with ſpots of violet blue. The cryſtals are tranſlucent. The croſs fracture is imperfectly foliated, the longitudinal imperfectly ſmall conchoidal. It is harder than quartz, which it ſcratches, but is eaſily broken in a direction perpendicular to the axis of the cryſtals. Its ſpecific gravity is 3.61. By the analyſis of Vauquelin, pycnite contains

Alumine - -	60
Silex - -	30
Fluoric acid -	6
Lime - -	2
Water - -	1
Loſs 1. - -	99

Bucholz makes the proportion of fluoric acid 17 *per cent.* There is no leſs difference in the proportion of fluoric acid in different ſpecimens of the topaz, as given by Klaproth and Vauquelin. See TOPAZ. B.

PYCNON, πυκνον. See SPISSUM.

PYCNOSTYLE, πυκνοστυλο, formed from πυκνος, *cloſe*, and στυλος, *column*, in the *Ancient Architecture*, a building where the columns ſtand very cloſe to one another; one diameter and a half of the column being allowed for the intercolumnation.

The pycnoſtyle is the ſmalleſt of all the intercolumnations mentioned by Vitruvius. Some make it the ſame with *ſyſtyle*; others diſtinguiſh the latter by its allowing half a module more in the Corinthian intercolumnation.

The pycnoſtyle, Mr. Evelyn obſerves, chiefly belonged to the Compoſite order, and was uſed before the moſt magnificent buildings; as, at preſent, in the peryſtyle of St. Peter's at Rome, conſiſting of near three hundred columns; and ſuch as yet remain of the ancients among the late diſcovered ruins of Palmyra.

PYCNOTICS, INCRASSANTS, or medicines of an aqueous nature, which have the faculty of cooling and condenſing, or thickening, the humours.

The word, in its original Greek, πυκνωτικον, ſignifies ſomething that has the power of thickening.

Purſlane, the nenuphar or water-lily, ſolanum, &c. are ranked among pycnotics.

PYDNA, in *Ancient Geography*, a town of Macedonia, in Pieria, on the coaſt of the Thermæan gulf, ſome miles N. of the river Aliacmon. It was near this town that the Romans gained over Perſeus the battle which terminated the kingdom of Macedon. Steph. Byz. calls it Cydna.—Alſo, a town of the Rhodians.—Alſo, a mountain of the iſland of Crete.—Alſo, a town of Aſia, in Phrygia, in the vicinity of mount Ida.

PYE, in Engliſh *Antiquity*. See PICA.

PYE, in *Mechanics*. See CRAB.

PYE, in *Ornithology*. See PICÆ.

PYE, *Sea*. See PICA *Marina*.

PYE'S *Iſlands*, in *Geography*, a cluſter of ſmall iſlands in the North Pacific ocean, near the W. coaſt of North America. The ſouthernmoſt forms, in various appearances of it, a very conſpicuous peak; its S. extremity is ſituated in N. lat. 59° 19'. E. long. 210° 21'.

PYGAIA, in the *Materia Medica*, a name by which ſome authors have called the ipecacuanha, or vomiting Indian root.

PYGARGA, in *Zoology*, a ſpecies of *Antelope*; which ſee.

PYGARGITES, in *Natural Hiſtory*, a name given by Pliny and ſome other of the old writers to the eagle-ſtone, when it was variegated with white, in the manner of the tail of the eagle, called *pygargus*.

PYGARGUS, in *Ornithology*, a ſpecies of eagle, called alſo by ſome authors *albicilla*, and *hirundinaria*. Linnæus has claſſed this bird among the vultures, calling it the *vultur albicilla*, becauſe its bill is rather ſtraighter than is uſual in the eagle; but Mr. Pennant obſerves, that it can have no claim to be ranked with that genus, becauſe the pygargus is wholly feathered; whereas the characteriſtic mark of the vulture is, that the head and neck are either quite bare, or only covered with down.

It is a large and fierce bird, of the ſize of the common turkey; its beak is yellow, and covered with a yellow membrane at its baſe; it has large hazel-coloured eyes; its feet are yellow, and its claws extremely ſtrong and ſharp; the head is white, and there are no feathers, but ſome fine hairs between the eyes and noſtrils; the upper part of the neck is of a reddiſh-brown, and the rump black; all the body beſides this is of an obſcure ruſt colour, and its wings are partly black, partly grey; its tail is long, and the upper half of it is white, and the reſt black. It is from this white part that it has its name *albicilla*. The male is of a darker colour than the female. This bird inhabits Scotland and the Orkneys, and feeds on fiſh as well as on land animals.

Authors who have written on this ſubject ſeem not at all agreed to call the ſame bird by this name. The pygargus of Aldrovand ſeems different from this, and the pygargus prior of Bellonius ſeems no other than the male of that kind of hawk, called in Engliſh the *hen-harrier*.

Mr. Willughby imagines his firſt pygargus, p. 61, to be only a variety of the white-tailed eagle, having the ſame

characteriſtic mark, and differing only in the pale colour of the head.

Pygargus *Accipiter*, a name by which many authors have called the fubbuteo, a bird of the hawk kind; the male of which is called in Engliſh the hen-harrier, and the female ſuppoſed by ſome to be the ring-tail. See Falco.

PYGELA, in *Ancient Geography*, a town of Aſia Minor, in Ionia, where was a temple of Venus Munychian, according to Strabo and Steph. Byz.

PYGME, πυγμη, the length, or extent, between the elbow, and extremity of the hand, the fiſt being ſhut; called alſo a cubit.

PYGMY, Pygmæus, πυγμαιος, formed of πυγμη, *cubit*, a dwarf, or perſon of exceeding ſmall ſtature, not exceeding a cubit in height. See Dwarf.

The appellation is given among the ancients to a fabulous nation, ſaid to have inhabited Thrace; who generated and brought forth young at five years of age, and were old at eight; famous for the bloody war they waged with the cranes.

Pygmy *Ape*, in *Zoology*. See Simia *Sylvanus*.

PYHA, in *Geography*, a large lake of Sweden, in the province of Savolax, N.E. of lake Saima, and communicating with it.—Alſo, a river of Sweden, which runs into the gulf of Bothnia, at Braheſtad.

PYHAJARVI, a town of Sweden, in the province of Nyland; 34 miles N.W. of Helſingfors.

PYHAJOCKI, a town of Sweden, in Eaſt Bothnia, near the ſea-coaſt; 10 miles S.S.W. of Braheſtad.

PYHAMAA, a ſmall iſland in the gulf of Bothnia, on a peninſula of the coaſt of Finland. N. lat. 69° 59′. E. long. 21° 12′.

PYKEHAUS, a town of Bengal; 52 miles S.E. of Pucculoe.

PYKER, or Pycar, in our *Writers*, a ſmall ſhip or herring boat.

PYLA, in *Geography*, a town of the duchy of Warſaw; 48 miles N. of Poſen.—Alſo, a river of England, in Monmouthſhire, which runs into the Olwy; 2 miles N.E. of Uſk.

PYLADES, in *Biography*. See Batihyllus, Hylas, Mime, and Pantomime.

PYLÆ Persides, in *Ancient Geography*, a famous ſtrait in Aſia, between the Perſide and Suſiana, according to Diodorus Sieulus. This ſtrait is named Portæ Perſicæ by Strabo, and Pylæ Suſiades by Arrian.

Pylæ *Sarmaticæ*. Sarmatia is bounded on the S. by mount Caueaſus, which ſeparates it from the neighbouring countries. Ptolemy ſpeaks of two ſtraits or paſſages in this famous mountain; one called Portæ Caucaſiæ, which affords entrance into Siberia; the other named Pylæ Albaniæ, and gives entrance into Albania.

PYLÆA, a town of Macedonia, in Trachinia, ſituated at the foot of mount Oëta, according to Philoſtratus. This gave name to the Pylaic gulf, mentioned by Strabo.

Pylæa, πυλαια, in *Antiquity*, a name given to the aſſembly of the Amphictyons, as well when they met at Delphi as at Thermopylæ. The concourſe of people at theſe aſſemblies was ſo great, that the term pylæa came to be uſed for any very numerous aſſembly, or crowd of people. Mem. Acad. Inſcr. vol. iv. p. 287. 290.

PYLAGORÆ, Πυλαγορες, a name given to the Amphictyons, becauſe they aſſembled at Thermopylæ, or Pylæ.

PYLAU, in *Geography*, a town of Pruſſia; 18 miles S. of Konigſberg.

PYLE, Thomas, in *Biography*, was born at Stodey, near Holt, in Norfolk, in the year 1674. He received his academical education at Caius college, Cambridge, where he took his degrees, and beeame an excellent ſcholar. When inducted to the chureh, he diſcharged all the duties attaching to his ſituation as curate with the moſt conſcientious integrity. His great aim was to amend and improve his hearers, and his diſcourſes and urgent manner gained him the attention for whieh he was anxious. In early life he took part in the Bangorian controverſy, and acquitted himſelf ſo much to the ſatisfaction of biſhop Hoadly, that his lordſhip preſented him with a prebend, and procured for him a reſidentiaryſhip in the cathedral church of Saliſbury, and likewiſe made his two ſons prebendaries of Wincheſter. He died in his 84th year. He was greatly admired as a preacher, and no leſs ſo as a faithful friend, an agreeable companion, a man of the moſt liberal ſentiments, and ſo free from all pride and conceit of his own abilities, that he was apt to pay a deference to the opinions of many perſons much inferior to himſelf. Archbiſhop Herring ſpeaks of him as a worthy man, but who had not at all times the proper government of his own temper. He was author of ſeveral works: as "A Paraphraſe, with Notes, on the Acts of the Apoſtles, and Epiſtles," being a ſupplement to Dr. Clarke's Paraphraſe on the Four Goſpels: "The Seripture Preſervative againſt Popery; being a Paraphraſe, with Notes, on the Revelation of St. John." He publiſhed alſo, between the years 1715 and 1725, "A Paraphraſe, with ſhort and uſeful Notes, on the Books of the Old Teſtament." In 1773, his friends publiſhed two vols. of poſthumous ſermons, to which, in 1783, a third was added. Though theſe ſermons want the care and poliſh of finiſhed compoſitions, they are reckoned intereſting and highly uſeful family diſcourſes.

PYLE-RUDBAR, in *Geography*, a town of Perſia, in the province of Ghilan; 32 miles S. of Reſhd.

PYLING *the Ground for Foundations*. See Foundation, and Pallification.

PYLORIC *Artery* and *Vein*, in *Anatomy*, are blood veſſels belonging to the ſtomach. See Stomach.

PYLORUS, the circular ring by which the ſtomach communicates with the ſmall inteſtine. See Stomach.

PYLSTART, in *Geography*, an iſland in the South Pacific oeean, about ſix miles in circumference, diſcovered by Taſman in 1643. It preſents to view two lofty hills, which ſeem ſeparated from each other by a low valley: it is called by Maurelle "La Sola." S. lat. 22° 22′. W. long. 175° 59′.

PYLUS *Meſſeniæ*, now *Navarin*, in *Ancient Geography*, was ſituated on the weſtern coaſt of Meſſenia, over-againſt the iſland of Aſina.

Pylus (*Zouchio*), or *Avarino Veccio*, a town of Meſſenia, upon the ſea-coaſt, S.E. of Platamodes.

Pylus *Ælianus*, a town of Triphylia, N.W. of Onus, upon the Ladon.

PYMATUNING, in *Geography*, a town of America, in Mercer county, Pennſylvania; 23 miles W.S.W. of Fort Franklin. It contains 376 inhabitants.

PYNAKER, Adam, in *Biography*, a landſcape painter, was born at the village of Pynaker, near Delft, in 1621. Whether his real name was that by which he is known or not, is not now to be aſcertained. By an earneſt ſtudy of the art, firſt in his native land, and afterwards at Rome, he acquired very conſiderable ſkill and celebrity. He generally exhibits brilliant effects of ſunſhine, in ſubjects not always happily ſelected, but executed with great freſhneſs, purity, and taſte. In his pictures we frequently ſee ruins of elegant and antique buildings, and figures well adapted to the ſcenery.

ſcenery. In general his pictures are of a ſmall ſize, and are rather ſcarce. He died in 1673, at the age of 52.

PYNANG, in *Botany*, a name by which ſome authors call the faufel, or areca-tree; a kind of palm, from the expreſſed juice of which the drug commonly, but improperly, called Japan-earth is made.

PYNY, in *Geography*, a town of Hindooſtan, in Coimbetore; 18 miles S. of Daraporum.

PYONY WATER. See WATER.

PYRACANTHA, in *Botany*, a name given by ſome authors to the lycium, or box-thorn.

PYRÆIA, or PYRETHEA, among the *Eaſtern Nations of Antiquity*, were great incloſures uncovered, and dedicated to the ſun, in which a perpetual fire was kept up in honour of this luminary, which was worſhipped by moſt of them. See CHAMANIM.

PYRALIS, the *fire-fly*, a name given by authors to a ſuppoſed inſect, which they ſay is produced in the violent fires of the glaſs and metal furnaces. Plin. lib. ii. c. xxxvi. See LAMPYRIS.

PYRAMID, πυραμις, in *Geometry*, a ſolid ſtanding on a ſquare, triangular, or polygonal baſis, and terminating at top in a point; or a body whoſe baſe is a regular rectilinear figure, and whoſe ſides are plain triangles; their ſeveral vertices meeting together in one point.

Euclid defines it a ſolid figure, conſiſting of ſeveral triangles whoſe baſes are all in the ſame plane, and have one common vertex.

Wolfius defines it a ſolid, bounded by as many triangles, A D C, D C B, and A D B, terminating in one point D, as the baſe A B C has ſides. *Plate* XI. *Geometry*, *fig.* 18.

The pyramid is ſaid to be *triangular*, *quadrangular*, *quinquangular*, &c. according as the baſe is triangular, quadrangular, &c. The pyramid may be called a ſquare, triangular, &c. cone; or the cone a round pyramid.

PYRAMID, *Properties of the.* 1. All pyramids and cones ſtanding on the ſame baſe, and having the ſame altitude, are demonſtrated to be equal.

2. A triangular pyramid is the third part of a priſm, ſtanding on the ſame baſe, and of the ſame altitude.

3. Hence, ſince every multangular may be divided into triangulars, every pyramid is the third part of a priſm, ſtanding on the ſame baſis, and of the ſame altitude.

4. If a pyramid be cut by a plane, *a b c*, parallel to its baſe, A B C, the former plane, or baſe, will be ſimilar to the latter.

5. All pyramids, priſms, cylinders, &c. are in a ratio compounded of their baſes and altitudes: the baſes, therefore, being equal, they are in proportion to their altitudes; and the altitudes being equal, they are in proportion to their baſes.

6. Similar pyramids, priſms, cylinders, cones, &c. are in a triplicate ratio of their homologous ſides.

7. Equal pyramids, &c. reciprocate their baſes and altitudes; *i. e.* the altitude of the one is to that of the other, as the baſe of this to the baſe of that.

8. A ſphere is equal to a pyramid, whoſe baſe is equal to the ſurface, and its height to the radius of the ſphere.

PYRAMID, *to meaſure the ſurface and ſolidity of a.* Find the ſolidity of a priſm that has the ſame baſe and height with the given pyramid. And divide this by three; the quotient will be the ſolidity of the pyramid. Or, multiply the baſe by the perpendicular height; and one-third of the product will be the content.

Suppoſe, *v. gr.* the ſolidity of the priſm be found 67010328, the ſolidity of the pyramid will be thus found 22336776.

The ſurface of a pyramid is had, by finding the areas, both of a baſe, A B C, and of the lateral triangles, A C D, C B D, D B A. (See TRIANGLES.) The ſum of theſe is the area of the pyramid.

The external ſurface of a right pyramid, ſtanding on a regular polygonal baſe, is equal to the altitude of one of the triangles which compoſe it, multiplied by the whole circumference of the baſe of the pyramid.

PYRAMID *on a plane, to deſcribe a.* 1. Draw the baſe, *v. gr.* the triangle A B C (if the pyramid required be triangular); ſo as that the ſide A B, ſuppoſed to be turned behind, be not expreſſed. 2. On A C and C B, conſtruct the triangles A D C and C D B, meeting in any aſſumed or determined point, *v. gr.* D; and draw A D, C D, B D; then will A D B C be a triangular pyramid.

PYRAMID *of paſteboard*, &c. *to conſtruct a.* Suppoſe, *v. gr.* a triangular pyramid required. 1. With the radius A B deſcribe an arc B E (*fig.* 19.); and to this arc apply three equal chords, B C, C D, and D E. 2. On C D conſtruct an equilateral triangle, D F C, and draw the right lines A D and A C. This paſteboard, &c. being cut off by the contour of the figure, what remains within will turn up into a pyramid.

PYRAMID, *Truncated.* See TRUNCATED.

PYRAMID, *Fruſtum of a.* See FRUSTUM.

PYRAMID, in *Architecture*, denotes a ſolid, maſſive edifice; which, from a ſquare, triangular, or other baſe, riſes diminiſhing to a point, or vertex.

Some derive the word from πυρος, *wheat*, and αμαω, *colligo*; pretending that the firſt pyramids were built by the patriarch Joſeph, for granaries. But Villalpandus, with much better reaſon, derives the word from πυρ, *fire*; becauſe of their ending in a point like flame.

Wilkins, converſant with the Coptic tongue, ſuggeſts (Diſſ. de Ling. Copt.) another derivation from that language, in which *pouro* ſignifies a king, and *miſi*, a race or generation; and he ſays, the pyramids were thus called, becauſe they were erected to preſerve the memories of the Egyptian kings and their families; and that thoſe who deſcended from them had recourſe to theſe pillars in order to prove their pedigree.

When they are very narrow at bottom, *i. e.* their baſe very ſmall, they are called *obeliſks*, and *needles*.

Pyramids are ſometimes erected to preſerve the memory of ſingular events, and, ſometimes, to tranſmit to poſterity the glory and magnificence of princes; but, as they are the ſymbols of immortality, they are more commonly uſed as funeral monuments

Such is that of Ceſtius at Rome, the mauſoleum of this diſtinguiſhed Roman, who was one of the ſeven officers called *Epulones*, and is ſaid to have lived under Auguſtus, repaired in 1673, by Alexander VII. and thoſe other celebrated ones of Egypt, as famous for their ſize as their antiquity; and reckoned by the ancients among the wonders of the world.

Theſe laſt are all ſquare in their baſes; and it is a thing that has been frequently propoſed, to eſtabliſh a fixed meaſure from them, to be thereby tranſmitted to poſterity. See their deſcriptions, meaſures, &c. in Thevenot, Pietro della Valle, Greaves, Pococke, Shaw, Perry, Maillet, Savary, &c. The pyramids of Egypt, comprehending the great and ſmall, are very numerous; of theſe there are about twenty of the largeſt ſize. The moſt remarkable are the three pyramids of Memphis, or, as they are now called, of Gheiſa, Geeza, or Gizé. The dimenſions of the greateſt of theſe have been differently ſtated both by ancient and

modern writers. Herodotus (lib. ii.) makes the base of it to be 800 Grecian feet long; Diodorus (lib. i.) 700; Strabo (lib. xvii.) less than 600; and Pliny (lib. xxxvi. c. 12.) 883 feet. Among the moderns, Sandys found it to be 300 paces; Bellonius 324; Greaves 693 English feet; Le Bruyn 704 French feet, or 750 English feet; Prosper Alpinus 750 French feet; Thevenot 682; Niebuhr 710; Chazelles 704.80 English feet. In order to reconcile these differences, Dr. Shaw observes, that none of the sides of this pyramid are exactly upon a level; so that it is difficult to find a true horizontal base; besides, it is impossible to say how much the drifts of sand, to which it is exposed, may have been accumulated above the foundation of it; and, therefore, all calculations depending upon the time and circumstances of the situation, when they were made, must be exceedingly precarious. The perpendicular altitude of it, according to Greaves, is 499 feet; but its oblique height is equal to the breadth of the base, or 693 feet. The whole area of the base contains 480,249 square feet, or $11\frac{1089}{4356}$ English acres. The height, according to Herodotus, is 800 French feet; according to Strabo 625; according to Diodorus Siculus 600 and a fraction; as stated by Le Bruyn 616; by Prosper Alpinus 625; by Thevenot 520; by Niebuhr 440. The ascent to the top of the pyramid is by steps, the lowermost being near four feet high and three broad; the second of the same dimensions, but retiring inward from the first near three feet; and in the same manner the third row is placed upon the second, and the rest in the same order to the top, which terminates in a small flat or square; and they are so disposed, that a line stretched from the bottom to the top would touch the angle of every step. These steps are called by Herodotus little altars, on account of their form; and their number has been variously assigned; Greaves states them at 207; Maillet at 208; Pococke at 212; Belon at 250; Thevenot at 208, and Chazelles at 498.222 English feet. For a description of the inside of this pyramid, we must refer to Greaves, Savary, &c. *ubi infra*.

This pyramid, being that already described, is situated on a rocky hill, in the sandy desert of Libya, about a quarter of a mile from the plains of Egypt, above which the rock rises 100 feet or more, with a gentle and easy ascent. Upon this advantageous elevation, and solid basis, the pyramid is erected: the height of the situation adding to the beauty of the work, and the solidity of the work affording it a stable support.

We may here observe, that the sides of this pyramid stand exactly facing the four quarters of the world, and consequently mark the true meridian of the place: which precise position could not have been well owing to chance, but was, probably, the effect of design and art; and this is said to be confirmed by the position of the tomb itself, which lies within it. We may hence infer that the Egyptians had made an early progress in astronomy.

The second pyramid stands at about a bow-shot from the first, towards the south of this. Herodotus says, after having measured both, that it falls short of the other in magnitude; that it has no subterraneous chambers, and that the Nile is not conveyed into it by a channel, as into the former, but that it is of an equal altitude. Diodorus informs us, that it resembles the first in its architecture, but is inferior to it in magnitude; each side of the base containing a stadium, or 600 Grecian feet in length, so that by his computation each side is less than that of the former in length by 100 feet. Pliny makes the difference to be greater by 46 feet. Thevenot makes it but 631 feet square. Strabo supposes these pyramids to be equal, and Greaves assures us, that the bases of both are alike, and that the height is not inferior to that of the first. This pyramid has no entrance like the other, and is built of white stones, not near so large as those of the first: the sides do not rise with gradations, but are smooth and equal, and the whole fabric, except on the south side, is quite entire. On the N. and W. sides of this second pyramid are two very stately and elaborate pieces of architecture, about 30 feet in depth, and about 1400 in length, cut out of the rock in a perpendicular direction and squared by a chissel; supposed to be designed for the lodgings of the Egyptian priests.

The third pyramid stands at about the distance of a furlong from the second, on an advantageous rising of the rock, so that at a distance it appears equal to the former, though it be much less and lower. Herodotus says that it is 300 feet on every side, and to the middle, built of Ethiopic marble. Diodorus gives the same dimensions of its base, and adds that the walls were raised fifteen stories with black stone, like Thebaic marble, and the rest finished with such materials as the other pyramids are built with; that this piece of work, though it be exceeded by the two former in magnitude, yet far excels them in respect to the structure, art, and magnificence of the marble; and that on the side towards the north, the name of Myeerinus, the founder, is engraved; but this inscription has been defaced by time. Pliny writes to the same effect, except that he makes this pyramid 363 feet between the angles.

Dr. Shaw apprehends, that neither of these pyramids was ever finished, supposing that the steps already mentioned should have been filled up with prismatical stones, so that each side of the pyramid might be smooth and level, like that of Cestius at Rome.

But from the description of Maillet and Savary, the first pyramid appears to have been covered with a coating of marble, and thus finished on the outside, but closed; and that it has been since forcibly opened, and the stones which shut the passage and were of an enormous size have been removed. This passage was composed of marble, and the stones which form its four sides are of the finest white and hardest marble. For other particulars we refer to Greaves, Maillet, and Savary.

The ancients inform us, that the stones of the pyramids were brought from the mountains of Arabia, and Herodotus (lib. ii. c. 124.) has described the manner in which they were conveyed; but Dr. Shaw imagines, that they were taken from the spot where they were employed; and he observes, that the greatest of them, especially, is not an entire heap of hewn stones, because that portion of it, which lies below the horizontal section of the entrance, may probably be no more than an incrustation of the natural rock on which it is founded. Dr. Bryant conjectures, that, like the sphynx, which stands directly in the front of the second pyramid, they were immense rocks which stood upon the brow of the mountain; that the Egyptians cased them over with large stones, and brought them by these means to a degree of symmetry and proportion. At the same time they filled up the unnecessary interstices with rubbish and mortar, and made chambers and apartments, as the intervals in the rock allowed, being obliged to humour the indirect turns and openings in the original mass to execute what they proposed. This he infers from the narrowness and unnecessary sloping of the passages, which are often very close and steep, and also from the fewness of the rooms in a work of so immense a structure. That the pyramids were built upon a rock in the place where they

now ſtand, was ſuggeſted by Mr. Hooke. See Birch's Hiſt. Royal Society, vol. iv. p. 245.

It is very ſurpriſing that the pyramids, which have been reckoned among the wonders of the world, ſhould not have preſerved a more certain era, and tradition of the names of their founders. Pliny reckons a number of authors who have wrote concerning them; and all, he informs us, diſagree in their accounts of thoſe who built them. Some modern writers maintain, that they were erected by the Iſraelites, under the tyranny of the Pharoahs, and allege to this purpoſe the teſtimony of Joſephus, Antiq. lib. i. cap. 5.

According to the relations of Herodotus (lib. ii.), and Diodorus (lib. i.), the firſt pyramid was erected by Cheops, or Chemmis, a king of Egypt, who is ſaid to have employed three hundred and ſixty thouſand men for twenty years in the ſtructure. Cephren, brother and ſucceſſor to the former king, is ſaid to be the founder of the ſecond pyramid; and the third is ſaid to have been built by Mycerinus, the ſon of Chemmis, according to Diodorus, but according to Herodotus, of Cheops. However, Herodotus ſays, that ſome aſcribed the laſt to Rhodope, a courtezan, and the other two to the ſhepherd Philittion. The learned Greaves places the three kings who erected theſe pyramids in the twentieth dynaſty; Cheops having begun his reign in the year 3448 of the Julian period, 490 years before the firſt olympiad, and 1266 years before the Chriſtian era. He reigned fifty years, ſays Herodotus, and built this pyramid, as Diodorus obſerves, 1000 years before his time, or in the 180th olympiad; whereas, he might have ſaid 1207. Cephren, the builder of the ſecond, reigned fifty-ſix years; and Mycerinus, the builder of the third, ſeven years.

Dr. Bryant gives a different account of the origin of theſe pyramids: he aſcribes the ſtructure of them to the Cuthites (ſee DISPERSION *of Mankind*), or Arabian ſhepherds, who built Heliopolis, and who were the giants and Titans of the firſt ages. Theſe ſons of Chus, according to this writer, ſeem to have come into Egypt immediately after their diſperſion from Babel.

Many have conſidered theſe ancient ſtructures with contempt, as being vaſt piles without any great ſymmetry, and have thought the labour idle, and the expence unneceſſary. Thus Pliny (lib. xxxvi. cap. 12.) calls them *regum pecuniæ otioſa ac ſtulta oſtentatio, &c.* built for oſtentation, to keep an idle people employed, and to prevent commotion and rebellion. Ariſtotle (Polit. lib. iii.) calls them the work of tyranny.

The general opinion with regard to their intention and uſe is, that they were ſepulchres and monuments of the dead, particularly of kings. This is expreſsly affirmed by Diodorus (lib. i.), and Strabo (lib. xvii.), and the opinion is confirmed by the writings of the Arabians. And the reaſon, ſays Greaves, of their erecting theſe magnificent ſtructures is founded in the theology of the Egyptians, who, as Servius ſhews in his comment upon Virgil (Æneid, lib. iii.), where he deſcribes the funeral of Polydorus—*Animamque ſepulchro condimus*—believed, that as long as the body endured, ſo long the ſoul continued with it; and this was alſo the opinion of the Stoics. Upon this principle, that the bodies might neither be reduced to duſt by putrefaction, nor converted into aſhes by fire, they embalmed them, and laid them up in theſe ſtately repoſitories, where they might continue free from the injury of time and of men. The reaſon of their building their ſepulchres in the form of pyramids, was either from a notion that this was the moſt permanent form of ſtructure, or becauſe they hereby intended to repreſent ſome of their gods: particularly, as Greaves conjectures, Oſiris, or the ſun with many rays; for, under this form, the ſtatues of the gods were frequently exhibited, and the gods themſelves worſhipped.

Among the Egyptians, the pyramid is ſaid to have been a ſymbol of human life; the beginning of which is repreſented by the baſe, and the end by the apex; on which account it was that they uſed to erect them on ſepulchres. Herodotus.

Some, however, have objected to this deſign of the Egyptian pyramids, and are of opinion that they were originally intended for ſome nobler purpoſe. If Cheops, or any other perſon, ſays Dr. Shaw, who was the founder of the great pyramid, intended it only for his ſepulchre, what occaſion was there for ſuch a narrow crooked entrance into it; for the well, as it is called, at the end of the entrance; for the lower chamber, with a large nitch or hole in the eaſtern wall of it; for the long narrow cavities in the walls of the upper room; or, for the two antichambers and the lofty gallery, with benches on each ſide that introduce us into it.

As the whole of the Egyptian theology was clothed in myſterious emblems and figures, it ſeems reaſonable to ſuppoſe, ſays this writer, that all theſe turnings, apartments, and ſecrets in architecture were deſigned for ſome purpoſe of religion, and that the Deity, which was typified in the outward form of this pile, was to be worſhipped within. The ſquare cheſt of granite marble, which is placed in the upper chamber of the great pyramid, may be ſuppoſed to have been rather intended for ſome religious uſe than for the coffin of Cheops. It might have ſerved for one of their ſacred cheſts, in which either the images of their deities, or their ſacred veſtments or utenſils were kept, or it might have been a *faviſſa* or ciſtern, ſuch as contained the holy water uſed in their ceremonies. Its length favours the opinion of its having been deſigned for a coffin, but its height and breadth far exceed the dimenſions that were adhered to on ſuch occaſions; the Egyptian ſtone coffins were made of a different form, and inſcribed with hieroglyphics. Nor is this cheſt placed according to the manner in which the Egyptians depoſit their dead; for their mummies always ſtand upright, whereas this cheſt lieth flat upon the floor. If, therefore, this cheſt was not intended for a coffin, it is inferred that the pyramid itſelf could not have taken the name of a ſepulchre from it. Cheops, indeed, and others might have been buried within the precinct of this or any other of the pyramids, and this was no more than was practiſed in other temples, and therefore could not deſtroy the principal uſe and deſign for which they were erected. Upon the whole, Dr. Shaw concludes, from the outward figure of theſe piles, the ſtructure and contrivance of the ſeveral apartments in the inſide of the greateſt, together with the ample proviſion that was made on each ſide of it for the reception, as may be ſuppoſed, of the prieſts, that the Egyptians intended the latter for one of the places, as all of them were to be the objects, at leaſt, of their worſhip and devotion.

Dr. Bryant has lately maintained, with conſiderable force of argument, this opinion, that the pyramids were deſigned for high altars and temples, and were conſtructed in honour of the Deity. If the chief pyramid were deſigned for a place of burial, what occaſion, ſays he, was there for a well, and for paſſages of communication, which led to other buildings? The apartments near the pyramids he ſuppoſes to be deſigned for the reception of prieſts, and to be appendages not to a tomb, but to a temple of the Deity.

The ſtone coffin, he apprehends, was a trough or reſervoir for water, which, by means of the well, they drew from the Nile. The prieſts of Egypt delighted in obſcurity, and they probably came by the ſubterraneous paſſages of the building to the dark chambers within; where they performed their luſtrations, and other nocturnal rites. Many, he adds, of the ancient temples in this country were caverns in the rock, enlarged by art, and cut out into numberleſs dreary apartments; for no nation upon the earth was ſo addicted to gloom and melancholy as the Egyptians. From the top of the pyramids they obſerved the heavens, and marked the conſtellations; and upon the ſame eminence it is probable that they offered up vows and oblations. See on this article Greaves's Works, vol. i. p. 1, &c. Shaw's Travels, fol. p. 413, &c. Pococke's Deſcript. of the Eaſt, vol. i. p. 41, &c. Perry's View of the Levant, p. 413, &c. Bryant's Anal. of Ancient Myth. vol. iii. p. 523, &c. Farmer's Worſhip of Human Spirits, &c. p. 379, &c. Savary's Letters, vol. i.

The tomb of Porſenna, king of Etruria, at Cluſium in Italy, is an ancient monument of ſquare ſtone, each ſide of which is three hundred feet broad, and fifty feet high. Within the ſquare baſe there is an inextricable labyrinth; upon this ſquare there ſtand five pyramids, four in the angles and one in the middle, ſeventy-five feet broad at the bottom, and a hundred and fifty feet high, and terminating in a point; at top they are covered with a braſs circle, from which are ſuſpended bells, which are put in motion by the wind, ſo as that their ſound may be heard at a great diſtance. Upon this circle there are four other pyramids, each a hundred feet high, above which, upon one plane, there are five other pyramids. Such is the account which Pliny gives from Varro, lib. xxxvi. cap. 13.

PYRAMID, *Scenography of a.* See SCENOGRAPHY.

PYRAMID, *Optic.* See OPTIC *Pyramid.*

PYRAMIDAL FOUNTAIN. See FOUNTAIN.

PYRAMIDAL *Mirrors.* See MIRROR.

PYRAMIDAL *Numbers* are the ſums of polygonal numbers, collected after the ſame manner as the polygonal numbers themſelves are extracted from arithmetical progreſſion. See NUMBERS.

Theſe are particularly called *firſt* pyramidals. The ſums of firſt pyramidals are called *ſecond* pyramidals. And the ſums of thoſe *third* pyramidals; and ſo on, *ad infinitum.* Particularly, thoſe ariſing from triangular numbers are called *prime triangular* pyramidals; thoſe ariſing from pentagonal numbers are called *prime pentagonal* pyramidals, &c. The numbers 1, 4, 10, 20, 35, &c. formed by the addition of the triangular numbers 1, 3, 6, 10, &c. are uſually called by the ſimple name of pyramidals; and the general formula for finding them is $n \times \frac{n-1}{2} \times \frac{n-2}{3}$; *i. e.* the fourth pyramidal may be found by ſubſtituting 4 for n; the fifth, by ſubſtituting 5 for n, &c.

PYRAMIDALIA CORPORA, in *Anatomy*, two prominences in the medulla oblongata. See BRAIN, and NERVOUS *Syſtem.*

PYRAMIDALIS ABDOMINIS, one of the abdominal muſcles. See OBLIQUUS.

PYRAMIDALIS *Naſi*, a name given by ſome anatomiſts to that portion of muſcular fibres which deſcends from the fronto-occipitalis along the ſide of the noſe. See EPICRANIUS.

PYRAMIDOID, called alſo *parabolic ſpindle*, a ſolid figure, formed by the revolution of a ſemiparabola round one of its ordinates.

According to the method of indiviſibles, this may be conceived to conſiſt of an infinite ſeries of circles, whoſe diameters are all parallel to the axis of the revolving parabola.

The parabolic ſpindle is equal to $\frac{8}{15}$ths of its circumſcribing cylinder. See SPINDLE.

PYRAMIDOID, *Parabolic.* See PARABOLIC *Pyramidoid.*

PYRAMIDS, in *Geography*, rocks in the Eaſt Indian ſea, near the E. coaſt of the iſland of Myſol. S. lat. 1° 55′. E. long. 130° 59′.

PYRAMUS, GIHON, in *Ancient Geography*, a river of Aſia, riſing in the country of Cataonia, where it begins to be navigable, and traverſing mount Taurus through the rocks, it enters the plain of Cilicia, paſſes by the foot of the mountain of Anazarbus, and leaving it to the right, throws itſelf into Mopſuete, and at length loſes itſelf in the Mediterranean, at the point where was formerly ſituated the town of Megarſus.

PYRBAUM, in *Geography*, a town of Bavaria, and capital of a lordſhip united to Salzburg; 13 miles S.E. of Nuremberg.

PYRENÆUM PROMONTORIUM, *Cape de Creus*, in *Ancient Geography*, a promontory of Hiſpania Citerior; which terminates the Pyrenées eaſtwards, and projects into the ſea.

PYRENÆUS SALTUS, a name given by Cornelius Nepos and Livy to that part of the Pyrenæan mountains which Hannibal traverſed in his way to Italy, paſſing from Spain to Gaul.

PYRENE, a town of Gallia Celtica, near the place where the Danube riſes, according to Herodotus.

PYRENE, in *Natural Hiſtory*, the name of a ſtone found always in the ſhape of the ſtone of an olive. It is of the lapis Judaicus kind, being no other than the petrified ſpine of ſome ſpecies of echinites.

PYRENE'ES, in *Geography*, a chain of mountains, celebrated ſince the time of Herodotus, forming the boundaries between France and Spain, and extending from the Mediterranean to the Atlantic, about 200 miles in length, and in its greateſt breadth 100 miles. Its various branches are diſtinguiſhed by different names, and may be conſidered as belonging either to France or Spain. The higheſt ſummits of theſe mountains, which are in the centre of the chain, have preſented to the reſearch of the naturaliſt not only calcareous appearances, but even ſhells. The higheſt elevation of the Pyrenées is *Mont* PERDU, for an account of which, we refer to that article. The Canigou was formerly reckoned the higheſt ſummit, though it does not exceed 8544 Engliſh feet. Other noted heights are Tuccarroy, Marboré, the pic de Midi, 9300 feet high, the pic de los Reyes, 7620 feet high, the pic d'Oſſano 11,700 feet in height, the pic d'Arni, the Niege Veille, the Vigne Mali, La Breche de Roland, &c. At a diſtance the Pyrenæan chain appears like a ſhaggy ridge, preſenting the ſegment of a circle fronting France, and deſcending at each extremity till it diſappears in the ocean and Mediterranean. Thus, at St. Jean de Luz, only high hills appear, and in like manner on the eaſt beyond the ſummit Canigou, the elevations gradually diminiſh. The higheſt ſummits are covered with perpetual ſnow. Blocks of granite are interſperſed with vertical bands, argillaceous and calcareous, the latter primitive or ſecondary, and ſupplying the marbles of Campan and Antin, of beautiful red ſpotted with white, though the general mountain maſs be grey. To the S. and W. the Pyrenées preſent nothing but dreadful ſterility, but on the N. and E. the deſcent is more gradual, and affords frequent woods and paſtures. Beſides the dreadful fall of

rocks, undermined by the waters, they are expoſed to Lavanges, or the impetuous deſcent of vaſt maſſes of ſnow, called Avalanches in Switzerland, and have their glaciers and other terrific features of the Alps.

The opinion of Ramond, that the ſummit of mont Perdu (which ſee) muſt have been covered by the ſea, is confirmed by Lapeyrouſe, (Journ. des Mines, N° 46.) A ſingular feature of the Pyrenées conſiſts of *houles*, as they are called, or walls diſpoſed in a circular form. Near the ſummit of mont Perdu is a conſiderable lake, more than 9000 feet above the level of the ſea, which throws its waters to the E. into the Spaniſh valley of Beouſſa; and which the travellers allége as a proof that mont Perdu really belongs to Spain, and that Tuccarroy forms the boundary. Lapeyrouſe ſuggeſts it as probable that the ſole acceſs to the ſummit of mont Perdu will be found on the ſide of Spain; there being three ſummits called by the Spaniards "Las Tres Sorrellas," or the Three Siſters; the higheſt being to the N., and the loweſt on the S., but ſeparated by large glaciers. Hence he infers the exiſtence of chains of mountains, in which bands of granite, porphyry, trap, hornblende, and petroſilex, alternate vertically with primitive limeſtone, and are ſo intermingled as to prove a common origin. But in the Pyrenées theſe bands are ſurmounted by ſecondary lime-ſtone, replete with marine ſpoils, and containing even ſkeletons of animals, ſo that he concludes that the higheſt mountains of the chain muſt have yielded to the fury of the ocean, and that the ſecondary parts only now exiſt. Mr. Townſend (Spain, i. 89.) obſerves, that the lime-ſtone and ſchiſtus feed the vegetation on the N. of the Pyrenées, while the S. is barren, and conſiſts of granite; while, in fact, mountains are generally barren and precipitous on the S. and W., becauſe the moſt violent rains and tempeſts come from thoſe regions. Pinkerton's Geog. vol. i.

The paſſages over theſe mountains from one country to another are five; the three principal of which are from St. Sebaſtian to St. Jean de Luz; from Pamplona to St. Jean de Luz; and from Jonqueira to Perpignan. Theſe mountains afford quantities of timber for ſhipping, which are conveyed, by means of the Ebro and other ſtreams to the ſea, with abundance of pitch and tar. The Pyrenées give name to three of the French departments.

Pyrenées, *Eaſtern*, one of the nine departments of the ſouthern region of France, in N. lat. 42° 40′, formerly Rouſſillon, bounded on the N. by the departments of the Arriere and the Aude, on the E. by the Mediterranean, on the S. and W. by Spain; about 58 miles from E. to W., and from 18 to 25 from N. to S., or 28 Fr. leagues in length, and 15 in breadth, containing 4337½ kiliometres or 212 ſquare leagues, and 117,764 inhabitants; it is divided into 3 diſtricts, 17 cantons, and 249 communes. The three diſtricts are Perpignan, including 51,961 inhabitants, Ceret, 24,750, and Prades, 41,053. According to Haſſenfratz, the number of circles is 3, of cantons 25, and of inhabitants 114,158. The contributions in the 11th year of the French era amounted to 1,010,520 fr., and the expences for adminiſtration, education, &c. to 181,961 fr. 85 cents. The capital is Perpignan. This department is fertile in corn, wine, oil, flax, hemp, fruits, and paſtures. On the hills there is little wood, but variety of medicinal plants and herbs. There are ſeveral lofty mountains on the S. and W. boundaries, as Maſſane, Canigou, &c.

Pyrenées, *Lower*, a department of France, in the S.W., or Garonne region, compoſed of Bearn, Navarre, Baſque-Français, with a part of Chaloſſa and of Landes, in N. lat. 43° 10′, and bounded on the N. by the departments of the Landes and Gers, on the E. by the department of the Upper Pyrenées, on the S. by Spain, and on the W. by the ſea; 70 miles in length, and from 15 to 45 in breadth, or 16 Fr. leagues in length and 10 in breadth. It contains 8072½ kiliometres, or 388 ſquare leagues, and 384,030 inhabitants. It is divided into 5 diſtricts, 40 cantons, and 660 communes. The diſtricts or circles are, Pau, including 99,486 inhabitants, Oleron, 69,484, Mauleon, 65,447, Bayonne, 69,486, and Orthés, 80,127. According to Haſſenfratz, its circles are 6, its cantons 44, and the number of its inhabitants 138,339. Its capital is Pau. Its contributions in the 11th year of the French era amounted to 1,523,760 fr. and its expences for adminiſtration, &c. to 290,740 fr. 66 cents. This department, bounded on one ſide by the Pyrenées, and on the other by the ocean, preſents a great variety of ſoil and diverſity of proſpect. The mountains are crowned with woods; the hills are covered with vines; the vallies are rich and populous; the heaths are wild and uncultivated. The plains yield wheat, rye, barley, oats, millet, flax, fruits, and paſtures. It has mines of ſilver, copper, iron, quarries of marble, granite, ſlate, and mineral ſprings.

Pyrenées, *Upper*, a department of France, in the Garonne region, formerly Bigore, in N. lat. 43°, bounded on the N. by the department of the Gers, on the E. by that of the Upper Garonne, on the S. by Spain, and on the W. by the department of Lower Pyrenées; 20 Fr. leagues long and 16 broad, or 53 Engliſh miles in length, and from 25 to 38 in breadth; a ſmall diſtrict towards the N. being ſcarcely more than ſeven miles in breadth. It contains 4937½ kiliometres, or about 235 ſquare leagues, and 206,680 inhabitants. It is divided into 3 diſtricts, 26 cantons, and 501 communes. Its diſtricts or circles are Tarbes, including 87,005 inhabitants, Bagnéres, 78,099, and Argelés, 41,376. According to Haſſenfratz, its circles are 5, and cantons 30, and the number of its inhabitants 188,690. Its capital is Tarbes. Its contributions in the 11th year of the French era amounted to 893,637 fr. and its expences for adminiſtration, &c. to 173,759 fr. 12 cents. The plains in this department yield little wheat, but abundant crops of rye, barley, and millet, excellent wine, flax, and paſtures. The hills produce conſiderable foreſts, with mines of iron and lead, quarries of marble, ſlate, and mineral ſprings.

PYRENOIDES Processus, in *Anatomy*, a proceſs of the ſecond vertebra of the neck; called alſo *odontoides*, and *dentiformis*, or the tooth-like proceſs.

The word πυρηνοειδης, is formed of πυρην, *nucleus*, *kernel*, or *berry*, and ειδος, *figure*.

PYRETHRUM, in *Botany*, an ancient Greek name, adopted by Haller, Gærtner, and the writer of the preſent article, who are followed by Willdenow and Aiton, for the genus in queſtion, on account of its reſemblance to the πυρεθρον of Dioſcorides. The latter is, however, the *Anthemis Pyrethrum* of modern writers, or Pellitory of Spain; owing its Greek appellation to the fiery or pungent flavour of the root; whence alſo it obtained the Latin name of *Salivaria*, becauſe it cauſes ſo remarkable a flow of ſaliva. Our preſent *Pyrethrum* is made up of ſeveral Linnæan ſpecies of *Chryſanthemum* and *Matricaria*, with ſome new ones.—Haller Helvet. v. 1. 40. Sm. Fl. Brit. 900. Willd. Sp. Pl. v. 3. 2150. Ait. Hort. Kew. v. 5. 97. Purſh v. 2. 527. Gærtn. t. 169.—Claſs and order, *Syngeneſia Polygamia-ſuperflua*. Nat. Ord. *Compoſitæ diſcoideæ*, Linn. *Corymbiferæ*, Juſſ.

Gen. Ch. *Common Calyx* hemiſpherical, imbricated; the ſcales cloſe-preſſed, rather acute, membranous at the edges. *Cor.* compound, radiated. Florets of the diſk perfect, numerous,

numerous, tubular, funnel-ſhaped, with five ſpreading ſegments; thoſe of the radius more than 12, female, ligulate, elliptic-oblong, three-toothed. *Stam.* in the perfect florets. Filaments five, capillary, very ſhort; anthers united into a cylinder, hardly ſo long as the corolla. *Piſt.* Germen, in all the florets, obovate; ſtyle thread-ſhaped, longer than the ſtamens; ſtigmas two, divaricated, abrupt. *Peric.* none, the calyx remaining unaltered. *Seeds* nearly alike in all the florets, oblong, quadrangular, each crowned with an erect, membranous, more or leſs lobed border. *Recept.* naked, dotted, convex.

Eſſ. Ch. Receptacle naked. Seeds crowned with a membranous margin. Calyx hemiſpherical, imbricated with ſharpiſh ſcales, bordered with a membrane.

Section 1. *Radius white; rarely reddiſh.*

1. P. *fruteſcens.* Shrubby Feverfew. Willd. n. 1. Ait. n. 1. (Chryſanthemum fruteſcens; Linn. Sp. Pl. 1251. Leucanthemum canarienſe, ſapore pyrethri; Walth. Hort. 31. t. 24. Buphthalmum canarienſe leucanthemum; Pluk. Almag. 73. Phyt. t. 272. f. 6.)—Stem ſhrubby. Leaves fleſhy, pinnatifid, linear, toothed; three-cleft at the extremities.—Native of the Canary iſlands, from whence it was brought very early; flowering in the green-houſe moſt part of the year. The woody *ſtem* is much branched. The *leaves* are crowded about the ends of the branches, and in their fleſhy texture, as well as linear forked figure, reſemble thoſe of a *Crithmum*, or *Artemiſia*. The *flowers* are terminal, ſolitary, on long naked ſtalks, and reſemble a white daiſy.

2. P. *ſimplicifolium.* Simple-leaved Weſt Indian Feverfew. Willd. n. 2. (Matricaria? proſtrata; Swartz Ind. Occ. v. 3. 1366.)—Leaves obovate; toothed at the extremity. Stalks axillary, ſingle-flowered. Branches proſtrate. Gathered by Von Rohr in Curaçao and the neighbouring iſlands. It has never been brought alive to Europe. *Stem* herbaceous, branched, decumbent, round, downy, eſpecially the ends of the branches. *Leaves* alternate, nearly ſeſſile, wedge-ſhaped, obovate, or roundiſh, half an inch long, downy, ribbed, notched or ferrated; moſtly accompanied by two minute leaves at the baſe. *Stalks* oppoſite to the leaves, thickiſh, an inch long, erect, downy, each bearing a yellowiſh-white, nearly globoſe, *flower*, whoſe diſk is entirely yellow. *Seeds* crowned with a quadrangular minute border. *Swartz.*

3. P. *ptarmicifolium.* Gooſe-tongue Feverfew. Willd. n. 3. Ait. n. 2.—Leaves linear, finely ferrated. Flowers corymboſe.—Native of mount Caucaſus. Sir Joſeph Banks ſent it to Kew in 1803. Willdenow deſcribes this as perennial, with the habit of *Achillea Ptarmica*, only the *flowers* are twice as large. The *ſtem* is branched, either erect or decumbent. *Leaves* an inch long, very finely and ſharply ferrated. *Corymbs* terminal, ſimple, the ſtalks ſingle-flowered. Radiant *florets* ovate. *Crown* half the length of the ſeed.

4. P. *ſerotinum.* Creeping-rooted Feverfew. Willd. n. 4. Ait. n. 3. Purſh n. 1. (Chryſanthemum ſerotinum; Linn. Sp. Pl. 1251. Jacq. Obſ. faſc. 4. 8. t. 90. Bellis americana, procerior, ſerotina, ramoſa, flore ampliſſimo; Pluk. Almag. 65. Phyt. t. 17. f. 2.)—Leaves lanceolate; the lower ones ſtrongly ferrated; the upper entire. Branches corymboſe.—Suppoſed to be a native of North America; but Michaux has it not, and Purſh merely ſaw a ſpecimen in Mr. Lambert's herbarium, probably, like that of Linnæus, from a garden. The plant was cultivated by Miller, and is a hardy perennial, flowering in October or later. Its *ſtem* is herbaceous, two or three feet high, much branched, leafy, furrowed and angular. *Leaves* alternate, ſeſſile, two or three inches long, and half an inch wide, entire or ſparingly ferrated in the upper parts of the ſtem, but moſtly furniſhed, in our ſpecimen, with a ſharp tooth on each ſide at the baſe, which we do not find mentioned by authors. The *flowers* are terminal, ſolitary, much like our common *Chryſanthemum Leucanthemum*, but rather ſmaller.

5. P. *uliginoſum.* Bog Feverfew. Willd. n. 5. Waldſt. et Kitaib. Hungar.—"Leaves lanceolate, all deeply ſerrated. Stem erect, branched at the top."—Native of wet ground in Hungary and Spain. Perennial. Very nearly akin to the laſt, but different in having all the *leaves* deeply ſerrated throughout, and the *ſtem* branched at the top only. *Willd.*

6. P. *Halleri.* Hallerian Feverfew. Willd. n. 6. (P. n. 97; Hall. Helvet. v. 1. 41. Leucanthemum alpinum tenuifolium; Barrel. Ic. t. 458. f. 3?)—Stem-leaves lanceolate, deeply toothed; radical ones pinnatifid, on long ſtalks. Stem ſingle-flowered.—Native of the Swiſs alps, in ſtony places. The *roots* are creeping, black, long and ſlender, with very long fibres. *Stems* ſolitary, ſimple, leafy, aſcending, three or four inches high. *Leaves* ſmooth; the lowermoſt ſhort, wedge-ſhaped, deeply pinnatifid, on long ſtalks; the uppermoſt ſeſſile, deeply and ſharply toothed, an inch or more in length. *Flowers* ſolitary, ſtalked, terminal, large; the calyx-ſcales bordered with black; the radiant florets broad and elliptical. The above figure of Barrelier ſeems to accord better with our Swiſs ſpecimens than fig. 2. cited by Haller and his copyiſts, except that the upper leaves in fig. 3. are too narrow.

7. P. *alpinum.* Alpine Feverfew. Willd. n. 7. Ait. n. 4. (Chryſanthemum alpinum; Linn. Sp. Pl. 1253. Leucanthemum alpinum; Cluſ. Hiſt. v. 1. 335.)—Lower leaves wedge-ſhaped, pinnatifid; uppermoſt linear and entire. Stem ſingle-flowered.—Native of the German, Swiſs and Italian alps. The creeping *roots* throw out many ſhort tufted leafy *ſtems*, each bearing one long ſimple *flower-ſtalk*, downy in its upper part, and furniſhed below with one, two, or more, alternate, ſimple, linear, entire floral leaves. The reſt of the *foliage* is ſtalked, pinnatifid, ſomewhat pectinate; the ſegments elliptical, entire, ſmooth, rather fleſhy; each *leaf*, with its flat ſtalk, an inch or more in length. The *flower* is large, much like the laſt.

8. P. *Balſamita.* Coſtmary-leaved Feverfew. Willd. n. 8. Ait. n. 5. (Chryſanthemum Balſamita; Linn. Sp. Pl. 1252. Jacq. Obſ. faſc. 4. 8. t. 89. Leucanthemum orientale, coſti hortenſis folio; Tourn. Cor. 37.)—Leaves ovate-oblong, ferrated, auricled. Flowers corymboſe.—Native of the Levant; rare in our gardens. Mr. Blackburne is ſaid to have cultivated it in his celebrated collection at Orford about 35 years ago. The habit of this ſpecies is ſo much like Common Coſtmary, *Tanacetum Balſamita* of Linnæus, that one cannot help ſuſpecting they are mere varieties of each other. The preſence of a radius, in the plant before us, is known, by the examples of *Bidens* and *Coreopſis*, to be no infallible diſtinction. There is indeed the membranous crown of the *ſeed*, as Willdenow remarks, which makes this a *Pyrethrum*, not a *Chryſanthemum*; but ſuch belongs to *Tanacetum*, and confirms our ſuſpicion, or rather our belief, that the preſent is but a radiated variety of the Coſtmary. The *radius* is about twice the length of the *calyx*, white, not yellow, as Linnæus ſeems to deſcribe it.

9. P. *paluſtre.* Marſh Feverfew. Willd. n. 9. (Leucanthemum orientale, chryſanthemi folio, tanaceti odore; Tourn. Cor. 37.)—"Leaves ſmooth, ſeſſile, lyrato-pinnatifid. Stalks ſingle-flowered, corymboſe."—Native of marſhy places in Armenia. *Tournefort.*—*Stem* erect, furrowed, ſmooth, two feet high. *Leaves* an inch or inch

and

and half long; their ſegments lanceolate, toothed at the outer margin, the lower ones deep, the upper gradually confluent into a large cut terminal lobe, and entire. *Stalks* ſingle-flowered, leafy, alternate, five or ſix at the top of the ſtem, compoſing a *corymbus*. *Flowers* the ſize of *Chryſanthemum Leucanthemum*. *Willd.*

10. P. *pinnatifidum*. Pinnatifid Feverfew. Willd. n. 10. —"Leaves downy, glaucous, nearly ſeſſile, lyrato-pinnatifid, unequally toothed. Flowers corymboſe." — Willdenow deſcribed this from living ſpecimens, but did not know their native country. The *ſtem* is ſaid to be erect, two feet high, branched, furrowed, ſlightly downy. *Leaves* downy on both ſides; pinnate at the baſe; pinnatifid in the middle; cut at the end; their length two or three inches; their ſegments lanceolate, unequally toothed. *Corymbs* ſimple, at the tops of the ſtem and branches. *Flowers* almoſt like the common *P. Parthenium*.

11. P. *macrophyllum*. Large-leaved Feverfew. Willd. n. 11. Ait. n. 6. (Chryſanthemum macrophyllum; Waldſt. et Kitaib. Hung. v. 1. 97. t. 94.)—Leaves hairy, nearly ſeſſile, pinnatifid, toothed, obtuſe. Corymb terminal, compound.—Native of the woods and mountains of Hungary. Sir J. Banks introduced it, in 1803, to the Kew garden, where it is a hardy perennial, flowering in July and Auguſt. This plant reſembles *Achillea macrophylla*, for which ſome botaniſts have miſtaken it, but is much larger. We have ſeen no ſpecimen.

12. P. *roſeum*. Roſe-coloured Feverfew. Ait. n. 7. Willd. Enum. 905. (Chryſanthemum coccineum; Willd. Sp. Pl. v. 3. 2144. Sims in Curt. Mag. t. 1080. Buphthalmum orientale, tanaceti folio ampliore, flore magno coccineo; Tourn. Cor. 37. Buxb. Cent. 2. 25. t. 20.)—Leaves ſmooth, pinnate; leaflets once or twice pinnatifid, ſerrated, acute, ſpreading. Stem erect, ſingle-flowered. Gathered by Tournefort in Iberia. It is found alſo on mount Caucaſus, from whence that diſtinguiſhed cultivator Mr. Loddiges received ſeeds of this elegant ſpecies in 1803. The plant proves perennial and hardy, flowering in Auguſt or September. The *ſtem* is 12 or 18 inches high, more or leſs leafy, bearing one large handſome *flower*, whoſe diſk is yellow, and the radius of a rich roſe colour, or crimſon, on its upper ſide; ſometimes varying to white. The *leaves* are from two to four inches long, ſtalked, rigid, paler beneath, pinnate, variouſly ſerrated, cut or pinnatifid, all the points and ſerratures very acute. Tournefort gathered plenty of this plant, and his original ſpecimens are diſperſed through many collections.

13. P. *corymboſum*. Mountain Feverfew. Willd. n. 12. Ait. n. 8. (Chryſanthemum corymboſum; Jacq. Auſtr. t. 379. Ch. corymbiferum; Linn. Sp. Pl. 1251. Tanacetum non odorum; Ger. Em. 650.)—Leaves pinnate; leaflets lanceolate, pinnatifid, ſharply ſerrated; the upper ones confluent. Flower-ſtalks corymboſe. — Native of mountainous woods in Siberia, and many parts of Germany. Gerarde appears, by the catalogue of his garden, to have cultivated it in 1596. The *root* is perennial, woody, with long fibres. *Stems* erect, two or three feet high. *Leaves* ſomewhat like Tanſy, but without ſcent or taſte, except that after a while, according to Jacquin, they cauſe a heat or pungency in the mouth. The numerous large white *flowers*, each with a bright yellow diſk, form an ample terminal corymb.

14. P. *Parthenium*. Common Feverfew. Sm. Fl. Brit. n. 1. Engl. Bot. t. 1231. Willd. n. 13. Ait. n. 9. (Matricaria Parthenium; Linn. Sp. Pl. 1255. Woodv. Suppl. t. 249. Fl. Dan. t. 674. Matricaria; Ger. Em. 652.)—Leaves pinnate; leaflets oblong, obtuſe, pinnatifid and cut. Stem branched. Flowers corymboſe. Radius about twice the length of the calyx. Seed-crown toothed. —Native of cultivated or waſte ground throughout Europe, ſpringing up abundantly with us in neglected gardens or court-yards, flowering all ſummer long. The *root* appears to be rather biennial than perennial. The whole *herb* is bitter and aromatic, hoary or downy. *Stem* buſhy. *Leaves* ſtalked, flat and dilated. *Flowers* numerous, each about the ſize of a common daiſy, but with a large yelloviſh diſk, and ſhort white radius. Sometimes the latter is wanting; and more frequently the flowers are double, the diſk becoming white and ligulate, like the radius, but each *floret* of a ſmaller proportion. The *receptacle* is flat.

15. P. *partheniſolium*. Narrow Hoary Feverfew. Willd. n. 14.—"Leaves pinnate; leaflets oblong, obtuſe, pinnatifid, toothed. Stem wand-like. Flowers corymboſe. Radius thrice the length of the calyx. Seed-crown entire."—Willdenow deſcribed this from a garden, without knowing whence it came. He ſays it is very like the laſt, but has a taller wand-like *ſtem*, narrower *leaves*, a *diſk* but half ſo large, though the *radius* is larger, and an entire, not toothed, margin to the *ſeed*. A plant, now become a weed in Kew garden, and ſaid to have been imported from China, anſwers preciſely to this deſcription in every point, except that its *ſtem* is ſcarcely leſs buſhy than in *P. Parthenium*. We are perſuaded, nevertheleſs, that it is what Willdenow meant. Its *leaves* are conſpicuouſly hoary, with narrower diviſions than thoſe of the laſt, and the *flowers*, on account of their long and brilliant-white *radius*, are more ſtriking. We have had no opportunity of inveſtigating the crown of the *ſeed*.

16. P. *caucaſicum*. Caucaſian Feverfew. Willd. n. 15. Ait. n. 10.—"Leaves doubly pinnate; leaflets linear-awl-ſhaped. Stem ſingle-flowered."—Native of mount Caucaſus. Sent to Kew in 1804, by the late Mr. G. Don. "*Root* woody, horizontal. *Stem* a ſpan high, ſimple, ſtriated, ſmooth. *Leaves* half an inch long, ſeſſile, doubly pinnate; their leaflets linear-awl-ſhaped, entire. *Flower* ſolitary, the ſize of *P. alpinum*, or rather larger. *Seed-crown* membranous, two-lobed." *Willd.*

17. P. *fuſcatum*. Dingy Feverfew. Willd. n. 16. Sm. Prodr. Fl. Græc. Sibth. n. 2095. (Chryſanthemum fuſcatum; Desfont. Atlant. v. 2. 283. t. 237.) — Leaves downy, pinnate; leaflets with a few deep linear-oblong ſegments. Stem branched from the baſe, diffuſe.—Gathered by Desfontaines in uncultivated fields near Tunis. Sibthorp found it in Greece. The *root* appears to be perennial, bearing many widely-ſpreading or procumbent *ſtems*, a ſpan long, which are leafy, and ſlightly branched. The *leaves* are rather ſucculent. *Flowers* terminal, ſolitary, large, with a blackiſh *calyx*, pale yelloviſh diſk, becoming brown in decay, and broad white elliptical radiant florets. It bloſſoms in winter.

18. P. *inodorum*. Corn Feverfew, or Scentleſs May-weed. Sm. Fl. Brit. n. 2. Engl. Bot. t. 676. Willd. n. 17. Ait. n. 11. (Chryſanthemum inodorum; Linn. Sp. Pl. 1253. Fl. Dan. t. 696.) — Leaves pinnate, in many capillary ſegments. Stem branched, ſpreading. Seed-crown entire. — Found in fields and waſte ground throughout moſt parts of Europe, eſpecially where the ſoil is gravelly, flowering in autumn. *Root* tapering, annual. *Herb* almoſt without any peculiar ſcent, by which it is readily known, in every ſtate of growth, from *Anthemis Cotula*. The *ſtem* is a foot or more in height, widely ſpreading, clothed with pale-green ſmooth *leaves*, whoſe leaflets are deeply and variouſly divided into linear, almoſt capillary, pointed ſegments. More ſimple ſegments are numerouſly

numerouſly crowded about the bottom of each *leaf*, rendering it, in a manner, lyrate, and ſurrounding the ſtem or branch. *Branches* ſomewhat corymboſe, each terminated by a rather large *flower*, with long white rays, and a prominent yellow diſk. The late Mr. Crowe once found in Norfolk a partly double-flowered variety.

19. P. *maritimum*. Sea Feverfew. Sm. Fl. Brit. n. 3. Engl. Bot. t. 979. Willd. n. 18. Ait. n. 12. (Matricaria maritima; Linn. Sp. Pl. 1256. Chamæmelum maritimum perenne humilius, foliis brevibus craſſis obſcurè virentibus; Dill. in Raii Syn. 186. t. 7. f. 1.)—Leaves doubly pinnate; ſegments linear, pointleſs, fleſhy; convex above; keeled beneath. Stem diffuſe. Seed-crown lobed.—Native of the ſea-coaſt in the north of Europe. Found in ſeveral parts of Scotland, as well as on the ſouth coaſt of England, and in Lancaſhire and Durham, flowering in July and Auguſt. The *root* is perennial. *Stems* numerous, proſtrate, ſpreading circularly to the extent of two or three feet. The *leaves* are more fleſhy than in the foregoing; the diſk of the *flower* broader, in proportion to the length of the rays; and the crown of the *ſeed* divided into three or four lobes. The whole herb is ſlightly aromatic, and of a darker more ſhining green than *inodorum*.

20. P. *parviflorum*. Small-flowered Feverfew. Willd. n. 19.—"Leaves doubly pinnate; leaflets linear-thread-ſhaped, in two or three deep diviſions. Stem erect, branched. Seed-crown two-lobed."—Deſcribed by Willdenow from living ſpecimens, but the native country of this ſpecies is unknown. It is ſaid to be annual, greatly reſembling *P. inodorum*, but having a taller and upright *ſtem*; a ſhorter *radius*; and a green two-lobed crown to the *ſeed*.

Section 2. *Radius yellow*.

21. P. *multicaule*. Many-ſtalked yellow Feverfew. Willd. n. 20. (Chryſanthemum multicaule; Deſfont. Atlant. v. 2. 282. t. 236.)—Leaves ſimple, ſmooth, ſpatulate; the lower ones toothed. Stem erect, much branched from the bottom.—Native of ſandy hills near Maſcar, in Barbary. *Root* fibrous, apparently annual. *Stem* branched from the baſe principally, buſhy; the branches naked above, each bearing a ſolitary *flower*, about as big as a French Marygold, whoſe radiant *florets* are yellow, and of a very broad elliptical form, about eight or nine or number.

22. P. *trifurcatum*. Three-forked Yellow Feverfew. Willd. n. 21. (Chryſanthemum trifurcatum; Deſfont. Atlant. v. 2. 281. t. 235. f. 2.)—Leaves fleſhy, ſmooth, linear, acute; the lowermoſt pinnate; the uppermoſt undivided. Stem aſcending, ſingle-flowered.—Native of fields near Kerwan in Barbary, flowering in winter. The *ſtem* is ſimple, a foot high; leafy below; naked above; terminated by a very large *flower*, with numerous yellow radiant florets. Some *leaves* are partly bipinnate; others three-cleft; the uppermoſt ſimple; all linear, wavy, acute, and of equal breadth.

23. P. *Bocconi*. Dwarf Pale-yellow Feverfew. Willd. n. 22. (Chryſanthemum aragonenſe; Aſſo Synopſ. n. 845. t. 9. f. 1. *Willd.* Bellis incana, chryſanthemi cretici folio; Bocc. Muſ. 136. t. 98.)—Leaves hoary, ſtalked, pinnate; leaflets linear-awl-ſhaped: upper ones linear, undivided, and entire. Stems ſingle-flowered.—Native of Spain and Sicily. Willdenow deſcribes it thus from dried ſpecimens. "*Root* many-headed, woody. *Stems* ſeveral, ſimple, a ſpan high, ſingle-flowered. *Leaves* hoary; the radical ones ſtalked, oblong, fading when arrived at maturity, and altogether wanting when the *flowers* open; lower ſtem-leaves ſtalked, pinnate at the extremity, with three or four pair of very ſhort linear-awl-ſhaped leaflets, and a membranous linear *footſtalk*; the upper ones linear, ſeſſile, and entire. Rays of the *corolla* pale yellow. It reſembles *Chryſanthemum pectinatum*, but differs abundantly in the *calyx* not being membranous, and in having a crown to the *ſeed*."

We know nothing of Aſſo's plant. Willdenow cites an additional ſynonym, Barrelier's t. 1153. f. 1, which ſeems to have no affinity to the figure of Boccone, and much more reſembles *Cineraria minuta*, Cavan. Ic. t. 33. f. 3, under which indeed Willdenow likewiſe quotes it, Sp. Pl. v. 3. 2086.

24. P. *orientale*. Oriental Yellow Feverfew. Willd. n. 23.—"Leaves doubly pinnate; leaflets linear. Stems aſcending, ſingle-flowered."—Native of Georgia. *Stems* ſix inches high, naked above. Lower *leaves* an inch long; the upper ones half as long, and only ſimply pinnate. Scales of the *calyx* withered at the edge. *Flowers* deep yellow, the ſize of *Chryſanthemum ſegetum*. *Willd.*

25. P. *millefoliatum*. Milfoil-leaved Yellow Feverfew. Willd. n. 24. Ait. n. 13. (P. n. 174; Gmel. Sib. v. 2. 207. t. 86. f. 1, 2. Chryſanthemum milleſoliatum; Linn. Syſt. Veg. ed. 13. 643. Anthemis millefolia; Linn. Sp. Pl. 1263. Achillea foliis pinnatis, &c.; Mill. Ic. t. 9.)—Leaves doubly pinnatifid, linear, bluntiſh. Stem corymboſe. Rays half as long as the diameter of the diſk.—Native of Siberia. A hardy perennial, flowering throughout the ſummer. The *ſtem* is twelve or eighteen inches high, leafy, branched and corymboſe, bearing eight or more long-ſtalked yellow *flowers*, whoſe diſk is about half an inch in diameter, and their radiant florets of a ſhort roundiſh figure, hardly extending a quarter of an inch from the diſk. *Seed-crown* toothed. *Leaves* doubly and interruptedly pinnatifid, with linear, bluntiſh ſegments, each tipped with a minute point; their ſurfaces both downy, or ſomewhat ſilky. The *leaves*, as well as *flowers* and *ſeeds*, are very diſtinct from *Chryſanthemum italicum*, to which Linnæus compares this ſpecies.

26. P. *bipinnatum*. Wing-leaved Yellow Feverfew. Willd. n. 25. Ait. n. 14. (P. n. 172; Gmel. Sib. v. 2. 205. t. 85. f. 1. Chryſanthemum bipinnatum; Linn. Sp. Pl. 1255.)—Leaves doubly or triply pinnatifid; their ſegments dilated upwards, minutely pointed. Stem nearly ſimple. Rays wedge-ſhaped, not a quarter ſo long as the diameter of the diſk.—Native of Siberia, flowering in June. Introduced at Kew by Mr. Buſh, in 1796. This differs from the laſt in having more compound *leaves*, whoſe ultimate ſegments are almoſt elliptical, and all their points diſtinctly awned. But the *flowers* eſpecially differ in being fewer, from one to three on each *ſtem*, and furniſhed with a diſk near an inch wide, while their radiant marginal florets are ſhort, broad, and wedge-ſhaped, with broad ſpreading teeth. The *calyx*, as well as all the herbage, is ſhaggy with ſoft hairs.

27. P. *indicum*. Eaſt Indian Yellow Feverfew. Sims in Curt. Mag. t. 1521. Ait. n. 15.—Leaves pinnatifid; their ſegments dilated upwards, lobed. Stem branched. Flowers on long ſtalks, nearly globular. Radiant florets few, very ſhort.—Sent by Dr. Roxburgh, from the Eaſt Indies, to A. B. Lambert, eſq. It proves a hardy annual in our gardens, flowering moſt part of the ſummer. The *ſtem* is much branched, but the pinnatifid, though more ſimple and broader, *leaves*, betray an affinity to the two laſt ſpecies, which is confirmed by the ſhort yellow radiant *florets*. Theſe however are, according to Dr. Sims, moſt generally wanting. The *flowers* are ſolitary, on long ſwelling furrowed *ſtalks*, terminating each branch; their diſk nearly an inch wide, and finally convex. The *herbage* appears to be ſmooth.

28. P.

28. P. *Myconi*. Tongue-leaved Yellow Feverfew. (Chryſanthemum Myconi; Dalech. Hiſt. 873. Linn. Sp. Pl. 1254. Willd. Sp. Pl. v. 3. 2148. Ait. Hort. Kew. v. 5. 96. Jacq. Obſ. faſc. 4. 10. t. 94.)—Leaves tongue-ſhaped, obtuſe, toothed, claſping the much-branched ſtem. Radiant florets numerous, roundiſh.—Native of fields in the ſouth of Europe; a hardy annual with us, but preſerved for the ſake of variety, rather than ornament, the flowers being inferior in ſize and ſplendour to our wild *Chryſanthemum ſegetum*, while the leaves reſemble thoſe of *C. Leucanthemum*. The plant however is very different from both thoſe, and a true *Pyrethrum*, akin to the laſt deſcribed, the *ſeed* having a very evident membranous crown, as Willdenow, copying Linnæus, mentions; yet he ſtill left this ſpecies where he found it. Our predeceſſor, the excellent Mr. Wood, has corrected this error. (See CHRYSANTHEMUM, at the end.) . We venture likewiſe to correct the ſpecific name, which authors have copied incorrectly from Dalechamp. He calls the plant *Myconi*, after its diſcoverer Myconus. The *ſtem* is very much branched. *Leaves* ſimple, an inch and a half or two inches long, ſmooth. *Flowers* on long ſolitary ſtalks, at the ends of the branches, bright yellow, an inch wide; their radiant florets numerous, crowded, ſhort, of a roundiſh or oblong ſhape. *Seed-crown* large, jagged, and fringed.

PYRETICS, formed from πυρετος, *fever*, of πυρ, *fire*, medicines good againſt fevers.

PYREXIA, in *Medicine*, from πυρετος, *fever*, a term uſed by Dr. Cullen to ſignify feveriſh action generally, whether idiopathic or ſympathic. The ſame writer alſo uſed the term as the denomination of his firſt claſs of diſeaſes, including fevers and inflammations. See his Noſol. Method. claſs 1, *Pyrexiæ*.

PYRGI, or PYRGOS, in *Ancient Geography*, a town of Italy, upon the coaſt of Etruria; placed by Ptolemy between Caſtrum Novum and Alſum, and ſaid by Livy to have been a Roman colony.—Alſo, a town of the Peloponneſus, in Meſſenia.

PYRGO, in *Geography*, a ſea-port town on the S.E. coaſt of the iſland of Santoria. N. lat. 36° 26′. E. long. 25° 38′.

PYRGUS, among the Romans, a dice-box of the ſhape of a modius, open above, and having a great many ſhelves or partitions within it; ſo that when the dice were thrown into it out of the fritillum, they were thereby overturned many times before they could reach the bottom, in which there was an opening for them to fall through upon the table.

PYRGUS, in *Botany*, a genus of Loureiro's, Fl. Cochinch. 120, which Mr. Brown, Prodr. Nov. Holl. v. 1. 533, reduces to ARDISIA, ſee that article. The name is taken from πυργος, *a turret*, alluding to the conical ſhape aſſumed by the converging ſtamens.

PYRHOPOECILOS, in the *Natural Hiſtory of the Ancients*, a ſtone ſo called from its having a great many ſpots of the colour of fire.

PYRIATERION, a word uſed by the ancients to expreſs a ſweating room.

PYRIATOS, a word uſed by ſome authors to expreſs a brick when heated, in order to be applied to the body wrapped up in a cloth by way of a dry fomentation.

PYRICAUSTUM, a word uſed by medical writers to expreſs a burn or ſcald.

PYRICUBIUM, in *Natural Hiſtory*, the name of a genus of foſſile bodies, uſually comprehended, with many others of very different figure and ſtructure, under the general name *pyrites*.

The diſtinguiſhing characters of the pyricubia are theſe; they are compound, inflammable metallic bodies, of a cubic figure, or reſembling a die, being compoſed of ſix ſides. Of this genus there are only two known ſpecies. Hill.

PYRIFORMIS, in *Anatomy*, a muſcle of the thigh, flattened and triangular in its figure, ſituated at the back of the pelvis, and extending from the ſacrum to the great trochanter. The poſterior ſurface is covered by the gluteus magnus, and partly by the medius. The anterior is partly in the pelvis, partly on the outſide of the cavity. Within the pelvis it correſponds to the rectum, the ſciatic plexus, and the hypogaſtric veſſels: externally to the cavity it covers the gluteus minimus, the os innominatum, and the capſule of the hip. The upper edge correſponds to the ſciatic notch, and the gluteal artery; it then lies cloſe to the gluteus medius. The inferior edge correſponds to the leſſer ſacro-ſciatic ligament, and then is parallel to the geminus ſuperior: it is at firſt ſeparated from the latter muſcle by the great ſciatic nerve, and afterwards approaches to, and is united with it.

The baſis of the pyriformis is attached to the ſide of the anterior ſurface of the ſacrum, in the intervals of the ſacral foramina, to theſe foramina at their outer parts, to the anterior ſurface of the great ſacro-ſciatic ligament, and to the poſterior and upper part of the os innominatum. The muſcle proceeds from within outwards, and rather downwards, paſſes out of the pelvis at the great ſacro-ſciatic foramen, gradually diminiſhes, and terminates in a ſmall tendon, fixed to the upper part of the internal ſurface of the great trochanter.

The attachment of this muſcle to the great trochanter is by means of a tendon, the lower edge of which is connected to that of the ſuperior geminus. This tendon expands into an aponeuroſis, which, after extending on the front of the muſcle, enters into its ſubſtance. The fleſhy fibres ariſe from the parts mentioned above; and are fixed in all directions to the tendon. Sometimes a portion of the ſciatic nerve paſſes through a ſlit in the muſcle.

When the thigh is extended, the pyriformis will rotate it outwards; but when it is bent, it will act as an abductor. If the thigh is fixed, it will move the pelvis in an oppoſite direction.

PYRIPHLEGES, a word uſed by the old writers in medicine to expreſs a perſon labouring under an extreme degree of a febrile heat.

PYRIPLACIS, in *Natural Hiſtory*, the name of a genus of pyritæ, the characters of which are theſe: they are compound, inflammable, metallic bodies, found in looſe detached maſſes of a ſimple and uniform, not ſtriated internal ſtructure, and are covered with an inveſtient coat or cruſt.

Of this genus of foſſils there are three known ſpecies. Hill.

PYRIPOLYGONIUM, the name of a genus of foſſils, the characters of which are, that they are compound metallic bodies, of a regular figure, conſiſting of twelve planes.

There is only one known ſpecies of this genus, though ſubject to great varieties in its appearance; and this has been by authors hitherto confounded with many other bodies of a very different nature and figure, under the general name *pyrites*.

It is not unfrequent in Cornwall and Devonſhire; but is much more common in Germany. Hill.

PYRITES, *Sulfure metallique*, in *Mineralogy* and *Chemiſtry*, a name given to certain ores which contain a large quantity of ſulphur, and have a metallic luſtre. The Greek

word πυριτης, formed of πυρ, *fire*, denotes fire-ſtone; a denomination given to this ſubſtance on account of its inflammability. For the mineralogical characters of copper pyrites, and iron pyrites, ſee COPPER *Ore*, and IRON *Ore*.

Beſides theſe there are arſenical pyrites, auriferous pyrites, and tin pyrites. Combinations of ſulphur with the metals are called by chemiſts ſulphurets; and the different kinds of pyrites are properly metallic ſulphurets. Sulphur has a great affinity for iron, and in combination with this metal, under the form of pyrites, exiſts in extenſive beds in primary mountains, or is diſſeminated through the ſecondary rocks and ſtrata, in veins and maſſes, or variouſly cryſtallized: it occurs alſo in beds of coal and bituminous clay. Iron pyrites may be conſidered, after the earths, as one of the moſt abundant ſubſtances in the mineral kingdom, forming a conſtituent part of the globe, and by its decompoſition giving riſe to many important ſubterranean phenomena.

The proportions of iron and ſulphur in the different ſubſpecies of iron pyrites enumerated by mineralogiſts are,

52 to 54 Sulphur
48 to 56 Iron.

Magnetic pyrites differs from common pyrites: its conſtituent parts, according to Mr. Hatchett, are,

36.50 Sulphur
63.50 Iron.

By the application of heat common pyrites becomes ſuſceptible of attraction by the magnet; the exceſs of ſulphur being expelled. Iron pyrites is not worked as an ore of iron, but is principally valued for the green vitriol or ſulphate of iron, which it affords when expoſed to air and moiſture. Sulphur may alſo be obtained from pyrites when heated with charcoal.

The decompoſition of pyrites is effected ſpontaneouſly by the abſorption of oxygen from water and the atmoſphere, which converts the ſulphur into ſulphuric acid, and the iron into an oxyd. Theſe ſubſtances unite during the proceſs, and form the ſulphate of iron, or green vitriol.

Some kinds of pyrites are rapidly decompoſed, others require to have part of the ſulphur expelled by heat. The pyrites, or pyritous ſubſtance intended to form vitriol, is collected in extenſive heaps, ſpreading the ſurface as much as can be conveniently done. The ground on which theſe heaps are ſpread ſhould be impervious to water, and inclined, in order that the ſaline matter which efflores̊ces may be waſhed off, and conveyed into reſervoirs to cryſtallize. As the decompoſition proceeds the maſs becomes heated, and is occaſionally moiſtened, particularly when the air is dry and warm. Theſe beds continue productive for many years, and if the pyrites be pure, but little reſiduum is left. An exceſs of ſulphuric acid is formed during the proceſs, on which account a quantity of old iron is added to the ſolution, to ſaturate it, and obtain the ſalt in a cryſtallized ſtate. During the decompoſition of pyrites much heat is evolved, and a conſiderable abſorption of oxygen from the atmoſphere takes place. The fact was firſt obſerved by Henckel, who affirmed, in his "Pyritologia," that air was neceſſary to the proceſs of vitriolization, and that it enters into combination with pyrites and remains fixed in it: "non ut inſtrumentum tranſiens ſed immanens." This may be conſidered as a happy anticipation of one of the moſt important doctrines of modern chemiſtry. Some geologiſts have ſuppoſed that ſubterranean fires, and the temperature of hot ſprings, are occaſioned by the ſpontaneous decompoſition of immenſe beds of pyrites in the interior of the earth, and an experiment made by Lemery gives ſome plauſibility to this opinion. He found that a mixture of iron filings and ſulphur, moiſtened with a ſmall quantity of water, becomes hot in a few hours, the maſs ſwells, and the parts adhere together: it then breaks with a perceptible noiſe and crackling, and emits aqueous vapour, and a fetid odour like that of ſulpurated hydrogen gas. If the mixture be made in a large quantity, it takes fire in twenty-four or thirty hours. As ſoon as the emiſſion of aqueous vapour has ceaſed, the heat becomes greater and greater, is ſucceeded by inflammation, the ſmell is then much ſtronger, and appears to ariſe from the hydrogen produced by the decompoſition of water. Beaumé, who obſerved this phenomenon from a mixture of one hundred pounds of iron filings, with an equal quantity of ſulphur in powder, ſtates that the flames roſe to a foot in height, but did not continue longer than two or three minutes; the maſs, however, remained red-hot for forty hours. Lemery the elder gave to this experiment the name of the artificial volcano.

Dr. Watſon, in his Chemical Eſſays, vol. i. p. 187, ſays that he has repeated this experiment more than once. When made in the open air the flame is of ſhort duration, and the whole maſs, after the extinction of the flame, continues at intervals to throw out ſparks. A ladle full of the ignited maſs being dropped down from a conſiderable height, deſcended like a ſhower of red-hot aſhes. The ſucceſs of this experiment depends on a due proportion of water. Half a pound of flower of ſulphur, with half a pound of clean iron filings, mixed with fourteen ounces of water, and worked into a paſte, will acquire heat enough to make the maſs take fire.

Some dark-coloured carbonaceous and bituminous earths contain pyrites in minute grains, and decompoſe with great rapidity when expoſed to moiſture. In the month of Auguſt 1751, the cliffs near Charmouth, in Dorſetſhire, containing a ſimilar kind of pyritous earth, took fire in conſequence of a heavy fall of rain after a hot dry ſeaſon, and continued at intervals to emit flame for ſeveral years. Almoſt all kinds of pit-coal in England contain more or leſs pyrites: in ſome the quantity is very inconſiderable, in other kinds it abounds ſo much as to render them unfit for domeſtic purpoſes, and totally inapplicable for forges or iron works, on account of the ſulphur which they emit when burned. This pyritous coal may be diſtinguiſhed by its greater ſpecific gravity, and the braſs-like metallic appearance of the pyrites with which it is intermixed. Pyritous coal and coal ſhale, or bituminous clay, containing pyrites, frequently take fire ſpontaneouſly in coal mines, or when expoſed in heaps out of the pits, and continue burning many years. Inſtances of this kind now exiſt in the north of England; and ſo intenſe is the heat produced by the ignition of theſe maſſes, that the coal ſhale is ſometimes fuſed. We have ſeen ſpecimens from theſe heaps which have all the characters of cellular volcanic lava. In the vicinity of Leeds there is a large heap of coal ſhale which has been on fire near half a century; it is covered in parts with vegetation, and preſents no appearance of ignition during the day; but if a dry ſtick be thruſt into it the ſurface is changed in a few minutes. In ſome of the coal mines in Leiceſterſhire, near Aſhby de la Zouch, the ſtratum of indurated clay over the main bed of coal contains ſo much pyritous matter, and is ſo ſubject to ſpontaneous inflammation when it falls down and is intermixed with ſmall coal and moiſture, that the miners are obliged to cloſe up the ſpace with brick-clay where the coal has been worked, to prevent the acceſs of air to the combuſtible matter. In this ſtate, excluded from the air, the pyritous earth ſometimes becomes ignited, as is evident by the heat communicated to the neighbouring parts of the mine; but the fire is prevented from ſpreading among the coal,

coal, by the precautionary meaſure of cloſing the cavities with clay.

The great heat evolved during the decompoſition of pyrites, may proceed in part from the combination of oxygen with the ſulphur and iron, and may be increaſed by the different capacity of the new compound for heat. Whenever chemical changes take place rapidly, they produce a change in the temperature of ſubſtances, as in the well-known inſtances of lime and water, nitric acid and vegetable oils, &c.

The phenomena accompanying the mud volcanoes in various parts of the world, preſent many appearances which give probability to the opinion, that they proceed from the decompoſition of pyritic ſtrata. See VOLCANO.

The formation of alum is alſo effected naturally, in many ſituations, by the decompoſition of pyrites, the ſulphuric acid combining with the alumine of pyritous clay. This is not unfrequently the caſe in excavations of coal mines that have been long worked out.

At Hartlet, near Glaſgow, in the excavations of an old coal mine that has been worked ſome centuries, there is a very extenſive formation of alum, from the decompoſition of the roof of the pit. It is a pyritous clay ten inches thick. In the old workings of the mine which are dry the air circulates ſlowly, and the roof gradually decompoſes and exfoliates, and falls upon the floor, in which ſituation the decompoſition proceeds, and the ſubſtance aſſumes the appearance of a ſpicular efflorescence. In time the whole ſpace to the roof is filled; it is then removed. The maſs conſiſts of earth richly impregnated with ſulphate of alumine, ſulphate of iron, and in ſome inſtances with ſulphate of magneſia. The coal in this mine, contrary to the uſual practice, is worked to the dip, ſo that the old workings are always dry. To this circumſtance may principally be attributed the great accumulation of alum in this mine. In many of the mines in England a ſimilar formation of alum would take place, but they contain too much water to permit the ſaline ſubſtances to remain. In general, alum rock or alum ſhale require to be expoſed in heaps, and burned in the open air, to expel the ſulphur, and combine it with the oxygen from the atmoſphere. The ſulphuric acid thus formed unites with a requiſite portion of the clay during the proceſs.

The gypſum, or the ſulphate of lime which occurs in beds, among ſecondary ſtrata of red ſand-ſtone and beds of marle, probably may owe its preſent ſtate to maſſes of pyrites, which have exiſted over common lime-ſtone, and been decompoſed naturally. The ſulphuric acid thus produced would unite with the lime, and form gypſum. The great quantity of the red oxyd of iron which is in the ſtone and marle that accompany this kind of gypſum, gives much probability to this opinion. The cryſtals of gypſum or ſelenite found detached in beds of clay had probably a ſimilar origin.

Sulphuret of iron may be formed by heating together iron filings and ſulphur. From the experiments of Vauquelin it is proved that there are four ſulphurets of iron, according to the degree of heat and other circumſtances under which the combination may be formed. The firſt ſulphuret conſiſts of

78 Iron
22 Sulphur } Artificial.

The ſecond ſulphuret, of

64 Iron
36 Sulphur } Natural magnetic pyrites.

The third ſulphuret, of

54.16 Iron
45.84 Sulphur } Artificial.

The fourth ſulphuret, of

47 Iron
33 Sulphur } Natural common pyrites.

When the quantity of ſulphur does not exceed 40 *per cent.* pyrites is ſoluble in muriatic acid, and may be rendered permanently magnetic. The ſpecific gravity of common pyrites is from 4.60 to 4.83. Of magnetic pyrites 4.51.

Arſenical pyrites, called marcaſite, is diſtinguiſhed from iron pyrites by its colour, which is a ſilver white, and by yielding a ſmell like garlic when rubbed or expoſed to heat. See ARSENIC *Ores*.

Auriferous pyrites, or iron pyrites, with a ſmall alloy of gold: the richeſt ſpecimens of this ore in Europe are found in Tranſylvania, containing from 0.02 to 0.03 of gld. Theſe ores are diſtinguiſhed from iron and copper pyrites by their colour, malleability, and ſpecific gravity.

Tin pyrites. See TIN *Ore*.

The pyritæ, in ſubſtance, are never uſed medicinally; nevertheleſs, in their products they are very important. From theſe common ſulphur is extracted, in Sweden and Saxony; the native vitriols are produced in caverns of the earth, or on its ſurface; the greateſt quantities of artificial vitriol are prepared; and the mineral waters, vitriolic, aluminous, ſulphureous, hot or cold, are ſuppoſed to receive their impregnation.

When the matter of the pyrites is mixed with the lead ores, the method of ſeparating the metal by aſſaying is this: roaſt two centners of the ore, as in the uſual method, and keep a ſtronger fire than when the ore is pure. The pyrites, eſpecially when it is merely iron, hinders ore from eaſily growing clammy or turning into large lumps, or entirely melting. When the ore is ſufficiently waſhed, let it cool, beat it to powder, and repeat the roaſting to a third fire, till when it is red-hot in the fire, there is no ſmell of ſulphur; then mix the ore with ſix centners of the black flux, and two of ſandiver, and finiſh the work in the common way, only making the fire greater, and continuing it longer, toward the end of the operation. Cramer's Art of Aſſaying, p. 292. See LEAD *Ore*.

PYRITES is applied by ſome authors to the marcaſite ores of all metals; the names of which are varied according to the metals they partake of.

Thus *chryſitis* is that of gold; *argyritis* that of ſilver; *ſideritis* that of iron; *chalcitis* that of copper; and *molybditis* that of lead, &c.

PYRITICUM LIQUAMEN. See LIQUAMEN *Pyriticum*.

PYRITRICHIPHYLLUM, in *Natural Hiſtory*, the name of a genus of foſſils of the claſs of the pyrites, the characters of which are theſe: they are compound, inflammable, metallic bodies, found in looſe maſſes not of any regularly angular figure, and of a ſtriated texture, with foliaceous ends to the ſtriæ, appearing on the ſurface, or within the maſs.

Of this genus there are only two known ſpecies: one having the foliaceous ends of the ſtriæ on the outer ſurface of the maſs; and the other having a ſmooth external ſurface, and the foliaceous ends of the ſtriæ covering the ſides of internal hollows.

The firſt of theſe is found in many of the Engliſh and German mines; the other has been yet only found in the mines on Mendip hills in Somerſetſhire, but there in conſiderable plenty. Hill.

PYRITRICHUM, the name of a genus of pyrites, the characters of which are theſe: they are compound, inflammable, metallic foſſils, always found in detached maſſes of

no regularly angular figure, and of a ſimply ſtriated internal ſtructure.

Of this genus of pyritæ there are three known ſpecies. All the three ſpecies are found plentifully in different parts of the kingdom: the firſt in all ſorts of ſtrata, and often looſe on the ground; the ſecond principally in the chalk-pits of Kent and Suſſex; and the laſt in Eſſex and Hampſhire, and very frequently in the German mines. Hill.

PYRITZ, in *Geography*. See PIRITZ.

PYRMONT, a town of Germany, and capital of the country ſo named; its citadel is fortified with a broad ditch, high ramparts, and ſubterraneous paſſages and vaults; 12 miles S.W. of Hamala. N. lat. 51° 57′. E. long. 9° 17′.—Alſo, a county and principality of Germany, bounded on the N. by the principality of Calenberg, on the E. by Wolfenbuttle and Calenberg, on the S. by Wolfenbuttle, and on the W. by the county of Lippe; about nine miles long, and three broad. The revenues are eſtimated at 30,000 rix-dollars, principally ariſing from the ſprings and ſalt works.

PYRMONT *Water*, in *Phyſiology* and *Medicine*, a very briſk, ſpirituous chalybeate, abounding in fixed air, and which, when taken up from the fountain at Pyrmont, in Germany, whence its name, ſparkles like the briſkeſt Champaign wine. It has a pleaſant, vinous taſte, and ſomewhat ſulphureous ſmell. It is perfectly clear, and bears carriage better than the Spa water.

The hiſtory of theſe waters is accurately given by Hoffmann in his obſervations on them, both in their natural ſtate, and in mixture with other bodies.

He firſt obſerves, that they contain a volatile and ſubtile principle, much more penetrating and ſtrong, as well as in larger quantity, than any other mineral water; but that this is not to be expected in them any where but upon the ſpot, for thoſe who tranſport them to other places are conſtrained to let a part of this fly off, to preſerve the reſt. If either glaſs or earthen veſſels be filled at the ſpring, and immediately corked and faſtened down, the conſequence is, that they will burſt on the firſt motion, or heat of the weather. They are, therefore, forced to fill them only in part at firſt, and let them ſtand awhile for this ſubtile ſpirit to exhale; and then awhile after the filling them up, to cork and fit them for carriage.

2. If they are drank upon the ſpot in a morning, on an empty ſtomach, they affect the noſe with a pungent tingling, and diſturb the head for many hours afterwards.

3. If they are taken at the ſpring, they purge but very little; but if taken in another place, after tranſportation, they purge conſiderably more, and render the ſtools black. It is obſervable alſo, that if they are left in an open veſſel a few days, their virtue wholly exhales, and they no longer purge nor render the ſtools black.

4. If tea-leaves, bauluſtine-flowers, or galls, are put into this water, they firſt change it to a blue, from that to a purple, and finally to a black. This is a ready proof that black is only a deep purple, and purple only a deep blue: a little ſpirit of vitriol added to this liquor deſtroys all the colour, and renders it limpid as before.

5. If any acid be mixed with Pyrmont water, there is raiſed an effervescence, and bubbles of air are carried up in great quantity; and this whether the ſtronger acids, ſuch as ſpirit of vitriol, or aqua fortis, be uſed; or the weaker, as vinegar, lemon juice, or Rheniſh wine.

6. If an alkaline liquor be added, whether it be volatile, as the ſpirit of ſal ammoniac, or fixed, as the oil of tartar, there is no ebullition raiſed, but the liquor becomes turbid and milky. If ſpirit of vitriol be afterwards added to this, to ſaturate the additional alkali, the liquor becomes limpid again.

7. Cow's milk mixed in equal quantity with Pyrmont water does not coagulate, but, on the contrary, becomes thinner than before, and is preſerved from turning ſour ſo ſoon as it otherwiſe would in hot weather. This is a proof that there is no predominating acid in theſe waters.

8. If ſyrup of violets be added to Pyrmont water, it turns it to a beautiful green. This is a proof of the alkaline nature of theſe waters; and it is further proved, by adding ſpirit of vitriol, or any other acid, to this green liquor, which on that becomes limpid again.

9. Four pints of this water evaporated over a gentle fire, yield no more than two ſcruples of a dry reſiduum. Oil of vitriol being poured on this, an acid effervescence ariſes, and with it an acrid and pungent vapour, like that produced by mixing oil of vitriol and common ſalt. If ſpirit of vitriol be uſed inſtead of the oil, the effervescence is in a leſs degree, and the ſalt is in part changed to a bitter ſaline maſs, the remainder ſeparated from which proves to be a calcareous earth, no longer fermenting with the ſpirit of vitriol.

10. If a quantity of Pyrmont water be expoſed twenty-four hours to the open air in a baſon, it will at the end be found to have loſt all its virtues, taſting wholly inſipid, and being turbid, inſtead of the fine clearneſs it had before, and a yellow ochreous earth is precipitated to the bottom: after this the liquor will no longer ſhew any of thoſe qualities, which were before its diſtinguiſhing characters; it will no longer ferment with acids, nor turn black with galls, nor green with ſyrup of violets.

It appears from the whole, that the Pyrmont waters poſſeſs a pure, extremely penetrating, and elaſtic mineral ſpirit, and that in a very large proportion; and to this their virtues are principally to be attributed. This mineral ſpirit, while it remains engaged in a calcareous earth, imitates the properties of an alkaline ſubſtance; and when joined with a ſubtile martial earth, it emulates the properties of vitriol, giving the ſtools a black colour, and turning a tincture of galls into ink: and while this remains in the water in theſe forms of an alkaline or vitriolic principle of ſo great ſubtilty, it cannot but give them very great virtues in ſtrengthening the tone of the viſcera, opening obſtructions, and ſtimulating in a proper manner the excretory ducts, ſo as to make them duly perform their office; but as ſoon as by the ſtanding of the water open, or by any other accident, this ſubtile element is evaporated, all the virtues of the water muſt be gone with it.

The great quantity of this powerful ſpirit contained in the waters, makes them more fit for the robuſt and ſtrong conſtitutions, when depraved by illneſs, than for the weak and tender ones; but even the tendereſt people may take them, only obſerving to take but a ſmall doſe, or to dilute them with an equal quantity of common water immediately before the taking them.

Hoffmann alſo recommends the Pyrmont water mixed with equal quantities of milk, on his own experience, in ſcorbutic and gouty caſes. Hoffm. Oper. tom. v. p. 143, ſeq.

We have already obſerved, under the articles ACIDULÆ and CARBONIC *Acid*, that Pyrmont water, and other mineral waters of a ſimilar nature, owe their acidulous taſte and peculiar virtues to the fixed AIR (carbonic acid) which they contain; and to thoſe articles the reader is referred for a brief hiſtory

of this important diſcovery. We ſhall here add ſome farther remarks on the effects and medical uſes of this water.

Perſons who drink it at the well are affected with a kind of giddineſs or intoxication, which is probably owing to the great quantity of carbonic acid with which the water abounds. The common operation of this water is by urine; but it is alſo a gentle ſudorific; and if taken in large quantity, proves laxative. However, in order to this effect, it is uſual to mix ſome ſalts with the firſt glaſſes. It is drank by glaſsfuls in the morning, to the quantity of from one to five or ſix pints, according to circumſtances; thoſe who drink it walking about between each glaſs. This water is recommended in caſes where the conſtitution is relaxed; in want of appetite and digeſtion; weakneſs of the ſtomach, and heartburn; the green ſickneſs; female obſtructions and barrenneſs; the ſcurvy, and cutaneous diſeaſes; and in the gout, eſpecially, as Hoffmann obſerves, when mixed with milk; in colics; bloody fluxes; diſorders of the breaſt and lungs; in which caſe it is beſt taken lukewarm: in nervous, hyſteric, and hypochondriacal diſorders; in apoplexies and palſies; in the gravel and urinary obſtructions; in foulneſs of the blood; and in obſtructions of the finer veſſels. It amends the lax tenure of the blood; exhilarates the ſpirits without inflaming, as vinous liquors are apt to do; and is reckoned among the beſt reſtoratives in decayed and broken conſtitutions. It is ſaid to poſſeſs the general virtues of the Spa water, and at the fountain it is more ſpirituous, as well as a ſtronger chalybeate. Elliot's Medicinal Virtues, &c. of Mineral Waters, 1781, p. 181.

Near the famous well at Pyrmont is a ſtone quarry under ground, from ſome parts in which a ſulphureous ſteam comes out, which commonly riſes to a ſmall height. Animals held in this ſteam are ſoon ſuffocated, but recover, if quickly taken out. When a man ſtands in this ſteam, but with his head over it, it proves an excellent ſudorific. Dr. Seip propoſes to perform cures in ſeveral diſeaſes with it. See Phil. Tranſ. N° 448, ſect. 4, and Miſc. Berolin. tom. v. part 2. ſect. 4. See GROTTA *del Serpi*.

PYRMONT *Water, Imitation of.* This medicinal water may be imitated very nicely by art in the following manner: take a quart of the pureſt and lighteſt water, add to it thirty drops of a ſtrong ſolution of iron made in ſpirit of ſalt, a drachm of oil of tartar per deliquium, and thirty drops of ſpirit of vitriol, or a little more or leſs, as is found neceſſary, not to let the alkali of the oil of tartar prevail too ſtrongly, though it muſt prevail a little. Shake all briſkly together, and on taſting it will be found extremely to reſemble the true Pyrmont water.

The baſis on which this is founded is the analyſis and trial of the true Pyrmont water, by which it is found to contain a ſubtile aqueous fluid, a volatile iron, and a predominant alkali, all joined together into one briſk pungent ſpirituous water. The artificial Pyrmont thus made, if the proportions are carefully minded, will extremely reſemble the natural, and will have the ſame effect as a medicine. Shaw's Lectures, p. 90.

But the beſt method of forming artificial Pyrmont water is by impregnating it with fixed air, or carbonic acid, for which we are indebted to Dr. Prieſtley. The firſt perſon, we believe, who actually compounded an artificial acidulous or ſpirituous water, like that of Seltzer or Pyrmont, was M. Venel; though he was ignorant of the real nature of the ingredient to which it owed theſe qualities, and which he erroneouſly ſuppoſed to be common air. For this purpoſe he diſſolved in a pint of water two drachms of foſſile alkali, to which he added an equal quantity of marine acid: in the proceſs he made uſe of a veſſel with a narrow neck, and to prevent the eſcape of the air, he diſpoſed the ingredients in ſuch a manner, that they could not communicate with each other till after the bottle was corked. In this caſe the fixed air diſlodged from the alkaline ſalt, in a phial nearly full and cloſely corked, being confined, ſuffers a degree of compreſſion that greatly promotes its combination with the water. See Memoires preſentés par les Sçavans Etrangers, tom. ii. containing two Memoirs of M. Venel, read before the Royal Academy of Sciences in 1750; and Laviſier's Eſſays, &c. by Henry, p. 34, &c. However, Dr. Prieſtley was undoubtedly the firſt who ſo far improved upon the diſcoveries made by himſelf and others in relation to the principle then denominated fixed air, as to contrive an eaſy method of impregnating water with it. The firſt idea of this kind occurred to him in 1767, when, having placed ſhallow veſſels of water within the region of fixed air on the ſurface of the fermenting veſſels of a brewery, and left them all night in that ſituation, he found that the water had acquired a very ſenſible and pleaſant impregnation. He proceeded to accelerate the impregnation by pouring the water from one veſſel into another, while they were both held within the ſphere of the fixed air. The method of effecting this by air diſlodged from chalk and other calcareous ſubſtances, did not occur to him till the year 1772, when he publiſhed his directions for this purpoſe, together with a drawing of the neceſſary apparatus, which he had before communicated to the Board of Admiralty. This apparatus, repreſented in *Plate* XV. *Pneumatics*, *fig.* 1, conſiſts of a glaſs veſſel, *a*, with a narrow neck, and ſo formed, that it will ſtand upright, with its mouth downwards: this veſſel, when filled with water, and covered with a ſlip of paper or thin paſteboard, preſſed cloſe to it, to prevent the admiſſion of common air, is inverted in another veſſel, *b*, with a little water in it, ſo that the ſlip of paper or paſteboard may be withdrawn, and the end of the pipe, *c*, introduced into it. This pipe is flexible and air-tight, and beſt made of leather, ſewed with a ſhoemaker's waxed thread. It is kept open at both ends by a piece of a quill, while one of them is introduced into the veſſel of water, and the other into the bladder *d*; the oppoſite end of which is tied round a perforated cork, kept open by a quill, and the cork is made to fit a phial, *e*, two-thirds of which ſhould be filled with chalk juſt covered with water. Dr. Prieſtley has ſince found it moſt convenient to uſe a glaſs tube; and to preſerve the advantage which he had of agitating the veſſel *e*, he makes uſe of two bladders, communicating by a perforated cork, to which they are both tied. He alſo obſerves, that the flexible pipe is not neceſſary; but inſtead of this a bent tube of glaſs muſt be ready to be inſerted into the hole made in the cork, when the bladder containing the fixed air is ſeparated from the phial in which it was generated. The extremity of this tube being put under the veſſel of water, and the bladder being compreſſed, the air will be conveyed into it, as in the other caſe. Inſtead of the bladder, a ſmall phial may be interpoſed between the phial containing the chalk, &c. and the veſſel of water: for thus the chalk and water that may be thrown up the tube communicating with this phial will lodge at the bottom of the other, while nothing but the air will get into the pipe communicating with the water. The apparatus being thus prepared, let the phial containing the chalk and water be detached from the bladder, and the pipe alſo from the veſſel of water; pour a little oil of vitriol upon the chalk and water; and having carefully preſſed all the common air out of the bladder, put the cork into the bottle preſently after the effervеſcence has begun. Alſo preſs the bladder once more after a little of the newly-generated air has got into it, in order the more effectually to clear it of all the remains of the common air; and then introduce

troduce the end of the pipe into the mouth of the veſſel of water, as in the drawing, and begin to agitate the chalk and water briſkly. This will preſently produce a conſiderable quantity of fixed air, which will diſtend the bladder; and this being preſſed, the air will force its way through the pipe, and aſcend into the veſſel of water, the water at the ſame time deſcending, and coming into the baſon.

When about one-half of the water is forced out, let the operator lay his hand upon the uppermoſt part of the veſſel, and ſhake it as briſkly as he can, not to throw the water out of the baſon; and in a few minutes the water will abſorb the air, and taking its place, will nearly fill the veſſel as at the firſt. Then ſhake the phial containing the chalk and water again, and force more air into the veſſel, till, upon the whole, about an equal bulk of air has been thrown into it. Alſo ſhake the water as before, till no more of the air can be imbibed. As ſoon as this is perceived to be the caſe, the water is ready for uſe; and if it be not uſed immediately, ſhould be put into a bottle as ſoon as poſſible, well corked, and cemented. It will keep, however, very well, if the bottle be only well corked, and kept with the mouth downwards.

It may be proper to obſerve on this proceſs, that the phial, *e*, ſhould always be placed conſiderably lower than the veſſel *a*; that the water to which the chalk is put ſhould be changed after every operation; that with a veſſel of water holding three pints, and a phial containing the chalk and water of ten ounces, a little more than a tea-ſpoonful of oil of vitriol will produce air enough to impregnate ſuch a quantity of water, that the whole proceſs does not take up more than a quarter of an hour, and the agitation not five minutes; and that in this method the water is eaſily made to imbibe an equal bulk of air; whereas Dr. Brownrigg found that Pyrmont water at the ſpring-head did not contain ſo much as one-half. This apparatus has received conſiderable improvements, which we ſhall briefly recite; but in juſtice to the merit of the original inventor, his method deſerves to be recorded; and beſides, it requires leſs time, and is much leſs expenſive than thoſe that are now generally uſed.

The apparatus contrived by Dr. Nooth, and improved by Mr. Parker, is repreſented in *fig.* 2. It is made of glaſs, and ſtands on a wooden veſſel, *d d*, reſembling a tea-board; the middle veſſel B has a neck, which is inſerted into the mouth of the veſſel A, to which it is ground air-tight. This lower neck of the veſſel B has a glaſs ſtopple S, compoſed of two parts, both having holes ſufficient to let a good quantity of air paſs through them. Between theſe two parts is left a ſmall ſpace, containing a plano-convex lens, which acts like a valve, in letting the air paſs from below upwards, and hindering its return into the veſſel A. The upper veſſel C terminates below in a tube *r t*, which, being crooked, hinders the immediate aſcent to the bubbles of fixed air into that veſſel, before they reach the ſurface of the water in the veſſel B. The veſſel C is alſo ground air-tight to the upper neck of the middle veſſel B, and has a ſtopple, *p*, fitted to its upper mouth, which has a hole through its middle. The upper veſſel B holds juſt half as much as the middle one B; and the end, *t*, of the crooked tube goes no lower than the middle of the veſſel B.

For the uſe of this apparatus, fill the middle veſſel B with ſpring or any other wholeſome water, and join to it the veſſel C. Pour water into the veſſel A (by the opening *m*, or otherwiſe) ſo as to cover the riſing part of its bottom: about three-fourths of a pint will be ſufficient. Fill an ounce phial with oil of vitriol, and add it to the water, ſhaking the veſſel ſo as to mix them well together. As heat is generated, it will be beſt to add the oil by a little at a time, otherwiſe the veſſel may be broke. Put to this, through a wide glaſs or paper funnel, about an ounce of powdered raw chalk, or marble. White marble being firſt granulated, or pounded like coarſe ſand, is better for the purpoſe than pounded chalk, becauſe it is harder; and, therefore, the action of the diluted acid upon it is ſlower, and laſts a conſiderable time. On this account the ſupply of fixed air from it is more regular than with the chalk: and beſides, when no more air is produced, the water may be decanted from the veſſel A, and the white ſediment waſhed off, and the remaining granulated marble may be employed again, by adding to it freſh water and a new quantity of oil of vitriol. The funnel in this proceſs is made uſe of in order to prevent the powder from touching the inſide of the veſſel's mouth: for if that happens, it will ſtick ſo ſtrongly to the neck of the veſſel B, as not to admit of their being ſeparated without breaking. Place immediately the two veſſels B and C (faſtened to each other) into the mouth of the veſſel A, as in the figure, and all the fixed air which is diſengaged from the chalk or marble by the oil of vitriol, will paſs up through the valve in S into this veſſel B. When this fixed air comes to the top of the veſſel B, it will diſlodge from thence as much water as is equal to its bulk: which water will be forced up through the crooked tube into the upper veſſel C.

Care muſt be taken not to ſhake the veſſel A when the powdered chalk is put in; otherwiſe a great and ſudden efferveſcence will enſue, which will perhaps expel part of the contents. In ſuch caſe it may be neceſſary to open a little the ſtopple *p*, in order to give vent, otherwiſe the veſſel A may burſt. It will be proper alſo to throw away the contents, and waſh the veſſel; for the matter will ſtick between the necks of the veſſels, and cement them together. The operation muſt then be begun afreſh. But if the chalk be thrown in without ſhaking the machine, or if marble be uſed, the efferveſcence will not be violent. If the chalk be put into the veſſel looſely wrapt up in paper, this accident will be ſtill better guarded againſt. When the efferveſcence goes on well, the veſſel C will ſoon be filled with water, and the veſſel B half filled with air; which will eaſily be known to be the caſe, by the air going up in large bubbles through the crooked tube *r t*.

When this is obſerved, take off the two veſſels B and C together as they are, and ſhake them ſo that the water and air within them may be much agitated. A great part of the fixed air will be abſorbed into the water; as will appear by the end of the crooked tube being conſiderably under the ſurface of the water in the veſſel. The ſhaking them for two or three minutes will be ſufficient for this purpoſe. Theſe veſſels muſt not be ſhook while joined to the under one A, otherwiſe too great an efferveſcence will be occaſioned in the latter; together with the ill conſequences above-mentioned. After the water and air have been ſufficiently agitated, looſen the upper veſſel C, ſo that the remaining water may fall down into B, and the unabſorbed air paſs out. Put theſe veſſels together, and replace them into the mouth of A, in order that B may be again half filled with fixed air. Shake the veſſels B and C, and let out the unabſorbed air as before. By repeating the operation three or four times, the water will be ſufficiently impregnated.

Whenever the efferveſcence nearly ceaſes in the veſſel A, it may be renewed by giving it a gentle ſhake, ſo that the powdered chalk or marble at the bottom may be mixed with the oil of vitriol and water above it; for then a greater quantity of fixed air will be diſengaged.

When the efferveſcence can be no longer renewed by ſhaking the veſſel A, either more chalk muſt be put in, or more

more oil of vitriol; or more water, if neither of theſe produce the deſired effects.

The ingenious Mr. Magellan has ſtill farther improved the contrivance of Dr. Nooth and Mr. Parker; he has two ſets of the veſſels B and C. While he is ſhaking the air and water contained in one of theſe ſets, the other may be receiving fixed air from the veſſel A. By this means twice the quantity of water may be impregnated in the ſame time. He has a wooden ſtand K (*fig.* 3.) to fix the veſſels B, C on, when taken off from A, which is very convenient. He has a ſmall tin trough for meaſuring the quantity of chalk or marble requiſite for one operation, and a wide glaſs funnel for putting it through into the veſſel A, to prevent its ſticking to the ſides, as mentioned before.

He has alſo contrived a ſtopple without a hole, to be uſed occaſionally, inſtead of the perforated one *p*. It has a kind of baſon at the top, to hold an additional weight when neceſſary. (See *fig.* 4.) The ſtopple muſt be of a conical figure, and very looſe; but ſo exactly and ſmoothly ground as to be air-tight merely by its preſſure, which may be increaſed by additional weights put into its baſon. Its uſe is to compreſs the fixed air on the water, and thereby increaſe the impregnation: for by keeping the air on the water in this compreſſed ſtate, the latter may be made to ſparkle like Champaign. And if the veſſels are ſtrong, there will be no danger of their burſting in the operation.

If the veſſels be ſuffered to ſtand ſix or eight hours, the water will be ſufficiently impregnated even without agitation. But by employing the means above deſcribed, it may be done in as many minutes.

The water thus impregnated may be drawn out at the opening *k*. But if it is not wanted immediately, it will be better to let it remain in the machine, where it has no communication with the external air. Otherwiſe the fixed air flies off by degrees, and the water becomes vapid and flat; as alſo happens to other acidulous waters. But it may be kept a long time in bottles well ſtopped, eſpecially if they are placed with their mouths downwards.

Mr. Blades of Ludgate-Hill has ſtill farther improved this apparatus, by changing the ſtopple at *k* for a glaſs cock, which is more convenient. He has likewiſe altered the middle veſſel B into a form more advantageous for the impregnation. See *fig.* 5.

For Dr. Hulme's method of impregnating water with fixed air, we refer to his "Safe and eaſy Remedy for the Stone," &c. 1778: obſerving, that he merely mixes the ſolution of fixed alkaline ſalt and water, containing as much vitriolic acid as he finds neceſſary, *á priori*, for neutralizing the alkali, and expelling from it all its fixed air.

Dr. Withering, of Birmingham, has lately contrived a new apparatus for impregnating water with fixed air, which, he ſays, is preferable to that in common uſe, becauſe it can be made at leſs expence, and is more eaſily prepared; becauſe the whole quantity of fixable air produced is converted to uſe, without any waſte of the vitriolic acid; becauſe it impregnates three times the quantity of water at one time, more completely and with leſs trouble; and the impregnated water will always retain its virtue, if the joints and cocks of the machine are made perfectly air-tight; for which purpoſe they ſhould once a year be ſupplied with a ſmall quantity of unſalted lard. This apparatus is exhibited in *fig.* 6, and conſiſts of a glaſs veſſel A, about ten inches high in the cylindrical part, and ſix inches and a half in diameter; another glaſs veſſel B, about twelve inches high in the conical part, one inch and a half in the neck, and five inches in diameter at the bottom; a copper pipe C paſſing through the ſtopper of the veſſel B, and tied faſt in the flexible tube D, made of ſtrong leather, air-tight, and kept hollow by means of a ſpiral wire paſſing through its whole length; a conical braſs pipe E, with a ſtop-cock faſtened to the tube D; another conical pipe F, with a ſtop-cock G, into which the end of the tube E is accurately ground, ſo as to be air-tight, and cutting off all communication with the atmoſphere when the pipe E is removed; two large hog's bladders H, H, each of which ought to hold two quarts; a ſtop-cock I, to prevent the water riſing into the bladders, when the veſſel A is agitated; a bladder K, tied to the crooked tube with the ſtop-cock L, which occaſionally opens or ſhuts the communication with the veſſel B; a glaſs funnel M, accurately fitted with the glaſs ſtopper N; an aperture O, fitted with a glaſs ſtopper or a ſilver cock, from which the impregnated water is to be drawn for uſe; and, laſtly, the tube P opening into the veſſel A. When this apparatus is uſed, let the veſſel A be filled with pure water, and any other ingredients that are required, in a proper proportion; into the veſſel B put as much marble or whiting, in ſmall lumps, as will cover its bottom to the height of about two inches, and pour in water to the height repreſented by the dotted line; let the mouth of the veſſel A be well fitted with a cork, and through a hole in the cork paſs the tube P, putting upon the cork melted ſealing-wax of the ſofteſt kind, or modelling-wax, ſo as to make the whole air-tight. The modelling-wax may be procured at the engravers, or it may be prepared by adding to half a pound of melted bees-wax, two ounces of tallow, and one ounce of Venice turpentine: to this maſs add a ſufficient quantity of red lead, or Spaniſh brown, to give it a colour, and let the mixture be ſtirred till it is cold: let the mouth of the veſſel B be ſtopped with a piece of mahogany, turned into a conical figure in a lathe, and of a ſize ſomewhat larger than the mouth of the glaſs will admit; put this piece of wood into melted bees-wax, and heat the wax till the wood begins to grow black: when cool, turn it again till it fits the mouth of the veſſel: the tubes C, L, and M, are fitted into holes bored through the wooden ſtopper, previous to its being immerſed in the wax: puſh theſe tubes through the holes, and preſs the ſtopper into the orifice of the veſſel B, and cement the whole with ſealing or modelling-wax: ſhut the ſtop-cocks I and L, having previouſly preſſed the air out of the bladder K; open the ſtop-cocks G and E; then ſqueeze the air out of the bladders H, H, and afterwards preſs the conical pipe E into the pipe F: pour about a large ſpoonful of oil of vitriol through the funnel M, and ſtop it with its ſtopper N. The fixable air let looſe by the effervеſcence in the veſſel B, riſing through the tube C, paſſes into the bladders H, H, and diſtends them. In this caſe open the ſtop-cock I, and from the aperture O draw out about a quart of water; and the ſpace before occupied by the water will be filled with fixable air, which ſoon begins to be abſorbed by the remaining water, and is ſtill ſupplied from the bladders H, H, and from the effervеſcing mixture in the veſſel B. When the bladders are conſiderably collapſed, more vitriolic acid muſt be added through the funnel M, ſo that they may be always kept pretty fully diſtended. When an impregnation is ſpeedily required, turn the ſtop-cocks at G and E, and open that at L; then ſeparate the pipe E from the tube F, and agitate the veſſel A; the fixable air will paſs into the bladder K, and may be preſſed into the two other bladders, when the parts of the apparatus are united. During the agitation, the ſtop-cock at I ſhould be cloſed, and open only occaſionally to ſupply out of the bladders H, H, the fixable air abſorbed by the water. If a ſtrong impregnation be required, this proceſs ſhould be carried on in a room, the heat of which does not exceed forty-eight degrees of Fahrenheit's thermometer. Dr. Withering obſerves,

obſerves, that the impregnated water receives no taſte from the bladders: and that if the veſſel A with its impregnated water be ſeparated from the veſſel B, at the conical parting E F, it may be incloſed in a pyramidal mahogany caſe, out of the lower part of which the ſilver cock at O projects; and thus ſerve for an ornamental as well as a luxurious and ſalubrious addition to the ſide-board, particularly in the ſummer and autumnal ſeaſons.

Mr. Henry has deſcribed a method of impregnating water in large quantities with fixed air, ſo as to give it the properties of mineral water, for the uſe of the ſick on board of ſhips, and in hoſpitals. He has given the following account of his apparatus and proceſs for this purpoſe. Cut off the two extremities of a calf's or pig's bladder *f*, (*fig.* 7.) and having previouſly moiſtened them, into one end inſert the top of the tubular ſtopper *e*, round the neck of which it is to be cloſely faſtened with ſtrong thread. Into the upper end introduce the part *g* of the long bent tube *h*, and tie them round in the ſame manner. The pipe *h* muſt be paſſed through a hole formed by a hot iron borer, in a large cork adapted to the orifice *i* in the caſk B B, holding about ten or twelve gallons, to which it muſt be cemented: and the length of the pipe from this point muſt be ſuch as to reach within a few inches of the bottom of the caſk B B, which is to be completely filled with freſh water, or ſuch as has been recovered from lime. See PUTREFACTION *of Water*.

To a quantity of mild calcareous earth and water, placed in the air-veſſel C, add a ſmall portion of ſtrong vitriolic acid, and by the time moſt of the common air may be ſuppoſed to be expelled by the fixed air ariſing from the mild calcareous earth, add a larger quantity of acid, and putting the tubulated ſtopper *e* in its place, the bladder *f* will become inflated. Preſs it gently till its ſides collapſe; and then introducing the pipe *h h*, with its cork, into the orifice *i* of the caſk B B, again preſs the air forward, as it diſtends the bladder into the water caſk, where, bubbling up through the water, it will riſe to the ſurface, and by its preſſure, force the water to aſcend into the funnel *k*, which is to be cemented into the head of the caſk at *l*. In proportion as the water in the caſk becomes impregnated with fixed air, that in the funnel will return into its place; but if, at any time, the latter ſhould riſe ſo high as to be in danger of overflowing, a quantity of air may be let out of the water caſk, by means of the ſmall plug at *m*. And this is neceſſary to be done, occaſionally, to diſcharge the reſiduum of the fixed air, which is not ſoluble in water.

If the operation be required to be performed more expeditiouſly, it may be quickened by agitating the water caſk. To do this, the tubular ſtopper *e* muſt be withdrawn from the air-veſſel, and ſupported, together with the bladder, by an aſſiſtant, while the caſk B B is ſhaken. During this time another tubular ſtopper muſt be put into the air-veſſel, and it may be immerſed into a quantity of lime-water to prevent waſte. When the agitation has been continued for ſome minutes, in proportion to the falling of the water in the funnel, replace the ſtopper attached to the bladder *f* in the air-veſſel when taken out of the lime-water, and proceed as before, repeating the agitation occaſionally.

During the proceſs, additional quantities of vitriolic acid may be introduced into the air-veſſel through the opening at *d*, which is to be, at all other times, carefully ſecured with its ſtopper.

By this proceſs, fixed air may be imparted to wine, beer, and almoſt any liquor whatever. And when beer is become flat or dead, it will be revived by this means; but the delicate agreeable flavour, or acidulous taſte communicated by the fixed air, and which is manifeſt in water, will hardly be perceived in wine, or other liquors, which have much taſte of their own.

The artificial mineral waters thus made, are more pleaſant to the taſte than the natural Pyrmont or Seltzer waters; which, beſides their fixed air, contain ſaline particles of a diſagreeable taſte, which are known to contribute little or nothing to their medicinal virtues, and may, in ſome caſes, be hurtful. They are likewiſe conſiderably ſtronger. According to ſir John Pringle, theſe waters may be made more nearly to reſemble genuine Pyrmont water, by adding to each pint of them from eight to ten drops of tinctura martis cum ſpiritu ſalis. Or this may be done, by adding to the water in the middle veſſel B (*fig.* 2.) in the proportion of about thirty grains of Epſom ſalt, ten grains of common ſalt, a ſcruple of magneſia alba, and a drachm of iron filings, or iron wire, clean and free from ruſt, to one gallon of ſpring water, and impregnating the whole with fixed air in the manner already deſcribed. Let them remain till the other ingredients, and as much of the iron as is neceſſary, are diſſolved, which will be in two or three days; or the magneſia may be omitted, and then the operation will be finiſhed in leſs than half that time. Theſe waters may be rendered ferruginous or chalybeate very eaſily, by putting in the middle veſſel two or more ſlender phials, filled with cuttings of fine iron-binding wire, or with ſmall iron nails; becauſe the impregnated water will diſſolve the iron ſo faſt, as to become well ſaturated with it in a few hours, according to the experiments of Mr. Lane. But the method of rendering theſe artificial waters chalybeate, uſed by Dr. Hulme, is to add one grain of ſalt of ſteel to each pint (ſixteen ounces) of water already impregnated with fixed air.

The diſcovery of an eaſy method of impregnating water with fixed air is of great importance; as it is now well known that ſuch water is a very powerful antiſeptic, or that it both reſiſts and corrects putrefaction. It is, therefore, given with great ſucceſs in putrid fevers, in the ſea-ſcurvy, in dyſenteries, in mortifications, and in other diſorders ariſing from a putrid cauſe, or attended with putrefaction, a draught of it being taken now and then, or even by way of common drink. But the ingenious Mr. Bewly has invented a ſtill better method of exhibiting fixed air as a medicine. He directs a ſcruple of alkaline ſalt to be diſſolved in a ſufficient quantity (a quarter of a pint, or leſs) of water, which is to be impregnated with as much fixed air as it can imbibe; this is to be drank for one doſe. Mr. Bewly directs it to be prepared in larger quantities at a time, and calls it his mephitic julep. If immediately after it a ſpoonful of lemon juice, mixed with two or three ſpoonfuls of water, and ſweetened with ſugar, be drank, the fixed air will be extricated in the ſtomach; and thus a much greater quantity of it may be given than the ſame quantity of water alone can be made to imbibe. Fixed air acts as a corroborant; and, therefore, may be given with ſucceſs in weakneſs of the ſtomach, and in vomitings ariſing from that cauſe. It has alſo been given with ſucceſs in the ſtone, and in nephritic complaints. When the lungs are purulent, fixed air, mixed with the air drawn into the lungs, has repeatedly been found to perform a cure. The bark alſo may be given with advantage in water impregnated with fixed air, as they both coincide in the ſame intention. Fixed air may be applied by means of a ſyringe, funnel, or otherwiſe, to inflamed breaſts, putrid ulcers, mortified parts, ulcerated ſore throats, and has been found in ſuch and ſimilar caſes to have very remarkable efficacy. It may alſo be given internally at the ſame time. In putrid dyſenteries, and in putrid ſtools, fixed air may be given by way of clyſter.

Ferment-

Fermenting cataplasms are of service chiefly as they supply fixed air to the part. In cases of putridity, fixed air has been successfully applied to the surface of the body, exposed to streams of it. It is also found an excellent cooling as well as strengthening beverage in hot relaxing weather, and has the advantage of being pleasant to the taste. See on the subject of this article Priestley's Exp. and Obs. on Air, vol. ii. p. 263, &c. 298, &c. Phil. Trans. vol. lxv. part i. p. 59, &c. Magellan's Description of a Glass Apparatus for making Mineral Waters, &c. p. 1, &c. Priestley's Exp. and Obs. vol. v. Appendix, p. 389, &c. Elliot's Account of the Nature and medicinal Virtues of the principal Mineral Waters, &c. 1781. Henry's Account of a Method of preserving Water at Sea, &c. 1781. p. 19, &c.

PYROBOLOGY, or the art of missile fires, is derived from the Greek πυρ, *fire*, and βαλλειν, *to throw*. See PYROTECHNY.

PYROBOLUS, in *Natural History*, a name given by many authors to the stone more generally called *pyrites*; others have called it *siderites*, *pyrobalanus*, *pyropus*, and *othonna*, and the Greeks *mylias*.

PYROCHROA, in *Entomology*. See LAMPYRIS.

PYROCTOGONIUM, in *Natural History*, the name given by Dr. Hill to a genus of fossils usually comprehended by authors, with many other bodies of a different figure and structure, under the general name *pyrites*.

The characters of the pyroctogonium are these: it is a compound, inflammable, metallic body, of a regular octohedral figure, or composed of eight planes.

There is only one known species of this genus, which is a very singular and elegant fossil, being composed of eight triangular planes; these being the sides of two quadrilateral pyramids, with broad bases, which being joined base to base, constitute the pyroctogonium.

It is found very frequently in Cornwall, Devonshire, and most other of our counties where there are mines. It is sometimes met with loose in the earth, sometimes lodged in the bodies of marcasites, or in the solid fossils, and varies sometimes from its iron colour to a dusky yellow. It is sometimes also found with many specimens connected into a mass; these are seldom uniform in size, and cohere in various directions, often greatly injuring one another's figure. Sometimes also, as in the case of the crystals, they form a large mass, of which the outer surface only is concreted into or covered with regular figures, the whole inner part being a confused substance.

Masses of this kind are not unfrequently found of a regular orbicular figure, and beset all over with regularly figured pyroctogonia of various sizes. Hill.

PYRODMALITE, in *Mineralogy*, a mineral discovered some years ago in the mine of Bjelke, in Vermeland, a province of Sweden, situated on the N. side of the lake Venner, which was observed to have the property of giving out the odour of muriatic acid when heated, and hence distinguished by the name of pyrodmalite. J. G. Gahn of Fahlun has given the following description of it. Its colour is commonly yellowish-brown, passing into greenish: internally, it is light greenish-yellow. It occurs crystallized in regular six-sided prisms, without any terminating pyramids. It is composed of plates lying on each other in a direction perpendicular to the axis of the prism; principal fracture, resplendent; cross fracture, uneven and without lustre; opaque; semi-hard; scratched by steel; the crystals are often several inches long; specific gravity 3.081. Before the blowpipe it becomes dark reddish-brown, and emits the odour of muriatic acid. It then melts into a black slag, and at last a small bead is obtained, more or less attracted by the magnet. It dissolves readily, and in considerable quantity in glass of borax, and gives a colour indicating the presence of manganese and iron:—in phosphate of ammonia and soda it dissolves with great difficulty. Its constituents are silica, lime, iron, manganese, and muriatic acid. In the mine of Bjelke it occurs mixed with iron ore, calcareous spar, and black crystallized malacolite. Pyrodmalite was lately analysed by Mr. Hisinger, who found its constituents to be as follow:

Silica - - -	35.4
Oxyd of iron -	32.6
Oxyd of manganese	23.1
Alumina - -	0.6
Muriatic acid -	6.5
Loss - - -	1.8
	100.0

The escape of the acid by heat seems to indicate the presence of a portion of water amounting to about two-thirds of the loss stated as sustained in the analysis. Annals of Philosophy, N° 12.

PYROENUS, formed of πυρ, *fire*, and οινος, *wine*, is a term sometimes used for rectified spirit of wine; thus called because made by fire, or rather because rendered of a fiery nature.

PYROET, PYROUET, or rather *Pirouette*, in the *Manege*. See PIROUETTE.

PYROLA, in *Botany*, a name adopted by Linnæus from the old authors, but not one of their best. It is a diminutive of *Pyrus*, and alludes to the resemblance of the leaves, in this pretty genus, to those of a pear-tree.—Linn. Gen. 221. Schreb. 297. Willd. Sp. Pl. v. 2. 621. Mart. Mill. Dict. v. 3. Ait. Hort. Kew. v. 3. 58. Pursh 299. Sm. Fl. Brit. 443. Prodr. Fl. Græc. Sibth. v. 1. 274. Juss. 161. Tourn. t. 132. Lamarck Illustr. t. 367. Gærtn. t. 63. (Chimaphila; Pursh 300.)—Class and order, *Decandria Monogynia*. Nat. Ord. *Bicornes*, Linn. *Ericæ*, Juss.

Gen. Ch. *Cal.* Perianth inferior, small, in five deep segments, permanent. *Cor.* Petals five, roundish, concave, spreading. *Stam.* Filaments ten, awl-shaped, shorter than the corolla; anthers drooping, large, with two horns at the base, each discharging the pollen by a terminal orifice. *Pist.* Germen superior, roundish, angular; style cylindrical, permanent, various in length and direction, sometimes scarcely any; stigma thickish, variously shaped. *Peric.* Capsule roundish, depressed, five-sided, of five cells, bursting at the angles. *Seeds* numerous, chaffy.

Ess. Ch. Calyx in five deep segments. Petals five. Capsule superior, with five cells, bursting at the angles, and many seeds. Anthers with two pores.

Obs. In some species the stamens and style are erect; in others inclined to one side or the other; in some the former spread every way. The form of the stigma is different in different species. In two American ones the stigma is nearly, or quite, sessile; on which mark Mr. Pursh's genus *Chimaphila* is founded, its name being nearly synonimous with Winter-green, the English appellation of *Pyrola*.

Section 1. *Style elongated. Pyrola* of Pursh.

1. P. *rotundifolia*. Round-leaved Winter-green. Linn. Sp. Pl. 567. Willd. n. 1. Ait. n. 1. Pursh n. 1. Engl. Bot. 213. (Pyrola; Ger. Em. 408. Camer. Epit. 723. Rivin. Pentap. Irr. t. 136. f. 2. P. vulgatior; Clus. Hist. v. 2. 116. Limonium; Fuchs. Hist. 467. L. sylvestre; Trag. Hist. 707.)—Stamens ascending. Style twice as long, deflexed and recurved. Cluster many-flowered. Calyx as long as the stamens.—Native of thickets, for the most

part in mountainous ſituations, in the more northern parts of Europe, alſo in North America, flowering in July. We have gathered it on the plain of mount Cenis, and in moiſt parts of the ſandy downs of Holland; oppoſite to which, on the Norfolk coaſt, this plant has likewiſe been found by the accurate Mr. Lily Wigg, growing among buſhes, on Bradwell common, not far from Yarmouth; where we likewiſe have ſeen it. There is more difficulty in aſcertaining an indubitable ſtation of this ſpecies in the northern or mountainous parts of Britain, becauſe of the *media* having been ſo much confounded with it, nor have we any ſpecimen from thoſe countries. The *roots* are perennial, long, creeping, thread-ſhaped, ſcaly. *Stems* very ſhort and ſimple, leafy, ſolitary at the end of each ſhoot of the root. *Leaves* four or five; on bordered ſmooth *footſtalks* of various lengths (from one to two inches); roundiſh or elliptical, obtuſe, an inch or inch and a half long, very obſcurely crenate, ſmooth, ſhining, reticulated with numerous veins; paler beneath. *Flower-ſtalk* terminal, ſolitary, about a ſpan long, angular, ſlightly twiſted, ſmooth, bearing a few ſcattered lanceolate membranous *bracteas*, and terminating in a long, rather looſe, *cluſter*, of from four to eight or ten large, handſome, white, drooping, but not quite pendulous, fragrant *flowers*, each having a ſimilar *bractea* to the reſt, at the baſe of the partial ſtalk, and fully equal to it in length. Segments of the *calyx* lanceolate, acute, full half the length of the *petals*, which, though uſually rounded and blunt, have ſometimes a pointed appearance. *Stamens* about the length of the calyx, all turned upward, and crowded together; their anthers deflexed, yellow, with orange horns. *Germen* ſhort, five-lobed. *Style* twice as long as the ſtamens, ſlender and quite pendulous in its lower part, gradually ſwelling towards the extremity, which is recurved. *Stigma* dilated, annular, with five ſmall central points. *Capſule* the ſize of a pea, depreſſed, five-lobed, crowned with the permanent ſtyle and ſtigma.

2. P. *chlorantha*. Greeniſh-flowered Winter-green.—Swartz in Stockh. Tranſ. for 1810. 190. t. 5. (P. folio obtuſo, flore viridiuſculo; Rivin. Pentap. Irr. t. 138. f. 1.)—Stamens ſlightly aſcending. Style twice as long, club-ſhaped, deflexed and recurved. Cluſter many-flowered. Calyx ſhorter than the ſtamens.—Native of Sweden, and probably, by the ſynonym of Rivinus, of Germany, flowering about the middle of July. Profeſſor Swartz diſtinguiſhes it from the foregoing, by the ſmaller, often abrupt, *leaves*; *ſtalk* almoſt deſtitute of *bracteas* below; *petals* of a whitiſh, or yellowiſh, green hue; and *ſtamens* leſs curved upwards. We gather alſo, from his figure and deſcription, that the *bracteas* which accompany each *flower* are much ſhorter than the partial ſtalks, and that the *calyx* alſo is ſhorter, and more cloſe-preſſed, than in *P. rotundifolia*. In the poſture and form of the *ſtyle* we find no difference. The common *flower-ſtalk* is remarkably ſpiral. Poſſibly the P. folio rotundo of Rivinus, t. 137, may repreſent this ſpecies in fruit; as the poſture of the permanent *ſtyles* agrees better with it than with the following.

3. P. *media*. Intermediate Winter-green. Swartz in Stockh. Tranſ. for 1804 (not 1784), 257. t. 7. f. 1. Engl. Bot. t. 1945. Winch Guide, v. 2. 19. (P. rotundifolia; Fl. Dan. t. 110.)—Stamens regularly inflexed. Style twice as long, deflexed perpendicularly. Cluſter of many pendulous flowers. Calyx ſhorter than the ſtamens.—Native of buſhy ſhady places in Sweden, and various parts of the north of England, flowering towards the end of June. We ſuſpect alſo that this is the Oxfordſhire ſpecies, commonly miſtaken for *minor*, and that it has often in Scotland, from whence we have ſpecimens, been taken for *rotundifolia*. The *leaves* moſt agree with the laſt-named, but the *flowers* differ eſſentially in being ſmaller, more pendulous, and of a leſs pure white. The *ſtamens* are nearly twice the length of the calyx, all regularly and equally inflexed, not at all turned upward. *Style* bent in a curve downward, its extremity furrowed, ſlightly thickened, vertical, not recurved. The *ſtalk* is ſpiral, as in the laſt, with about two diſtant *bracteas* in its lower part, the *bracteus* which accompany each flower being nearly as long as the partial ſtalks. Even Linnæus may perhaps have confounded this with his true *minor*.

4. P. *minor*. Leſſer Winter-green. Linn. Sp. Pl. 567. Willd. n. 2. Ait. n. 2. Engl. Bot. t. 158. Fl. Dan. t. 55. Rivin. Pentap. Irr. t. 136. f. 1. (P. roſea; Engl. Bot. t. 2543.)—Stamens regularly inflexed. Style the ſame length, ſtraight, ſtigma lobed, pointleſs. Cluſter of many drooping flowers. Stalk ſtraight.—Native of woods and thickets on the mountains of Europe; occurring in ſeveral parts of Scotland and the county of Durham, and flowering in July. This is ſmaller in general than any of the foregoing; the *leaves* more elliptical; *ſtalk* ſtraight, not ſpiral, with three principal angles and a ſmaller one, bearing a few broad *bracteas* near the baſe, but ſcarcely any other, except the ſmall awl-ſhaped ones at each partial ſtalk. The *flowers* are very numerous, but ſmall, drooping or even pendulous, white with more or leſs of a pink tinge. *Stamens* regularly incurved. Pores of the *anthers* dilated, not tubular. *Style* ſtraight, of a much ſhorter proportion than any of thoſe we have hitherto mentioned; the *ſtigma* large, five-lobed; depreſſed, and deſtitute of points, in the centre. We can no longer doubt that t. 158 and t. 2543 of Engliſh Botany repreſent one and the ſame ſpecies, which we poſſeſs alſo from mount Cenis, Savoy, and Switzerland, as well as in the Linnæan herbarium. *P. media*, having been confounded by botaniſts in general with this, has cauſed all our perplexity expreſſed in Engl. Bot. 2543. The plant which Mr. Lightfoot introduced at Bulſtrode, we judge from memory to have been *media*; ſee Engl. Bot. 158.

5. P. *aſarifolia*. Aſarabacca-leaved Winter-green. Michaux Boreal-Amer. v. 1. 251. Purſh n. 2.—"Leaves kidney-ſhaped. Stalk with a few ſheathing, convoluted, diſtant ſcales. Flowers turned every way. Style declining." *Michaux*.—Found by Michaux in Canada; by Purſh in beech woods on the mountains of Pennſylvania, flowering in July. The *flowers* are yellowiſh-green. If it were not for the "ſheathing ſcales," we ſhould ſuſpect this might be the ſame as our *chlorantha*, n. 2, whoſe *leaves* are often, it ſeems, ſhort and abrupt; but we have ſeen no ſpecimens anſwerable to either.

6. P. *dentata*. Toothed Winter-green.—Leaves elliptic-obovate, obtuſe, toothed. Stalk ſtraight, obſcurely angular, nearly naked. Stamens aſcending. Style deflexed, ſtrongly recurved. Stigma with a cylindrical point. Gathered by Mr. Menzies, on the weſt coaſt of North America. This ſpecies is readily diſtinguiſhed from all others, hitherto diſcovered, by its *leaves*, which are obovate, or ſomewhat elliptical, one and a half or two inches long, half or three quarters of an inch broad; their margin beſet with very remarkable diſtinct, ſmall, blunt teeth, uſually near a quarter of an inch aſunder; their ſurface not reticulated, but furniſhed with one ſeries of connected arching veins, on each ſide the midrib. *Footſtalks* triangular, about as long as the leaves. *Flower-ſtalk* ſix inches long, nearly naked, round, very ſlightly angular, bearing a long looſe *cluſter* of *flowers*, much reſembling thoſe of the firſt ſpecies in ſize and ſtructure, as well as in the poſition of their *ſtamens*; but their *ſtyle* is ſtill more remarkably recurved, ſo as to form a ſemicircle; and the point of the *ſtigma* much more prominent, of a cylindrical ſhape, five-cleft at the ſummit.

7. P. *aphylla*. Leafleſs Winter-green.—Stem and ſtalk ſcaly,

ſcaly, without leaves. Anthers beaked. Style deflexed and recurved. Stigma with a cylindrical point.—Gathered on the weſt coaſt of North America, by Mr. Menzies, who aſſures us the plant is always quite deſtitute of *leaves*, inſtead of which the angular *ſtem* bears numerous lanceolate, membranous, pointed *ſcales*, about half an inch in length, a few ſimilar but more remote ones being ſcattered along the *ſtalk*, which is angular. The *flowers* are nearly as large as the laſt, but our dried ſpecimen will not allow us to determine the poſture of the *ſtamens*. The *anthers* are long and narrow, with a ſmall acute point at the contrary end to the pores. *Style* deflexed, its end ſomewhat recurved. *Stigma* with a long cylindrical point, like the laſt.

8. P. *picta*. Variegated Winter-green.—Leaves ovate, ſomewhat ſerrated. Flowers drooping all one way. Pores of the anthers contracted, tubular. Style curved. Stigma abrupt, with five ſmall points.—This alſo was found by Mr. Menzies on the weſt coaſt of North America. In ſome points it agrees with the two laſt, as well as with the *rotundifolia* and its allies; in others it reſembles the following, but is a totally diſtinct ſpecies. The *leaves* are near an inch and half long, and almoſt an inch wide, ovate, bluntiſh, with ſhallow, more or leſs diſtant, ſerratures, rather fleſhy, marked with large branching veins, and variegated with white or yellowiſh blotches. *Footſtalks* nearly as long as the leaves. *Flower-ſtalk* ſix inches long, obliquely aſcending, quadrangular, twiſted, bearing two or three ſhort, ovate, pointed ſcales. *Flowers* numerous, as big as thoſe of the *rotundifolia*, all, as far as we can judge from the dried ſpecimen, drooping toward one ſide. *Calyx* ſhort, broad, and ſpreading. *Stamens* all, as far as can be diſcerned, alike diſpoſed round the germen; their *anthers* ſhort, ovate, minutely pointed, the pores prominent in the form of two ſhort narrow tubes, contracted at the orifice. *Style* curved, but we cannot tell in what direction. *Stigma* ſcarcely at all thicker than the ſtyle, abrupt, with an acute edge, and apparently five minute ſharp central points.

9. P. *ſecunda*. Serrated Winter-green. Linn. Sp. Pl. 567. Willd. n. 3. Ait. n. 3. Purſh n. 4. Fl. Dan. t. 402. Engl. Bot. t. 517. (P. ſecunda tenerior; Cluſ. Hiſt. v. 2. 117. Ger. Em. 408. P. folio mucronato; Rivin. Pentap. Irr. t. 138. f. 2.)—Leaves ovate, acute, ſerrated. Flowers drooping all one way. Pores of the anthers dilated. Style ſtraight. Stigma dilated, five-lobed.—Native of moſſy alpine woods in various parts of Europe, from Lapland to Greece, as well as of ſandy barren woods in North America, from Canada to New Jerſey, flowering in July. It occurs in fir or birch woods, in ſeveral parts of the highlands of Scotland; as alſo near Moffat in the lowlands; and according to Ray in Yorkſhire. The *ſtems* are long and trailing. *Leaves* ſcattered or crowded, an inch or more in length, with numerous fine ſhallow ſerratures, and abundance of reticulated veins. *Footſtalks* half the length of the leaves. *Flower-ſtalk* from three to ſix inches long, erect, ſtraight; round below; angular above; with two or three green ovate ſcales. *Cluſter* of many crowded greeniſh-white *flowers*, not half the ſize of the foregoing, nor ſo much expanded. *Stamens* regularly placed round the germen, at firſt curved, then ſtraight. *Anthers* whitiſh, ſhort, pointleſs; their pores ſomewhat oblique, but not tubular, ſoon becoming dilated and jagged. *Style* ſtraight, twice the length of the flower. *Stigma* much dilated, annular, but thin-edged, terminating in a large five-lobed umbilicated ſummit.

10. P. *uniflora*. Single-flowered Winter-green. Linn. Sp. Pl. 568. Willd. n. 6. Ait. n. 6. Purſh n. 5. Fl. Dan. t. 8. Engl. Bot. t. 146. (P. quarta minima; Cluſ. Hiſt. v. 2. 118. Ger. Em. 408. P. flore ſingulari; Rivin. Pentap. Irr. t. 139. f. 1.)—Stalk bearing a ſolitary flower. Pores of the anthers contracted, tubular. Stigma with five rays.—Native of alpine foreſts, among moſſy rills, in various parts of Europe and North America. It was firſt diſcovered, in the Britiſh dominions, by Mr. James Hoggan, who gathered wild ſpecimens, now before us, in the weſtern iſlands of Harris and Bernera, in 1783. Mr. James Hoy, and Mr. Brodie of Brodie, have alſo gathered this moſt elegant and curious plant in fir woods of the county of Moray. It is, like the reſt, perennial and evergreen, bloſſoming in July. The *leaves* vary greatly in ſhape and acuteneſs, but are generally roundiſh, about an inch long, more or leſs ſtrongly ſerrated, and reticulated with many veins. *Footſtalks* half as long. *Flower-ſtalk* ſolitary, ſimple, erect, three inches high, with one concave *bractea*, and a large, terminal, white, or ſlightly reddiſh, *flower*, an inch in diameter, and ſmelling like lily of the valley. *Stamens* ſpreading equally, half the length of the corolla, three of them lying on one of the petals, one only on another, and two on each of the three remaining. *Anthers* ſhort, ovate, pointleſs; their pores tubular, conſiderably elongated. *Style* erect, ſtraight, the length of the germen. *Stigma* large, of five thick, ſpreading, acute, ray-like lobes. The wild ſpecimen delineated in Engliſh Botany, having travelled from ſo great a diſtance, was in too imperfect a condition to allow of that figure being ſo good as uſual.

Section 2. *Stigma nearly ſeſſile.* *Chimaphila* of Purſh.

11. P. *umbellata*. Umbelled Winter-green. Linn. Sp. Pl. 567. Willd. n. 4. Ait. n. 4. Curt. Mag. t. 778. (P. tertia fruticans; Cluſ. Hiſt. v. 2. 117. Ger. Em. 408. P. folio arbuti; Rivin. Pentap. Irr. t. 139. f. 2. Chimaphila corymboſa; Purſh n. 2.)—Leaves obovate, ſerrated. Flowers ſomewhat umbellate. Stigma nearly ſeſſile. Stamens ſmooth.—Native of woods in the northern parts of Europe, Aſia and America, but not found wild in Britain. Mr. Menzies gathered it on the weſt coaſt of North America, and Mr. Purſh found it frequent in dry woods, from Canada to Virginia. Linnæus, Gmelin, Pollich, Roth, &c. give it in their Floras. Dr. Sims, who received this ſpecies in flower in June, from Mr. Loddiges, juſtly aſſerts it to be the moſt beautiful of all the genus. The *ſtem* is woody, a ſpan high, ſomewhat branched, angular, and roughiſh. *Leaves* crowded together into ſomething like whorls, ſtalked, narrow-obovate, bluntiſh, ſtrongly ſerrated; dark green and veiny above; paler beneath; about an inch and a half long. *Flower-ſtalks* terminal, ſolitary, three inches long, reddiſh, bearing about five, imperfectly umbellate, ſimple, partial ſtalks, each an inch long, ſpreading, rough with glandular pubeſcence, and ſometimes furniſhed with a little lanceolate *bractea*. *Flowers* ſmaller than that of *P. uniflora*, but larger than any other of the foregoing, drooping. *Petals* orbicular, concave, cream-coloured; crimſon at the baſe. *Stamens* ſhort, red, all regularly inflexed. *Anthers* ſhort, purple, with white tubular pores, dilated and lobed at the orifice. *Germen* globoſe, green. *Style* thick and very ſhort, but certainly preſent. *Stigma* orbicular, convex, with five ſlight notches. The American ſpecimens are uſually leſs umbellate, and more racemoſe, than the European.

12. P. *maculata*. Holly-leaved Winter-green. Linn. Sp. Pl. 567. Willd. n. 5. Ait. n. 5. Curt. Mag. t. 897. (P. mariana, arbuti foliis anguſtioribus, &c.; Pluk. Mant. 157. Phyt. t. 349. f. 4. Chimaphila maculata; Purſh n. 1.)—Leaves ovato-lanceolate, with tooth-like ſerratures. Stalks two or three-flowered. Stigma nearly ſeſſile. Stamens woolly.—This is excluſively an American ſpecies. Mr. Purſh obſerved it in ſhady gravelly or ſandy woods, from Canada to Carolina, and Mr. Menzies brought ſpeci-

mens from the north-weſt coaſt. It is now and then met with in our more curious gardens, requiring bog earth, with ſhade and moiſture, and flowering in June and July. Its ſhrubby habit is like the laſt, but of more humble growth. *Leaves* more pointed, with ſharper tooth-like ſerratures; their upper ſurface marked, along the rib and veins, with a pale ſtripe. Partial *flower-ſtalks* uſually two, rarely three, drooping. *Flowers* the ſize of the laſt, but white. *Stamens* denſely fringed in their lower part. *Anthers* with tubular jagged-mouthed pores. *Style* very ſhort and thick. *Stigma* hemiſpherical, nearly entire, green. Mr. Purſh ſays this plant is in high eſteem among the natives of North America for its medicinal qualities, and is called *Sip-ſiſewa*. He witneſſed a ſucceſsful cure of ſevere hyſterics by a decoction of this *Pyrola*.—We can by no means aſſent to the eſtabliſhment of that able writer's genus *Chimaphila*, hinted at by Michaux; there being ſurely no diverſity of habit to ſupport it; nor any character, but a difference of length in the ſtyle; which the other ſpecies of *Pyrola* ſhew to afford admirable ſpecific, but no generic, diſtinctions.

PYROLAMPIS, in *Zoology*. See GLOW-*worm*, and LAMPYRIS.

PYROLIGNEOUS ACID, or *Empyreumatic acid of wood*, in *Chemiſtry*, a ſpecies of empyreumatic ACETOUS *Acid* (which ſee), procured by diſtilling in a glaſs or earthen retort a quantity of ſhavings of any kind of wood, ſuch as box, guaiacum wood, or beech; in which caſe an extremely ſtrong-ſmelling dark-coloured empyreumatic acid liquor is obtained, nearly one-third of the weight of the wood. This acid is ſourer, and alſo much blacker and more empyreumatic, than either the *pyromucous* or *pyrotartareous* acid, probably as requiring a ſtronger heat for its production. The acid of wood is obtained in a large quantity near London, from the preparation of charcoal for gunpowder, by diſtilling wood in caſt-iron cylinders. It ſtains the hands deeply, and wood indelibly. This acid is procured in ſuch a quantity as to be an object of manufacture. At the beſt it is only an inferior acetous acid, and the difficulty of purifying it will prevent the profitable uſe of it in many of the arts to which vinegar is applied. However, as the proceſs for procuring radical vinegar at the ſame time purifies this empyreumatic acid, it may probably be uſed for this purpoſe. It may be added, that much of the acid from the diſtilled charcoal for gunpowder, near London, is employed by calico-printers in forming the acetated iron, uſed as a mordant, as in this caſe the colour and ſmell of the acid are not at all detrimental. Some time ago Vauquelin announced, as a *new* diſcovery, that pyroligneous acid is identically the ſame as the acetous; but this was known to Glauber near 200 years ago. In the folio edition of his works, p. 188, may be ſeen directions for its diſtillation, with a copper-plate of the apparatus which he employed. He there calls it the vinegar of wood. Parker's Chem. Catech. p. 195, note.

PYROMACHUS, a name given by ſome to antimony, when reduced to a ſtony hardneſs; and by others to copper, when fuſed with ſulphur, and thus rendered leſs ductile.

PYROMANCY, προμαντεια, a kind of divination, performed by means of fire.

The ancients imagined they could fortell futurity by inſpecting fire and flame: to this end they conſidered its direction, or which way it turned. Sometimes they added other matter to the fire, *e. gr.* a veſſel full of urine, with its neck bound about with wool, watching narrowly on which ſide it would burſt, and thence taking their augury.

Sometimes they threw pitch on it, and if it took fire immediately, they eſteemed it a good augury.

PYROMETER, formed of πυρ, *fire*, and μετρω, *I meaſure*, in *Phyſics*, the name of a machine contrived to meaſure the alteration of the dimenſions of metals, and other ſolid bodies, ariſing from heat.

Theſe inſtruments have been conſtructed of various forms; but as their object is to render the ſmall expanſions of ſolids apparent to the obſerver, they have conſiſted of a machine adapted to this purpoſe, and of an apparatus fit for heating the bodies under examination to a determined degree.

The moſt uſual, and, indeed, the moſt eligible mode of heating the bodies, is to place them in water, in which a thermometer is placed, and to heat the water by means of lamps. The ſmall expanſions of the heated ſolids have been rendered viſible, *firſt*, by multiplying-wheels, or by levers, or by fine ſcrews, which render a ſmall motion communicated to one end of the mechaniſm productive of a great movement at the other end; and, *ſecondly*, by magnifying the ſmall expanſion through microſcopes; which ſeems, upon the whole, to be the method that is both moſt certain and moſt manageable; for with wheels and pinions, and even with levers or ſcrews, there is always ſome equivocal motion, ariſing from the looſe connection of teeth and pinions, or from the ſtreſs and bending of other parts.

Muſchenbroek, who was the original inventor of this machine, has given a table of the expanſion of the different metals, in the ſame degree of heat. Having prepared cylindric rods of iron, ſteel, copper, braſs, tin, and lead, he expoſed them firſt to a pyrometer with one flame in the middle; then with two flames; and ſucceſſively to one with three, four, and five flames. But previous to this trial, he took care to cool them equally, by expoſing them ſome time upon the ſame ſtone, when it began to freeze, and Fahrenheit's thermometer was at thirty-two degrees. The effects of which experiment are digeſted in the following table, where the degrees of expanſion are marked in parts equal to the $\frac{1}{125\,00}$dth part of an inch.

Number of Flames.	Expanſion of					
	Iron.	Steel.	Copper.	Braſs.	Tin.	Lead.
By one flame - -	80	85	89	110	153	155
By two flames placed cloſe together	117	123	115	220		274
By two flames $2\frac{1}{2}$ inches diſtant	109	94	92	141	219	263
By three flames placed cloſe together	142	168	193	275		
By four flames placed cloſe together	211	270	270	361		
By five flames - -	230	310	310	377		

It is to be obſerved of tin, that it will eaſily melt when heated by two flames placed together. Lead commonly melts with three flames placed together, eſpecially if they burn long.

From theſe experiments it appears, at firſt view, that iron is the leaſt rarefied of any of theſe metals, whether it be heated by one or more flames; and therefore is moſt proper for making machines, or inſtruments, which we would have free from any alterations by heat or cold, as the rods of pendulums for clocks, &c. So likewiſe the meaſures of yards or feet ſhould be made of iron, that their length may be as nearly as poſſible the ſame, ſummer and winter.

The expanſion of lead and tin, by only one flame, is nearly the ſame; that is, almoſt double of the expanſion of iron. It is likewiſe obſervable, that the flames, placed together, cauſe a greater rarefaction than when they have a ſenſible interval between them; iron, in the former caſe, being expanded 117 degrees, and only 109 in the latter; the reaſon of which difference is obvious. By comparing the expanſion of the ſame metal, produced by one, two, three, or more flames, it appears, that two flames do not cauſe double the expanſion of one; nor three flames three times that expanſion, but always leſs; and theſe expanſions differ ſo much the more from the ratio of the number of flames, as there are more flames acting at the ſame time.

It is alſo obſervable, that metals are not expanded equally at the time of their melting, but ſome more, ſome leſs. Thus, tin began to run, when rarefied 219 degrees; whereas braſs was expanded 377 degrees, and yet was far from melting.

As to the conſtruction of M. Muſchenbroeck's pyrometer, together with Deſaguliers's alterations and improvements, the curious may conſult Deſagul. Experim. Philoſ. vol. i. p. 421, &c. See alſo Muſchenbroeck's tranſlation of the experiments of the Academy del Cimento, printed at Leyden in 1731. And for a pyrometer of a new conſtruction, by which the dilatations of metals in boiling fluids may be examined and compared with Fahrenheit's thermometer, ſee Muſchenb. Introd. ad Philoſophiam Nat. 4to. 1762, vol. ii. p. 610.

But it has been obſerved, that M. Muſchenbroeck's pyrometer was liable to ſome objections; and a contrivance was made, with a view of removing theſe, by Mr. Ellicott, who has given a deſcription of his improved pyrometer in the Philoſophical Tranſactions, N° 443. This may alſo be ſeen in Dr. Martyn's Abridgment, vol. viii. p. 464.

This inſtrument is formed with a flat piece of braſs A A, (*Plate* XXIII. *Miſcellany*, *fig.* 4.) which is ſcrewed down to a thick piece of mahogany. Upon this plate are ſcrewed three pieces of braſs, two of which, B, B, ſerve to ſupport the flat iron bar C, called the ſtandard bar. The upper part of the third piece of braſs is a circle D, about three inches in diameter, divided into three hundred and ſixty equal parts, or degrees: within this circle is a moveable plate *d*, divided likewiſe into three hundred and ſixty parts, and a ſmall ſteel index. The bar of metal E, upon which the experiment is to be made, is laid on the ſtandard bar. F is a lever two inches and a half long, faſtened to an axis, which turns in two pieces of braſs, ſcrewed to one of the ſupports B. To the end of this lever is faſtened a chain, or ſilk-line, which, after being wound round a ſmall cylinder, to which the index in the braſs circle, D, is faſtened, paſſes over a pulley, with a weight hung to the end of it. Upon the axis, to which the lever is fixed, is a pulley, a quarter of an inch in diameter, to which a piece of watch-chain is faſtened, the other end of which is hooked to a ſtrong ſpring G, which bears againſt one end of the metal E. H is a lever, exactly of the ſame form and dimenſions with the other; but the chain faſtened to the pulley on its axis is hooked to the ſtandard bar. The line faſtened to the end of this lever, after being wound round a cylinder, to which the moveable plate is fixed, paſſes over a ſmall pulley, and has a weight hung to the end of it; or rather the ſame line, paſſing under a pulley to which the weight is hung, has its other end faſtened to the lever F; ſo that one weight ſerves for both levers. From this deſcription it is plain, that whenever the bar E is lengthened, it gives liberty to the weight to draw the lever F upwards by its action to the ſpring G; and the index will, at the ſame time, by means of the ſilk line, be carried forward in the circle; and as the bar ſhortens, it will return back again: the ſame motion will be communicated to the ſtandard bar. When the bar is lengthened the 20th part of an inch, the index will be carried once round the braſs circle, which is divided into three hundred and ſixty degrees; and, therefore, if the metal lengthens the 7200dth part of an inch, the index will move one degree. In order to make an experiment with this inſtrument, lay a bar of any kind of metal, as E, on the ſtandard bar; then heat this bar to any degree of heat with a lamp, and mark the degree of its expanſion, as indicated by the moveable plate; obſerve alſo the degree of expanſion of the metal E, by the heat communicated to it from the ſtandard bar, as marked on the braſs circle by the index: let the inſtrument ſtand, till the whole is thoroughly cold; then removing the bar E, lay any others ſucceſſively in its place, and proceed exactly as before; and thus the degrees of expanſion of different metals, by the ſame degree of heat, may be eſtimated.

By the help of this inſtrument Mr. Ellicott found, upon a medium, that the expanſion of bars of different metals, as nearly of the ſame dimenſions as poſſible, by the ſame degree of heat, were as follow:

Gold,	Silver,	Braſs,	Copper,	Iron,	Steel,	Lead,
73	103	95	89	60	56	149

The great difference between the expanſions of iron and braſs, has been applied with good ſucceſs to remedy the irregularities in pendulums ariſing from heat. Phil. Tranſ. vol. xlvii. p. 485. See PENDULUM.

Mr. Graham uſed to meaſure the minute alterations, in length, of metal bars, by advancing the point of a micrometer-ſcrew, till it ſenſibly ſtopped againſt the end of the bar to be meaſured. This ſcrew, being ſmall and very lightly hung, was capable of agreement within the three or four thouſandth part of an inch. On this general principle Mr. Smeaton contrived his pyrometer, in which the meaſures are determined by the contact of a piece of metal with the point of a micrometer-ſcrew. A B C D (*fig.* 5.) repreſents the main bar or baſis of this inſtrument; E F is the bar to be meaſured, lying in two notches, one fixed to the upright ſtandard A B, the other to the principal lever H I; the end E of the bar E F bears againſt the point of G, a ſcrew which is of uſe in examining the micrometer-ſcrew; the other end of the bar F bears againſt a ſmall ſpherically protuberant bit of hard metal, fixed at the ſame height as G, in the principal lever H I; K is an arbor fixed in the baſis, which receives at each end the points of the ſcrews, H, L, upon which the lever H I turns and ſerves as a fulcrum to it; O is a ſlender ſpring, to keep the lever in a bearing ſtate againſt the bar; and P is a check, to prevent the lever from falling forward, when the bar is taken out; N is the feeler, ſomewhat in the ſhape of a T, ſuſpended, and moveable up and down upon the points of the ſcrews,

I, M,

I, M, which, as well as L, H, are ſo adjuſted as to leave the motion free, but without ſhake; Q R is the handle of the feeler, moveable upon a looſe joint at R, ſo that laying hold of it at Q, the feeler is moved up and down, without being affected by the irregular preſſure of the hand; the extremity, S, of the feeler is alſo furniſhed with a bit of protuberant hard metal, to render its contact with the point of the micrometer-ſcrew more perfect; T is the micrometer-ſcrew; V the divided index-plate; and W a knob for the handle; the micrometer-ſcrew paſſes through two ſolid ſcrewed holes at D and Y; the piece Y Z is made a little ſpringy, and endeavours to pull the ſcrew backwards from the hole at D, and conſequently keeps the micrometer-ſcrew conſtantly bearing againſt its threads the ſame way, and thereby renders the motion thereof perfectly ſteady and gentle; X is the index, having diviſions upon it, anſwering to the turns of the ſcrew. This piece points out the diviſions of the plate, as the face of the plate points out the diviſors upon the index. When the inſtrument is uſed, lay hold of the knob at Q with one hand, and, moving the feeler up and down, with the other move forward the ſcrew T, till its point comes in contact with the feeler; then will the plate and index, V and X, ſhew the turns and parts. The baſis of this inſtrument, as well as the other parts of it, is braſs: one end of which is continued of the ſame piece at right angles, to the height of three inches and a half; and the other end acts upon the middle of a lever of the ſecond kind, whoſe fulcrum is in the baſis; and, therefore, the motion of the extremity of the lever is double the difference between the expanſion of the bar and the baſis. Hence, having the length of the lever from its fulcrum to the point of ſuſpenſion of the feeler, the diſtance between the fulcrum and the point of contact with the bar, the inches and parts that correſpond to a certain number of threads of the micrometer, and the number of diviſions in the circumference of the index-plate; the fraction of an inch expreſſed by one diviſion of the plate may be deduced. Thoſe meaſures are as follow: from the fulcrum of the lever to the feeler, 5.875 inches; from the fulcrum to the point of contact, 2.895 inches; length of ſeventy threads of the ſcrew, 2.455 inches; and the diviſions in the circumference of the index-plate, 100. Hence the value of one diviſion will be the $\frac{1}{57803}$d part of an inch: but if the ſcrew be altered one-fourth of one of theſe diviſions, when the contact between the ſcrew and feeler is well adjuſted, the difference of contact will be very perceivable to the ſlighteſt obſerver; and, conſequently, $\frac{1}{231215}$th part of an inch is perceivable in this inſtrument. When the inſtrument is made uſe of, it is immerged, together with the bar to be meaſured, in a ciſtern of water; which water, by means of lamps underneath, is made to receive any intended degree of heat not greater than that of boiling, and thereby communicates the ſame degree of heat to the inſtrument, the bar, and to a mercurial thermometer immerged therein, for the purpoſe of aſcertaining that degree. See *fig.* 6, in which A B is the ciſtern, C the cover, which, when the inſtrument (*fig.* 5.) is raiſed upon blocks, goes on between the bar E F and the baſis B C; D a handle to take off the cover, when hot; E the mercurial thermometer; F the cock, to let out the water; and G H a hollow piece of tin, which ſupports ſeven ſpirit lamps, which are raiſed higher or lower by the ſcrews I and K, in order to give the water in the ciſtern a proper degree of heat. With this pyrometer Mr. Smeaton performed ſeveral experiments, which are arranged in a table; and their reſult agrees very well, he obſerves, with the proportions of expanſions of ſeveral metals given by Mr. Ellicott. The following table ſhews how much a foot in length of each metal grows longer, by an increaſe of heat correſponding to 180° of Fahrenheit's thermometer, or to the difference between freezing and boiling water, expreſſed in ſuch parts of which the unit is equal to the 10,000dth part of an inch.

1.	White-glaſs barometer-tube	100.
2.	Martial regulus of antimony	130.
3.	Bliſtered ſteel	138.
4.	Hard ſteel	147.
5.	Iron	151.
6.	Biſmuth	167.
7.	Copper hammered	204.
8.	Copper eight parts, mixed with tin one	218.
9.	Caſt braſs	225.
10.	Braſs ſixteen parts, with tin one	229.
11.	Braſs wire	232.
12.	Speculum metal	232.
13.	Spelter ſolder, *viz.* braſs two parts, zinc one	247.
14.	Fine pewter	274.
15.	Grain tin	298.
16.	Soft ſolder, *viz.* lead two, tin one	301.
17.	Zinc eight parts, with tin one, a little hammered	323.
18.	Lead	344.
19.	Zinc or ſpelter	353.
20.	Zinc hammered half an inch *per* foot	373.

For a farther account of this inſtrument, with its uſe, ſee Phil. Tranſ. vol. xlviii. art. 79. p. 598, &c.

Mr. Ferguſon has conſtructed and deſcribed a pyrometer, which makes the expanſion of metals by heat viſible to the 45,000dth part of an inch. The upper ſurface of this machine is repreſented by *fig.* 7. Its frame, A B C D, is made of mahogany, on which is a circle divided into three hundred and ſixty equal parts; and within that circle is another, divided into eight equal parts. If the ſhort bar E be puſhed one inch forward (or toward the centre of the circle,) the index *e* will be turned 125 times round the circle of 360 parts or degrees. As 125 times 360 is 45,000, it is evident, that if the bar E be moved only the 45,000dth part of an inch, the index will move one degree of the circle. But, as in this pyrometer the circle is nine inches in diameter, the motion of the index is viſible to half a degree, which anſwers to the 90,000dth part of an inch in the motion or puſhing of the ſhort bar E.

One end of a long bar of metal F is laid into a hollow place in a piece of iron G, which is fixed to the frame of the machine; and the other end of this bar is laid againſt the end of the ſhort bar E, over the ſupporting croſs-bar H I: and, as the end, *f*, of the long bar is placed cloſe againſt the end of the ſhort bar, it is plain that if F expands, it will puſh E forward, and turn the index *e*.

The machine ſtands upon four ſhort pillars, high enough from a table, to let a ſpirit lamp be put on the table under the bar F; and, when that is done, the heat of the flame of the lamp expands the bar, and turns the index.

There are bars of different metals, as ſilver, braſs, and iron; all of the ſame length as the bar F, for trying experiments on the different expanſion of different metals, by equal degrees of heat applied to them for equal lengths of time; which may be meaſured by a pendulum that ſwings ſeconds. Thus,

Put on the braſs bar F, and ſet the index to the 360th degree: then put the lighted lamp under the bar, and count the number of ſeconds in which the index goes round the plate, from 360 to 360 again; and then blow out the lamp, and take away the bar.

This done, put on an iron bar F where the braſs one was

was before, and then ſet the index to the 360th degree again. Light the lamp, and put it under the iron bar, and let it remain juſt as many ſeconds as it did under the braſs one; and then blow it out, and you will ſee how many degrees the index has moved in the circle: and by that means you will know in what proportion the expanſion of iron is to the expanſion of braſs; which will be found to be as 210 is to 360, or as 7 to 12. By this method, the relative expanſion of different metals may be found.

The bars ought to be exactly of equal ſize, and to have them ſo, they ſhould be drawn, like wire, through a hole.

When the lamp is blown out, you will ſee the index turn backward; which ſhews that the metal contracts as it cools.

The inſide of this pyrometer is conſtructed as follows.

In *fig.* 8. A *a* is the ſhort bar, which moves between rollers; and, on the ſide *a*, it has fifteen teeth in an inch, which take into the leaves of a pinion B (twelve in number), on whoſe axis is the wheel C of one hundred teeth, which take into the ten leaves of the pinion D, on whoſe axis is the wheel E of one hundred teeth, which take into the ten leaves of the pinion F, on the top of whoſe axis is the index above-mentioned.

Now, as the wheels C and E have one hundred teeth each, and the pinions D and F have ten leaves each, it is plain, that if the wheel C turns once round, the pinion F, and the index on its axis, will turn one hundred times round. But, as the firſt pinion B has only twelve leaves, and the bar A *a* that turns it has fifteen teeth in an inch, which is twelve and a fourth part more; one inch motion of the bar will cauſe the laſt pinion F to turn one hundred times round, and a fourth part of one hundred over and above, which is twenty-five. So that if A *a* be puſhed one inch, F will be turned one hundred and twenty-five times round.

A ſilk thread *b* is tied to the axis of the pinion D, and wound ſeveral times round it; and the other end of the thread is tied to a piece of ſlender watch ſpring G, which is fixed in the ſtud H. So that as the bar *f* expands, and puſhes the bar A *a* forward, the thread winds round the axle, and draws out the ſpring; and as the bar contracts, the ſpring pulls back the thread, and turns the work the contrary way, which puſhes back the ſhort bar A *a* againſt the long bar *f*. This ſpring always keeps the teeth of the wheels in contact with the leaves of the pinions, and ſo prevents any ſhake in the teeth.

In *fig.* 7. the eight diviſions of the inner circle are ſo many thouſandth parts of an inch in the expanſion or contraction of the bars; which is juſt one thouſandth part of an inch for each diviſion moved over by the index. Ferguſon's Lectures on Mechanics, Supplem. p. 7, &c. 4to.

Another pyrometer was invented by M. De Luc, in conſequence of a hint ſuggeſted to him by Mr. Ramſden. The baſis of this inſtrument is a rectangular piece of deal board two feet and a half long, fifteen inches broad, and one inch and a half thick, and to this all the other parts are fixed. This is mounted in the manner of a table, with four deal legs, each a foot long, and an inch and a half ſquare, well fitted near its four angles, and kept together at the other ends by four firm croſs-pieces. This ſmall table is ſuſpended by a hook to a ſtand; the board being in a vertical ſituation in the direction of its grain, and bearing its legs forward in ſuch a manner as that the croſs-pieces which join them may form a frame, placed vertically facing the obſerver. This frame ſuſtains a microſcope, which is firmly fixed in another frame that moves in the former by means of grooves, but with a very conſiderable degree of tightneſs; the friction of which may be increaſed by the preſſure of four ſcrews. The inner ſliding frame, which is likewiſe of deal, keeps the tube of the microſcope in a horizontal poſition, and in great part without the frame, inſomuch that the end which carries the lens is but little within the ſpace between the frame and the board. This microſcope is conſtructed in ſuch a manner as that the object obſerved may be an inch diſtant from the lens; and it has a wire which is ſituated in the focus of the glaſſes, in which the objects appear reverſed. At the top of the apparatus there is a piece of deal, an inch and a half thick, and two inches broad, laid in a horizontal direction from the board to the top of the frame. To this piece the rods of different ſubſtances, whoſe expanſion by heat is to be meaſured, are ſuſpended: one end of it ſlides into a ſocket, which is cut in the thickneſs of the board, and the other end, which reſts upon the frame, meets there with a ſcrew, which makes the piece move backwards and forwards, to bring the objects to the focus of the microſcope. There is a cork very ſtrongly driven through a hole bored vertically through this piece; and in another vertical hole, made through the cork, the rods are fixed at the top; ſo that they hang only, and their dilatation is not counteracted by any preſſure. In order to heat the rods, a cylindrical bottle of thin glaſs, about twenty-one inches high, and four inches in diameter, is placed in the inſide of the machine, upon a ſtand independent of the reſt of the apparatus. In this bottle the rods are ſuſpended at a little leſs than an inch diſtance from one of the ſides, in order to have them near the microſcope. Into this bottle is poured water of different degrees of heat, which muſt be ſtirred about by moving upwards and downwards, at one of the ſides of the bottle, a little piece of wood faſtened horizontally at the end of a ſtick: in this water is hung a thermometer, the ball of which reaches to the middle of the height of the rods. During theſe operations the water riſes to the cork, which thus determines the length of the heated part; the bottle is covered to prevent the water from cooling too rapidly at the ſurface; and a thin caſe of braſs prevents the vapour from fixing upon the piece of deal to which the rods are fixed. This pyrometer is repreſented in *fig.* 9, in which *a a* is the ſtand to which it is ſuſpended; *b* the hook from which it hangs; *c c c* the deal-board, which is the baſis of the whole apparatus; *d, d, d, d,* four arms, to which is fixed the frame *e e e e*: the other frame which carries the microſcope is *s s s s*: *g, g,* are two croſs-pieces, through which paſſes the tube of the microſcope, and which ſupport it near both ends; *h h* is the microſcope; *i* its micrometer; *k* the cork, through which paſſes the glaſs rod *l l*, and by which it is kept ſuſpended; *m* a rod of metal, or any other ſubſtance leſs dilatable than glaſs; *n* the point of union, obtained by means of two connected rings, in which both rods are faſtened by ſcrews: above theſe is another pair of rings, in one of which the metal rod is free, and which rod it ſupports; *o p* the piece to which the glaſs rod is ſuſpended; *q* a ſquare piece fixed to the frame by four ſcrews, behind which is a box, in which, as well as in a groove cut in the baſis in *p*, the piece *o p* ſlides; *r* a ſcrew, which paſſes through the ſquare piece *q*, whoſe uſe is to move backwards or forwards the piece *q*, in order to bring the ſurface of the metal rod to the focus of the microſcope: *s, s, s, s,* four ſcrews, with round metal plates behind their heads, which ſerve to preſs the frame of the microſcope againſt the frame *e e e e*; the longitudinal openings, through which the ſcrews paſs, permit the free motion of the firſt frame, when one ſtrikes gently with a hammer to the bottom or the top of one of the ſides. If the microſcope is wanted higher or lower than the grooves permit, the ſcrews may be removed

moved to other holes made on purpoſe in the ſide pieces or the frame *eeee*: *tttt* is the cylindrical bottle, in which hang the rods in order to be heated at different degrees by water of various temperatures; *u*, *u*, are the ſupporters of the bottle; *x* the thermometer ſuſpended in the water; *y y* a rod, to the lower end of which is fixed a ſmall plate, to ſtir the water, by moving it up and down; *z z* a ſyphon, one branch of which is within, and the other without, the bottle, the latter being furniſhed with a cock, which ſerves to draw off the quantity of water that is neceſſary for changing the temperature in the bottle. For a farther account of this inſtrument, together with the principle of its conſtruction and uſe, both in the comparative meaſure of the expanſions of bodies by heat, and the meaſure of their abſolute expanſion, and the experiments made with it, we muſt refer to an elaborate eſſay of M. De Luc on Pyrometry, &c. in the Phil. Tranſ. vol. lxviii. part i. art. 20. p. 419—546.

All the contrivances above deſcribed muſt be conſidered as inferior to that conſtructed by Mr. Ramſden, of which general Roy has given an accurate and minute account in the Phil. Tranſ. vol. lxxv. p. 462. We ſhall here give ſuch an account as our limits will allow of this inſtrument, the conſtruction of which is ſo accurate, ſays major-general Roy, that it ſeems not eaſy to improve it; and refer for a fuller account illuſtrated by appropriate drawings. This pyrometer, named the *microſcopic*, becauſe by means of two microſcopes attached to it, the expanſion is meaſured, conſiſts of a ſtrong deal frame, 5 feet long, nearly 28 inches broad, and about 42 inches in height. The metallic bar, whoſe expanſion is to be meaſured, and which may be even five feet long, is placed in a copper trough little longer than five feet; and this is placed over 12 ſpirit lamps, the flames of which heat the water of that trough fully to the boiling point, and of courſe heat the bar which is plunged into it. Two other wooden troughs, alſo full of water, are placed parallel to, and at a little diſtance from, the copper one. Each of theſe contains a caſt-iron priſmatic bar. To the ends of one of theſe bars two microſcopes are faſtened in an horizontal ſituation, perpendicularly to the bars. One of theſe microſcopes is furniſhed with a micrometer, or mechaniſm, to meaſure the magnified image of an object; the other microſcope has a ſimple mark. The parts of the microſcopes, as well as the proper marks for meaſurement, are ſo ſeparated and diſpoſed, partly upon the ends of the caſt-iron rods, and partly upon the ends of the rod under examination, that if any of them be lengthened or ſhortened, that alteration is clearly perceived through the microſcopes, and may be meaſured by means of the micrometer. It follows, that if the temperature of the caſt-iron priſmatic bars be kept unaltered, whilſt that of the bar under examination is increaſed, then the increaſe of length, which is meaſured by the micrometer, muſt be attributed to that bar only, and by theſe means the expanſions of ſeven ſubſtances were aſcertained. For further particulars relating to the conſtruction and uſe of this inſtrument, we refer to the Tranſactions (ubi ſupra), and to the article EXPANSION in this Cyclopædia. For an account of Wedgwood's pyrometer, ſee THERMOMETER. Alſo, for a deſcription of Mr. Troughton's pyrometer, we are under the neceſſity of referring to the ſame article.

PYROMUCOUS ACID, or *Empyreumatic acid of ſugar*, or *Syrupous acid*, is different from the acid of ſugar, or OXALIC *Acid*, (which ſee,) and denotes that pungent acid vapour of ſugar, or any ſaccharine matter ſtrongly heated, which is familiar to every perſon who has ever entered a ſugar baking-houſe. It is prepared by chemiſts in the following manner: Put into a very large glaſs retort any quantity of pulverized ſugar of any kind, ſo as to fill only $\frac{1}{4}$th of it, as the matter very much ſwells in the proceſs: adapt to it a large receiver, not cloſely luted, and heat it gradually on a ſand-bath. A great quantity of gas ariſes when the ſugar begins to be ſcorched, which is moſtly carbonic acid mixed with an inflammable gas, probably the gaſeous oxyd of carbon. In the receiver is condenſed a weak acidulous liquor, coloured by an oily matter, and alſo apparently fouled by a portion of fuliginous matter volatilized during the diſtillation. The quantity of acid, obtainable in this proceſs, varies according to the regulation of the fire, which ſhould at leaſt be puſhed ſo as to make the retort red-hot, and to reduce the ſugar to a perfect charcoal; but in general about $\frac{2}{3}$ths of the weight of ſugar may be obtained of the diſtilled acid. Gum mucilage, manna, honey, ſtarch, and other mucous or mucoſo-ſaccharine ſubſtances, yield, by diſtillation, the ſame acid as ſugar. Aikin, Dict. Min.

PYRONOMIA, a term uſed by the chemical writers to expreſs the art of regulating fire, ſo as to make it ſubſervient to all their proceſſes in a determinate degree.

PYROPE, in *Mineralogy*, a precious ſtone, formerly called the Bohemian garnet. (See GARNET.) The colour is a dark blood red: when held between the eye and the light, the red colour inclines to a yellow. The pyrope is never found cryſtallized, but occurs in ſmall round or angular fragments imbedded in ſerpentine rock, or ſcattered in the ſands on the ſea-ſhore, and in alluvial ground. It ſcratches quartz. The ſpecific gravity is ſtated by Klaproth 3.718. On account of its luſtre, tranſparency, colour, and hardneſs, it is much prized by jewellers. The ſmall grains, when powdered, are applied to cut ſofter ſtones. According to Klaproth, the conſtituent parts of pyrope are

Silex	40.0	
Alumine	28.50	
Magneſia	10.00	
Lime	3.50	
Oxyd of iron	16.50	
Oxyd of manganeſe	0.25	
Loſs	1.25	B.

PYROPHAGI. See FIRE-*Eaters*.

PYROPHANES, in *Mineralogy*, a variety of the ſemi-opal; ſo called becauſe, being heated in a ſpoon, it becomes tranſparent, but returns to its opaque ſtate when cold, as Mr. Landriani has diſcovered. M. Sauſſure, junior, renders common hydrophanes tranſparent, and of a topaz colour, when heated by digeſting them in melted wax. It is ſaid that ſome pyrophanes are found in Armenia, which are tranſparent while expoſed to the ſun, and opaque at night. See GEM.

PYROPHORUS, formed of πυρ, *fire*, and φερω, *I bear*, in *Chemiſtry*, the name uſually given to that ſubſtance called by ſome *black phoſphorus*; a chemical preparation poſſeſſing the ſingular property of kindling ſpontaneouſly when expoſed to the air.

This ſubſtance was accidentally diſcovered by M. Homberg, who prepared it of alum and human fæces. (See PHOSPHORUS *Fæcalis*.) See alſo M. Le Fevre's preparation, deſcribed under PHOSPHORUS *of Sulphur*.

It was apprehended for a conſiderable time after the diſcovery, that human fæces were eſſential to the operation, till the youngeſt ſon of the great Lemery found, that honey, ſugar, flour, and, indeed, any animal or vegetable matter, might be ſubſtituted inſtead of the human fæces; and ſince that time, M. de Suvigny has ſhewn that moiſt vitriolic ſalts may be ſubſtituted for the alum; having added to the alu-

minous pyrophorus of Homberg two other claſſes of ſubſtances of this kind, *viz.* the metallic, or thoſe made with the three vitriols of iron, copper, and zinc; and the neutral, or thoſe compoſed of vitriolated tartar and Glauber's ſalt.

The aluminous pyrophorus may be made in the following manner. Take four or five parts of alum, and one part of wheat flour, or any animal or vegetable ſubſtance; calcine theſe together to a brown or blackiſh maſs: powder the maſs, and put it into a phial; ſtop it looſely with paper, and ſet it in a ſand heat, ſo as to make it continue glowing-hot for ſome time; after this remove the whole from the fire, ſet it to cool gradually, and finally ſtop the bottle very cloſe down.

The following proceſs is recommended by Macquer for this preparation. Let three parts of alum and one part of coarſe brown ſugar be mixed together. This mixture muſt be dried in an iron ladle or ſhovel over a moderate fire, till it be almoſt reduced to a blackiſh powder or coal; during which operation it muſt be ſtirred with an iron ſpatula. Any large maſſes muſt be bruiſed into powder, and then it muſt be put into a glaſs matraſs, the mouth of which is rather ſtraight than wide, and its length ſeven or eight inches. This matraſs is to be placed in a crucible, or rather earthen veſſel, large enough to contain the belly of the matraſs, with about a ſpace equal to the thickneſs of a finger all round it. The ſpace is to be filled with ſand, ſo that the matraſs ſhall not touch the earthen veſſel: the apparatus is then to be put in a furnace, and the whole to be made red-hot; the fire muſt be gradually applied, that any oily or fuliginous matter may be expelled. After which, when the matraſs is made red-hot, ſulphureous vapours exhale: this degree of heat is be continued till a truly ſulphureous flame, which appears at the end of the operation, has continued nearly a quarter of an hour: the fire is then to be extinguiſhed, and the matraſs to cool without taking it out of the crucible; and when it ceaſes to be red-hot, it muſt be ſtopped with a cork. Before the matraſs is perfectly cold, it muſt be taken out of the crucible; and the powder it contains muſt be poured into a very dry glaſs phial, which muſt be well cloſed with a glaſs ſtopper. If we would preſerve this pyrophorus a long time, the bottle containing it muſt be opened as ſeldom as poſſible. Sometimes it kindles while it is poured into the glaſs phial, but it may be then extinguiſhed by cloſing the phial expeditiouſly.

Another excellent method of preparing pyrophorus, cited by Aikin from Higgins's Minutes, is the following. Mix together three parts of Roman alum, and one of flour, and heat the mixture to dryneſs in an iron pot, as already deſcribed: the black calcined maſs thus produced is to be put into ounce phials of green glaſs, coated without and within with clay. The phials thus charged are to be lightly ſtopped with balls of tempered clay, and then ſet up to their necks in ſand in an iron pot; charcoal powder is then to be ſtrewed on to the depth of half an inch, over which is to be placed an earthen cover, luted to the pot. The whole apparatus is now to be placed in a furnace, and kept at a red heat for an hour and a half; at the expiration of which period, being taken out of the furnace and cooled quickly, it is to be unpacked, and the phials containing the pyrophorus are to be placed with their mouths inverted in mercury, in which ſituation the pyrophorus may be kept for many years without injury.

When half a drachm of this pyrophorus is put on a piece of paper and expoſed to air, it quickly kindles, becomes red like burning coals, emits a ſtrongly ſulphureous vapour, and burns the paper or other combuſtible body which ſupports it: and nothing is left but the white earthy baſe of the alum. When no ſenſible change takes place in the pyrophorus, either from a defect in the preparation, or from ſome air remaining in the phial that contains it, the combuſtion may be effected by breathing on the powder, and thus ſupplying it with the moiſture which ſeems to be the primary agent in this phenomenon. The pyrophorus that is made in the laſt method we have recited is ſo highly inflammable as to take fire while it is falling from the mouth of the phial. If it be poured into a jar of pure oxygen gas, it forms a brilliant fiery ſhower: the oxygen is for the moſt part conſumed, and there remain in the jar ſulphureous acid and carbonic acid gaſes: the pyrophorus alſo being conſumed with the exception of its aluminous baſe.

The ſpontaneous accenſion of the aluminous pyrophorus, on its being expoſed to the air, has been a ſubject of conſiderable diſcuſſion among chemiſts and philoſophers; ſeveral of whom have adopted the hypotheſis propoſed by M. de Suvigny, in the Memoires de Mathematique et de Phyſique, tom. iii. To explain this curious appearance, M. de Suvigny obſerves, that the vitriolic acid in the alum, during the calcination in the phial, leaves its earthy baſis, and unites with the phlogiſton in the coal. By its union with this inflammable matter, a part of it is undoubtedly rendered volatile, and exhales partly under the form of volatile vitriolic acid, and partly in that of a blue ſulphureous flame; while another part of it combines likewiſe with the phlogiſton forming a real ſulphur, or an earthy hepar ſulphuris; in which the ſulphur is protected from the fire by the earth with which it is combined, and the particles of which remain every where intermixed with thoſe of the powder. Thus far (ſays Mr. Bewly, an excellent chemiſt and philoſopher) M. de Suvigny is ſupported by the appearances, and by a juſt chemical analyſis of the powder: but he proceeds farther, and ſuppoſes that, at the end of the proceſs, a part of the vitriolic acid is left in a diſengaged, or uncombined ſtate, and highly concentrated. In this ſtate it is well known that this acid attracts moiſture, and at the ſame time generates a conſiderable degree of heat. When the pyrophorus, therefore, is expoſed to the air, he again ſuppoſes that this diſengaged and concentrated acid ſuddenly attracts the watery particles floating in the atmoſphere, and by the heat thus generated, ſets fire to the ſulphur and other inflammable matter contained in the powder. This hypotheſis he has endeavoured to eſtabliſh by the following obſervations; that the pyrophorus, as he apprehends, can be made only with ſubſtances fit for producing ſulphur, or with ſulphur itſelf; —that no pyrophorus will be produced, if the mixture be calcined by too long or too violent a fire; becauſe then the whole vitriolic acid can be combined into perfect ſulphur, and conſequently is engaged, and not in a proper ſtate to attract the moiſture of the air; or elſe if it does not combine into ſulphur, being half diſengaged from its baſis, it is driven off by the violence or long continuance of the fire; and, conſequently, after this complete calcination, no acid remains partly diſengaged, as it ought to be, that it might unite with the water with ſufficient activity:—that when the pyrophorus is very ſlowly moiſtened, as when it is kept in a bottle not well cloſed, it does not kindle, becauſe ſufficient heat is not produced by this ſlow and gradual attraction of water; it is alſo ſpoiled and rendered incapable of kindling, when expoſed to the open air; becauſe its acid becomes then ſaturated, or nearly ſaturated with moiſture, and cannot, therefore, unite with that of the air with ſufficient activity:—that a pyrophorus, thus ſpoiled by expoſure to moiſture, may be reſtored to its peculiar properties by making it again red-hot in a matraſs; ſince by this calcination its partly-

diſengaged acid is again concentrated, and reſumes all its force of combining with water;—and, laſtly, that the inflammation of the pyrophorus is accelerated by placing it upon a paper a little wetted, or by breathing upon it; becauſe the acid then attracts the moiſture more haſtily, and conſequently with more heat.

M. de Suvigny extends the ſame reaſoning to the ſeveral other pyrophori which he diſcovered, ſimilar to that of alum; particularly to thoſe which are made by ſubſtituting vitriolated tartar, Glauber's ſalt, and other vitriolic ſalts with metallic, earthy, or alkaline baſes, in the room of alum. Mr. Bewly has examined this hypotheſis with his uſual acuteneſs and accuracy; and from numerous well-conducted experiments he is led to conclude, that pyrophori of all the above-mentioned claſſes may be prepared, differing from them in no other particular, except that they contain no vitriolic acid, and which nevertheleſs kindle as readily, on being expoſed to the air, as thoſe which have been impregnated with that principle. In order to ſhew that the preſence of vitriolic acid is not neceſſary to conſtitute the pyrophorus made with vitriolated tartar, he added to a quantity of this tartar more than an equal weight of powdered charcoal, and calcined the mixture a long time, in a red heat, in an open crucible; frequently ſtirring the powder, in order to expel from it as much of the vitriolic acid as poſſible; the calcination was alſo ſometimes repeated with freſh charcoal: and yet on heating the ſalt, thus deprived of a conſiderable part of its acid, with charcoal, in a crucible or tobacco-pipe, in the manner which we ſhall here ſubjoin, he obſerved no diminution in its quality of producing a pyrophorus.

Mr. Bewly, in ſeveral of his experiments, made uſe of the bowl of a tobacco-pipe, in which he combined the materials, which he wiſhed to examine in ſmall quantities, and in an expeditious manner; preſſing them down ſlightly, ſo as to fill half or three-fourths of the bowl, and filling the remainder of it with fine ſand. This is kept in a red heat twenty minutes, or half an hour; or it may continue there two hours longer, if the operator pleaſes, without any injury to the pyrophorus. The pipe being taken out of the fire, the matter is knocked out of it as ſoon as it becomes cool, and generally, pretty ſoon afterwards, takes fire ſpontaneouſly. Thus he formed his pyrophorus with a mixture conſiſting of two parts of alum, previouſly calcined in a red heat; and of powdered charcoal and ſalt of tartar each one part.

In another experiment, having added ſucceſſively various and increaſing quantities of fixed alkali to the ſalt heated as above, till the vitriolic acid contained in the mixture might be conſidered nearly as an evaneſcent quantity, a pyrophorus was ſtill produced on calcining it with charcoal as before. He alſo mixed equal parts of ſalt of tartar, and vegetable or animal coal, or ſometimes three parts of the former with two of the latter, and calcined them in the uſual manner; and this compoſition, on being expoſed to the air, generally kindled in half a minute or a minute; though, as it contained no ſulphur, it did not burn with ſo much vivacity as the vitriolic pyrophori. This, which Mr. Bewly calls the alkaline pyrophorus, differs in no circumſtance from M. de Suvigny's neutral pyrophori, except in its not containing that principle to which he aſcribes their accenſion. However, leſt it might be ſuſpected that the ſalt of tartar which he employed might accidentally contain vitriolated tartar, or vitriolic acid, he repeated the experiment with tartar calcined by himſelf, as well as with nitre fixed or alkaliſed by deflagration with charcoal, and with iron filings; and in all theſe caſes with the ſame reſult. By diverſifying in a like manner M. de Suvigny's experiments on the metallic pyrophori, Mr. Bewly found that none of the three vitriols, heated with charcoal alone, in his uſual method, could produce a pyrophorus. And thus he found that the addition of an alkaline ſalt to the compoſition, which was a part of M. de Suvigny's proceſs, was eſſential to its ſucceſs.

Treating in the uſual manner equal parts of calcined green vitriol and charcoal, the powder which contained no ſulphur nor hepar ſulphuris, did not acquire any of the properties of a pyrophorus. The vitriolic acid ſeemed to have been entirely diſſipated; having no baſe to detain it, when diſlodged from the metallic earth. The charcoal and calx of iron, left in this proceſs, were calcined again, together with ſome ſalt of tartar; and a pyrophorus was produced, which exhibited indications of its containing a ſcarcely perceptible portion of hepar ſulphuris. Thirty grains of crocus martis aſtringens were calcined with fifteen grains of charcoal, and the ſame quantity of ſalt of tartar; and the mixture burnt ſpontaneouſly, though it contained no hepar ſulphuris, or vitriolic acid. Having by theſe experiments evinced that metallic pyrophori may be prepared without vitriolic acid, Mr. Bewly proceeded to form an aluminous pyrophorus of the ſame kind. For this purpoſe, he procured the earth of alum by a long and violent calcination; and examining a part of it, he found, by the uſual teſts, that it neither contained any ſulphur, hepar ſulphuris, nor alum undecompounded. This he conſidered as perfectly pure, though he afterwards found that it contained a ſmall quantity of vitriolated tartar: and yet it repeatedly furniſhed a pyrophorus as active as when alum itſelf is employed. From theſe and ſimilar experiments he infers, that the ſeveral kinds of pyrophori are not kindled by moiſture attracted by the vitriolic acid, as M. de Suvigny has maintained: and his concluſion is farther confirmed by ſome experiments of Dr. Prieſtley, from which it appears, that they are kindled in dry, nitrous, and dephlogiſticated air.

M. Prouſt, cited by Mr. Bewly, deſcribes a variety of new pyrophori, which neither contain vitriolic acid, nor ſeem likely to owe their accenſion to the attraction of humidity from the air. Theſe principally conſiſt of a coaly matter ſimply divided by metallic or other earths; ſuch are the ſediment left on the filter in preparing Goulard's extract, various combinations of tartar, or its acid, or the acetous acid, with metals, calcareous earth, &c.

Mr. Bewly, having evinced the inſufficiency of M. de Suvigny's theory, and diſcovered that the pyrophori are not kindled by moiſture, attracted (merely) by the vitriolic acid, directed his attention to the nitrous acid, which Dr. Prieſtley has ſhewn to be a conſtituent part of atmoſpherical air, as the probable agent in the production of this phenomenon. The ſtrong affinity which this acid has with phlogiſton, and the heat, and even flame, which it is known to produce with certain inflammable matters, manifeſted that it was equal to the effect; and having excluded the vitriolic acid from having any eſſential concern in this operation, he ſuggeſts, either that the pyrophorus is kindled by moiſture attracted by ſome of the other ingredients which compoſe it; or that it has the power of decompounding atmoſpherical air, by ſuddenly attracting its nitrous acid, and thereby generating a heat ſufficient to kindle the phlogiſtic matter contained in it. This idea appeared plauſible, when he farther conſidered that Dr. Prieſtley produced the pureſt reſpirable air with this ſame acid combined with other principles; and that this as well as common air is diminiſhed, and probably in part decompounded, in a variety of phlogiſtic proceſſes. This ingenious writer concludes, upon the whole, from the experiments he hath made, that the pyrophorus ſeems to owe its ſingu-

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lar property to its being a combination of earth or alkali with phlogiſton; the vitriolic acid, when preſent, only occaſionally increaſing or diminiſhing the effect, according to circumſtances. In the proceſs of calcination, the earth or alkaline principle is not merely mixed, but actually, though looſely, combined with the phlogiſtic principle of the coal; ſo that the pyrophorus, conſidering it in its moſt ſimple ſtate, is only a perfectly dry phlogiſticated alkali or earth. On theſe data, the phenomena may be explained in the two following methods; with reſpect particularly to the influence of moiſture and heat upon the pyrophorus. Suppoſing either the alkaline or earthy principles to have a greater affinity to water than to the phlogiſton with which either of them is united, they may, on being expoſed to a moiſt atmoſphere, attract the humidity, and therefore ſet the phlogiſtic principle at liberty; which may, in its turn, attract and be ignited by, the ſuppoſed aerial acid, its ſtrong affinity to which is well known:—or, if this hypotheſis be rejected, the inflammable matter may be kindled, merely in conſequence of the heat produced by the combination of the alkali, &c. with moiſture. This reaſoning, however, ſuppoſes the exiſtence of phlogiſton, which modern chemiſts have generally exploded.

The chemical changes that take place during the formation and decompoſition of pyrophorus, as they are ſtated by Aikin, appear to be the following: 1. By being heated below redneſs in the open air, the ingredients enter into fuſion, and thus mix accurately with each other; then the water of cryſtallization is driven off from the alum, and of the ſugar or flour, little elſe than the charcoal eſcapes volatilization. 2. The red heat to which it is expoſed in the phial cauſes the ſulphuric acid of the alum and charcoal of the ſugar to re-act on each other, by which part of the charcoal is driven off in the form of carbonic acid, and part of the ſulphuric acid eſcapes as ſulphureous acid. The blue flame that characterizes the latter part of this proceſs is probably cauſed by the volatilization and combuſtion of a portion of ſulphur, more than is requiſite to ſaturate the potaſh of the alum. Thus the pyrophorus, when prepared, conſiſts of alumine, charcoal, and ſulphuret of potaſh in intimate mixture. 3. When this powder is expoſed to the air, a rapid decompoſition of the air itſelf, and of the moiſture which it contains, takes place, the oxygen of each being abſorbed by the ſulphuret, while a ſufficient quantity of heat is diſengaged, to bring the charcoal and remainder of the ſulphur to a ſtate of actual inflammation. See on the ſubject of this article, Macquer's Chemical Dict. art. Pyrophorus; and Prieſtley's Obſ. on Air, vol. iii. Appendix, p. 386, &c. vol. iv. Appendix, p. 479, &c. Aikin's Dictionary.

PYROPHYLACIA, a term uſed by Kircher and ſome others, to expreſs thoſe magazines of fire which are placed in the cavities of mountains and other hollows of the earth, and ſerve to ſupply the ſeveral volcanoes in the different parts of the world. See VOLCANO.

PYROPHYSALITE, in *Mineralogy*, is ſo called from πυρ, *fire*, and φυσαλις, *a bubble*, becauſe this mineral emits bubbles when expoſed to the flame of the blowpipe. It is found at Finbo, near Fahlun, in Sweden, imbedded in a granitic rock. The colour of pyrophyſalite is white, inclining to green, and occaſionally ſmall ſpots of blue fluor ſpar are ſeen on its ſurface. It commonly occurs in oblong pieces, ſome of which approach to an irregular rhomboid. It differs from felſpar, to which it has the moſt reſemblance, in having but one determinate direction in which it can be ſplit; its ſpecific gravity is alſo greater, and it fuſes more eaſily. The fragments ſcratch glaſs, but are leſs hard than quartz. The powder of the fineſt fragments emit a phoſphoreſcent light when heated. Its ſpecific gravity is 3.45, and the conſtituent parts, according to Heſinger and Berzelius, are

Alumine -	53.5
Silex -	32.88
Lime -	.88
Oxyd of iron	.88
Volatile matter	.75
Loſs -	11.26

The ſubſtance loſt during the proceſs is ſuſpected to be fluoric acid. Haüy claſſes this mineral with the topaz. See TOPAZ. B.

PYROPŒCILOS, in the *Natural Hiſtory of the Ancients*, the name by which they call the granite of Arabia, commonly known to this day under the name of the Oriental granite.

The name is derived from the Greek, πυρ, *fire*, or *fire-coloured*, and ποικιλος, *ſpotted*; and the ancients having uſed the epithet fiery to yellow, as well as red, ſome have imagined the granite muſt be a yellow ſtone; but it is evident that red is the colour meant by it here.

PYROSCOPE, an inſtrument invented by profeſſor Leſlie for meaſuring the intenſity of fire. This is merely the *differential* THERMOMETER (which ſee), with one of its balls covered with ſilver leaf, while the other is naked. The fire heats the naked ball, but not the ſilvered ball. Hence the liquid in the tube riſes or falls, according to the intenſity of the fire, and of courſe marks that intenſity.

PYROSCOPIA, formed of πυρ, *fire*, and σκοπεω, *I conſider*, among the Greeks, a kind of divination, being the ſame with pyromancy and ignifpicium.

PYROSIS, in *Medicine*, called in Scotland the *water-braſh*, is a diſorder of the ſtomach, which is characterized by a ſudden and violent attack of pain in that organ, followed by a copious diſcharge of a colourleſs, inſipid, and generally cold fluid, reſembling ſaliva, from the œſophagus, mouth, and throat.

The firſt deſcription of this diſeaſe was given by Linnæus, as a common affection of the Laplanders, under the appropriate appellation of *Cardialgia ſputatoria*; whence Sauvages gave it the denomination of pyroſis *Suecica*. (Noſol. Meth. claſs vii. gen. 18.) Dr. Cullen adopted the generic term pyroſis, and deems it an idiopathic diſeaſe. It ſeems to occur, however, in conjunction with other forms of indigeſtion, and might have been arranged as one of the ſymptoms of dyſpepſia.

The fits of pyroſis uſually come on in the morning and forenoon, when the ſtomach is empty. The firſt ſymptom is a pain at the pit of the ſtomach, with a ſenſe of conſtriction, as if the ſtomach were drawn towards the back: the pain is increaſed by raiſing the body into an erect poſture, and therefore the patient bends himſelf forward. This pain is often extremely ſevere, with a ſenſe of burning; and after continuing for ſome time, it brings on an eructation of a thin watery fluid in conſiderable quantity. This fluid has ſometimes an acid taſte; but moſt commonly it is deſcribed as being abſolutely inſipid. It continues to be brought up for ſome time, and does not immediately give relief to the pain which preceded it; but at length it terminates the pain, and the fit ceaſes.

Theſe paroxyſms come on without any evident cauſe, nor is the origin of the diſeaſe always to be imputed to any particular ſort of diet. It ſeldom, if ever, attacks thoſe people who uſe freſh animal food daily; but appears to be moſt common among thoſe who live almoſt entirely upon tea, milk, potatoes, and farinaceous ſubſtances. It is much more

common in women than in men; ſometimes it attacks pregnant women, and often thoſe who labour under leucorrhœa. It ſeldom occurs in any one before the age of puberty, or in thoſe who are conſiderably advanced in life: when it has once taken place, it is very prone to recur occaſionally for a long time afterwards. It is more common in Scotland than in this country, and chiefly affects the lower claſſes of the people.

While the ſame diet is continued, it is not always eaſy to cure the diſeaſe. The paroxyſm is moſt effectually relieved by anodynes, eſpecially opium; hyoſcyamus, conium, &c. anſwer a ſimilar purpoſe; and with leſs certainty; other ſtimulants and antiſpaſmodics, as ſulphuric æther, ammonia, the tincture of guaiacum, &c. alleviate the fit. Theſe remedies, however, do not materially contribute to prevent the recurrence of the paroxyſms; and bitters, aromatics, and the whole of remedies againſt indigeſtion, have been often employed in vain. A combination of aromatic laxatives, with ſtrong alkalies and narcotics, have appeared to the writer of this article to be on the whole the moſt effectual remedies. See Cullen, Firſt Lines, vol. iv. p. 1.

Pyrosis is alſo a word uſed to expreſs an intenſe heat and redneſs in the face, ſuch as that of perſons who travel in extremely hot weather, and the like.

PYROSTRIA, in *Botany*, ſo called by Commerſon, from the pear-ſhaped ſtriated fruit.—Juſſ. 206. Willd. Sp. Pl. v. 1. 614. Lamarck Illuſtr. t. 68.—Claſs and order, *Tetrandria Monogynia*. Nat. Ord. *Rubiaceæ*, Juſſ.

Gen. Ch. *Cal.* Perianth ſuperior, ſhort, in four deep, acute, broad ſegments, deciduous. *Cor.* of one petal, ſomewhat bell-ſhaped; tube thrice as long as the calyx, ſwelling gradually upwards; limb of the ſame length, in four acute, equal, ſpreading ſegments; throat downy. *Stam.* Filaments four, ſhort, inſerted into the tube of the corolla, alternate with the ſegments of the limb; anthers oblong, erect, pointed, ſhorter than the limb. *Piſt.* Germen turbinate, inferior; ſtyle ſhort, cylindrical; ſtigma capitate. *Peric.* Berry ſmall, dry, pear-ſhaped, with eight furrows, and eight cells, deſtitute of any crown. *Seeds* ſolitary in each cell.

Eſſ. Ch. Calyx four-toothed. Corolla bell-ſhaped, four-cleft, downy in the throat. Berry inferior, obovate, with eight furrows and eight ſeeds.

Obſ. Juſſieu, by an error which ſeems typographical, attributes five ſegments to the corolla, which Willdenow copies. There are, however, but four, as the analogy of the other parts, in this caſe, neceſſarily requires.

1. P. *ſalicifolia*. Willow-leaved Streak-berry. Willd. n. 1. (Pyroſtria olæoides; Lamarck Illuſtr. v. 1. 289. t. 68. f. 2, (not f. 4.)—Gathered by Commerſon, in the iſle of Bourbon; not, as Willdenow has it, the Mauritius. A *ſhrub*, with round, ſmooth, greyiſh, leafy *branches*. *Leaves* oppoſite, on ſhort ſtalks, rather crowded, two or three inches long, elliptic-lanceolate, ſharpiſh, entire, coriaceous, ſmooth, with one rib, and ſeveral lateral incurved veins, occaſionally accompanied by an axillary gland-like tubercle, that ſeems accidental; paler beneath. *Stipulas* between the footſtalks, and of the ſame length, awl-ſhaped, erect, dilated at the baſe, deciduous. *Flower-ſtalks* axillary, ſolitary, ſomewhat umbellate, bearing one or more ſimple, ſingle-flowered, partial ſtalks, with a pair of oblong tapering *bracteas* at the baſe of the latter. *Flowers* hardly a quarter of an inch long, erect, apparently white. *Fruit*, according to Lamarck, near an inch in length, pear-ſhaped, umbilicated, with eight deep longitudinal furrows. When cut tranſverſely, it ſhews the eight ſeeds, compreſſed, and radiating from the centre.

PYROTARTAREOUS Acid, or *Empyreumatic acid of tartar*, a ſpecies of empyreumatic acetous acid, very different from Tartareous *acid*; which ſee. To procure this acid, diſtil any quantity of cream of tartar in a glaſs or earthen retort, as in the proceſs for Pyromucous *Acid*: the retort being half full of the tartar, on raiſing the fire very ſlowly, the firſt produce is a limpid, acidulous, ſomewhat bitteriſh water, after which, as the heat increaſes, a moſt prodigious volume of the inflammable gas is given out, together with a ſtronger acid, and more empyreumatic liquid, and at laſt a black oil, and ſome volatile alkali.

The whole quantity of liquid acid procured from tartar in this method, is generally not more than about a quarter of the weight of the tartar, and is not quite ſo brown, nor ſo highly empyreumatic as the *pyromucous*. This acid, and alſo the pyroligneous and pyromucous acids, are capable of very conſiderable purification by eaſy methods, ſo that they loſe their empyreuma, their peculiar taſte and ſmell, in which conſiſt their characteriſtic differences, till at laſt, when brought into the moſt concentrated ſtate by ſome of the modes in which vinegar is dephlegmated, they exhibit the characters of acetous acid ſo unequivocally, that no doubt can be entertained of their identity. Simple rectification, or rediſtillation in a very gentle heat, and ſtopping the proceſs when the liquor at laſt comes over much coloured, will purify, to a very great degree, the pyromucous and pyroligneous acids: the latter, by this proceſs, from being of a dark coffee colour, aſſumes the hue of very pale clear brandy. But on long expoſure to light, it again becomes brown, for it retains its empyreumatic character more than any other. Charcoal, newly burnt and powdered, contributes very much to the purification of all theſe acids; they may be either gently diſtilled off it, or even merely filtered through a ſtratum of it. But the moſt effectual method of purification is by uniting theſe acids with lime, or a fixed alkali, evaporating to dryneſs, and then expelling the acid by means of the ſulphuric acid, in the ſame manner as the concentrated vinegar is prepared. The acid vapour that riſes in this proceſs has now loſt its empyreuma almoſt entirely; has both the ſtrength and the powerful odour of radical vinegar; when again united to potaſh, forms acetated potaſh, which may be obtained white by repeated cryſtallization, or by charcoal powder, and in ſhort is perfect acetous acid. Aikin.

PYROTECHNY, derived from the Greek words πυρ, *fire*, and τεχνη, *art*, is a term applied to the art or ſcience which teaches the management and application of fire in certain operations. Although this term has been uſed in a very extenſive ſenſe by ſome writers, and applied to the uſe and ſtructure of fire-arms and artillery employed in the art of warfare, yet it is commonly confined, as it will be in this work, to thoſe articles and inſtruments made uſe of for amuſement, and for grand public occaſions, as the celebration of victories, the demonſtrations of public joy on account of peace, after long continued war, &c.

Of the origin of artificial fire-works there is nothing certain recorded. In Europe the invention of them is of recent date, and is given to the Italians. The uſe of fire-works in China was very general long before they were known in European countries: and from an account given of ſome recent exhibitions at Pekin, it ſhould ſeem that they have attained to a degree of perfection not ſurpaſſed even by the artiſts of England, France, or Italy. "The fire-works, in ſome particulars," ſays Mr. Barrow in his Travels in China, "exceeded any thing of the kind I had ever ſeen. In grandeur, magnificence, and variety, they were, I own, inferior to the Chineſe fire-works we had ſeen at Batavia, but infinitely ſuperior in point of novelty, neatneſs,

neatneſs, and ingenuity of contrivance. One piece of machinery I greatly admired; a cheſt five feet ſquare was hoiſted up by a pulley to the height of fifty or ſixty feet from the ground: the bottom was ſo conſtructed as then ſuddenly to fall out, and make way for twenty or thirty ſtrings of lanterns encloſed in a box to deſcend from it, unfolding themſelves from one another by degrees, ſo as at laſt to form a collection of full 500, each having a light of a beautifully coloured flame burning brightly within it. This devolution and developement of lanterns were ſeveral times repeated, and, at every time, exhibited a difference of colour and figure. On each ſide was a correſpondence of ſmaller boxes, which opened in like manner as the others, and let down an immenſe net-work of fire, with diviſions and compartments of various forms and dimenſions, round and ſquare, hexagons, octagons, &c. which ſhone like the brighteſt burniſhed copper, and flaſhed like priſmatic lightning with every impulſe of the wind. The diverſity of colours with which the Chineſe have the ſecret of clothing fire ſeems one of the chief merits of their pyrotechny. The whole concluded with a volcano, or general exploſion and diſcharge of ſuns and ſtars, ſquibs, crackers, rockets, and granadoes, which involved the gardens for above an hour in a cloud of intolerable ſmoke."

The apparatus uſed in making fire-works conſiſts of ſolid wooden cylinders, called formers, for rolling the caſes on; ſimilar cylinders, either of wood or metal, for ramming down the compoſition; moulds for holding the caſes while filling; a machine for contracting the cavity of the caſes; another for grinding the materials; and a particular apparatus for boring ſome caſes after they are filled.

Conſtruction of the Cartridges for Rockets.—A rocket is a cartridge, or caſe made of ſtiff paper, which, being filled in part with gunpowder, ſaltpetre, and charcoal, riſes of itſelf into the air when fire is applied to it. There are ſeveral kinds and ſizes of rockets, but the three following are the principal: *viz.* 1. Small ones, the calibre of which is not larger than that of a bullet of a pound weight. 2. Rockets, the calibre of which is equal to the ſize of a ball of from one to three pounds weight. 3. Large rockets, equal to a ball of from three pounds to a hundred weight.

To give the cartridges the ſame length and thickneſs, they are put into a hollow cylinder of metal, or ſtrong wood. This mould is not to be confounded with another piece of wood, called the former or roller, around which is rolled the thick paper employed to make the cartridge. The rule for the ſize of the mould and roller is this: if the calibre of the mould be divided into eight equal parts, the diameter of the roller muſt be equal to five of theſe parts; of courſe the vacuity between the roller and the interior ſurface of the mould is equal to $\frac{3}{8}$ths of the calibre of the mould, which will be exactly filled by the cartridge.

The ſize of the mould is meaſured by its calibre; but the length of the moulds for different rockets does not always bear the ſame proportion to the calibre, the length being diminiſhed as the calibre is increaſed. In ſmall rockets, the length of the mould ought to be ſix times the diameter of the calibre; but in the larger ſized rockets, it need not be more than between four and five times the calibre of the mould.

Large ſtiff paper of a peculiar kind is employed in making cartridges, and hence it has obtained the name of *cartridge-paper*. This paper is wrapped round the roller, and then cemented by means of common paſte. When the cartridge is formed, the roller is drawn almoſt out, by turning it round, until it is diſtant from the edge of the cartridge the length of its diameter. A piece of cord is then made to paſs twice round the cartridge at the extremity of the roller; and into the vacuity left in the cartridge another roller is introduced, ſo as to leave a ſpace between the two. By means of the cord, the cartridge muſt be pinched till there remains only an aperture capable of admitting an inſtrument called a piercer: then the cord is removed, and its place is ſupplied by a piece of packthread.

Beſides the roller, a rod is employed to load the cartridge, which muſt be ſomewhat ſmaller than the roller, that it may be eaſily introduced into the cartridge. This rod is pierced lengthwiſe to a ſufficient depth to receive the piercer, which muſt enter into the mould, and unite with it exactly at the lower part. The piercer, which decreaſes in ſize, is introduced into the cartridge through the part where it has been choaked, and ſerves to preſerve a cavity within it.

After the cartridge is placed in the mould, the prepared compoſition is to be poured gradually in, and rammed down with great accuracy. When the cartridge is about half filled, ſeparate, with a bodkin, half of the folds of the paper which remains, and having turned them back on the compoſition, preſs them down, and pierce three or four holes in the folded paper, by means of a piercer, which muſt be made to penetrate to the compoſition of the rocket. Theſe holes ſerve to form a communication between the body of the rocket and the vacuity at the extremity of the carriage, as it is called, or that part which has been left empty. In ſmall rockets this vacuity is filled with granulated powder, and covered over, which ſerves to let them off: in thoſe that are larger, the pot, containing ſtars, ſerpents, and running rockets, is adapted to it.

It now remains to affix the rocket to its rod, which is thus done. When it has been conſtructed, in the way juſt deſcribed, it is to be faſtened to a rod of light ſmooth wood. Its length and weight muſt be proportioned to the ſize of the rocket; that is, it ought to be as long as to remain in equilibrium with it, when ſuſpended on the finger, or other fulcrum, within an inch, or an inch and a half of the neck. Before it is fired, place it with the neck downwards, and let it reſt on two nails, in a direction perpendicular to the horizon: and to make it aſcend to a greater height, adapt to its ſummit a pointed cap made of ſtiff paper, which will ſerve to facilitate its paſſage through the air. To theſe rockets may be added ſeveral other things, as a petard, which is a box of tin plate filled with fine gunpowder, placed on the ſummit. The petard is placed on the compoſition, at the end where it has been filled, and the remaining paper of the cartridge is folded down over it, to keep it firm. The petard produces its effect when the rocket is in the air, and the compoſition is conſumed. A repreſentation of a rocket completely fitted up is given in *Plate Pyrotechny, fig.* 2.

Stars, ſerpents, &c. may be added to them, which is done by adjuſting to the head of the rocket an empty pot or cartridge, larger than the rocket, in order that it may contain the things intended to render the exhibition the more beautiful. The following tables are neceſſary to thoſe who would manufacture rockets for themſelves. The firſt ſhews the ſize of the calibre of the mould for rockets of a pound weight and below; and the ſecond points out the ſize required for the calibre of moulds of from 1lb. to 50lbs. It muſt be obſerved, that a pound rocket is that which is juſt capable of admitting a leaden bullet of a pound weight, and ſo of the reſt.

TABLE I.—Size of the Calibre of Moulds of a Pound Weight and below, to One Ounce.

Weight of Rockets in Ounces.	Diameters in Lines.
16	19½
12	17
8	15
7	14¾
6	14¼
5	13
4	12⅓
3	11½
2	9⅙
1	6½

Here it is evident, that the mould of a rocket of twelve ounces in weight ought to be ſeventeen lines in diameter; one of five ounces will require a mould of thirteen lines in diameter. Hence we derive an eaſy method of finding the ſize when the weights are given: and if the diameter of the rocket be given, it will be equally eaſy to find the weight of the ball correſponding to that calibre. Thus, if the diameter be fifteen lines, it will, by the table, be ſeen that it correſponds to a ball of eight ounces.

TABLE II.—Size of the Calibre of Moulds, of from 1 to a 50lb. Ball.

Pounds.	Calibre.	Pounds.	Calibre.	Pounds.	Calibre.	Pounds.	Calibre.
1	100	14	241	27	300	40	341
2	126	15	247	28	304	41	344
3	144	16	252	29	307	42	347
4	158	17	257	30	310	43	350
5	171	18	262	31	314	44	353
6	181	19	267	32	317	45	355
7	191	20	271	33	320	46	358
8	200	21	275	34	323	47	361
9	208	22	286	35	326	48	363
10	215	23	284	36	338	49	366
11	222	24	288	37	333	50	368
12	228	25	292	38	336		
13	235	26	296	39	339		

By this ſecond table, if the weight of the ball be given the ſize of the mould may be found: ſuppoſe it be 18 pounds, oppoſite to it is the number 262. Then we ſay by the rule of proportion (as 19½, ſee table I. is ſuppoſed to be divided into 100 parts), 100 : 19½ :: 262 to the fourth term ſought, *viz.* 51.09; therefore the required calibre is 52 lines nearly, or four inches and four lines, or 4⅓ inches. But if the calibre be given in lines, the weight of the ball may be found: ſuppoſe the given calibre be 36 lines, then as 19½ : 100 :: 36 : 184. The neareſt number in the table to this is 181, which ſhews that the weight of the ball will be rather more than 6lbs., or, in other words, that a rocket, the diameter or calibre of which is 36 lines, is a rocket of a 6lb. ball.

The compoſition of the powder for rockets muſt be different, according to the different ſizes, it being completely aſcertained that what is proper for ſmall rockets would be too ſtrong for the larger ones.

For rockets of one or two ounces, the compoſition ſhould be one pound of gunpowder, and two ounces of finely ground ſoft charcoal.

For rockets of ſomewhat larger ſize, the compoſition may be ten ounces of gunpowder, three and a half of ſaltpetre, and three ounces of charcoal.

If the rockets be of five or ſix ounces weight, then to two pounds five ounces of gunpowder, add eight ounces of ſaltpetre, two ounces of ſulphur, ſix ounces of charcoal, and two ounces of iron filings.

If the rockets be from ten to twelve ounces, you may add to ſeventeen ounces of gunpowder, four ounces of ſaltpetre, three and a half of ſulphur, and one of charcoal.

For rockets of a pound weight: to one pound of gunpowder add an ounce of ſulphur, and three ounces of charcoal.

For rockets of from four to ſeven pounds: to thirty-one pounds of ſaltpetre, add four pounds and a half of ſulphur, and ten of charcoal: and for thoſe that are ſtill larger, we may add to eight pounds of ſaltpetre, one pound four ounces of ſulphur, and two pounds twelve ounces of charcoal. In all caſes the ingredients are to be pounded ſeparately, and finely ſifted before they are uſed. Gunpowder, thus reduced from the corns in which it is manufactured, is called meal-powder.

Matches.—The matches to let off rockets are thus made. Take linen, hemp, or cotton thread, and double it eight or ten times, if intended for large rockets, or only four or five times, if to be employed for ſtars. When the match is thus made, dip it in pure water, and being ſoaked, it is to be ſqueezed as dry as poſſible. Mix ſome gunpowder with a little water, ſo as to reduce it to a kind of paſte, and immerſe the match in it, turning and twiſting it till it has imbibed a ſufficient quantity of gunpowder; then ſprinkle it over with dry powder, and when it is dry, it is fit for uſe.

In anſwer to the inquiry what cauſes rockets to aſcend in the air, we may obſerve, that it is nearly the ſame as that which produces a recoil in fire-arms. Thus, when powder is inflamed in the chamber of a muſket or cannon, it exerts its power againſt the breech of the piece, and againſt the bullet or wadding. But the reſiſtance oppoſed by the bullet being much leſs than that oppoſed by the maſs of the barrel or cannon, the bullet is forced out with great velocity. The cauſe of the aſcent of a rocket is nearly the ſame. At the moment when the powder begins to inflame, its expanſion produces a torrent of elaſtic fluid, which acts in every direction, that is, againſt the air which oppoſes its eſcape from the cartridge, and againſt the upper part of the rocket; but the reſiſtance of the air is more conſiderable than the weight of the rocket; therefore the rocket aſcends by the exceſs of the one of theſe forces over the other. This, however, would not be the caſe unleſs the rockets were pierced to a certain depth.

Brilliant Fire and Chineſe Fire.—As iron-filings, when thrown into the fire, enflame and emit a ſtrong light, this gave riſe to the idea of rendering the fire of rockets much more brilliant, than when gunpowder, or the ſubſtances of which it is compoſed, are alone employed. But the Chineſe have long been in poſſeſſion of a method of rendering this fire much more brilliant and variegated in its colours. It conſiſts in the uſe of a very ſimple ingredient, namely, caſt iron reduced to a powder more or leſs fine: the Chineſe give it a name that anſwers to *iron-ſand* in our language. It is prepared from old iron pots pulverized, till the grains are not larger than radiſh ſeed. Theſe, however, are paſſed through ſieves of different degrees of fineneſs; thoſe that paſs through the cloſeſt ſieve, are called ſand of the firſt order;

order; thoſe which paſs through the next ſieve in ſize, ſand of the ſecond order, and ſo on. This ſand, when it inflames, emits an exceedingly vivid light, forming almoſt inſtantaneouſly luminous flowers and ſtars of various apparent magnitudes. It ſhould be obſerved that rockets, into the compoſition of which iron-filings and iron-ſand enter, cannot be long preſerved, owing to their readineſs in attracting the moiſture which the ſaltpetre gives out. The following tables exhibit the proportions of the different ingredients for rockets of this kind of from 12 to 33 lbs.

For Red Chineſe Fire.

Calibres.	Saltpetre.	Sulphur.	Charcoal.	Sand of the 1ſt Order.
Pounds.	Pounds.	Ounces.	Ounces.	oz. dr.
12 to 15	1	3	4	7 0
81 — 21	1	3	5	7 8
24 — 36	1	4	6	8 0

For White Chineſe Fire.

Calibres.	Saltpetre.	Mealed Gu. powder.	Charcoal.	Sand of the 2d Order.
Pounds.	Pounds.	Ounces.	oz. dr.	oz. dr.
12 to 15	1	12	7 8	11 0
18 — 21	1	11	8 0	11 8
24 — 36	1	11	8 8	12 0

When theſe materials have been accurately weighed, the ſaltpetre and charcoal muſt be three times ſifted through a hair ſieve, in order to their being well mixed: the iron-ſand is then to be moiſtened with brandy to make the ſulphur adhere, and then they are to be thoroughly incorporated.

The upper part of rockets is generally furniſhed with ſome compoſition, which takes fire when it has reached to its greateſt height, emits a conſiderable blaze, or produces a loud report and whizzing noiſe. Of this kind are ſauciſſons, maroons, ſtars, ſhowers of fire, &c. To make room for an artifice of this kind, the rocket is crowned with what is called a pot, which is larger than the rocket. (See *fig.* 3.) The following is the method of making this pot, and connecting it with the body of the rocket.

The mould for forming the pot, though of one piece, muſt conſiſt of two cylindric parts of different diameters. That on which the pot is rolled up muſt be three diameters of the rocket in length, and its diameter muſt be three fourths that of the rocket; the length of the other ought to be equal to two of theſe diameters, and its diameter to $\frac{7}{10}$ths that of the rocket. Having rolled the thick paper, intended for making the pot, twice round the cylinder, a portion of it muſt be pinched in that part of the cylinder which has the leaſt diameter: this part muſt be pared in ſuch a manner, as to leave only what is neceſſary for making the pot faſt to the top of the rocket, and the ligature muſt be covered with paper.

To charge ſuch a pot, attached to a rocket. Having pierced three or four holes in the double paper which covers the vacuity of the rocket, pour over it a ſmall quantity of the compoſition with which the rocket is filled, and by ſhaking it, make a part enter theſe holes; then arrange, in the pot, the compoſition with which it is to be charged, taking care not to introduce into it a quantity heavier than the body of the rocket. The whole muſt be ſecured by means of a few ſmall balls of paper, to keep every thing in its place, and the pot muſt be covered with paper cemented to its edges: if a pointed ſummit be added to it, the rocket is fit for uſe.

Serpents.—Theſe are ſmall flying rockets, without rods, which, inſtead of riſing in a perpendicular direction, mount obliquely, and deſcend in a zigzag form, without aſcending to a great height. The compoſition of theſe is nearly the ſame as that of rockets, and the conſtruction is as follows. The length, A C, (*fig.* 4.) of the cartridge is about four inches; it muſt be rolled on a ſtick ſomewhat larger than a gooſe-quill, and after being choaked at one of its ends, it is filled beyond the middle, as to B, with the compoſition; then it is to be pinched ſo as to leave a ſmall aperture. The remainder, B C, muſt be filled with grained powder, which will occaſion a report when it burſts. Laſtly, choak the cartridge entirely towards the extremity C; and at the other extremity, A, place a train of moiſt powder, to which, if fire be applied, it will be communicated to the compoſition in the part A B, and cauſe the whole to riſe in the air. The ſerpent, as it falls, will make ſeveral turns in a zigzag direction, till the fire is communicated to the grained powder in the part B C; on which the ſerpent will burſt with a loud report before it falls to the ground. The ſerpent cartridges are generally made of playing cards. Theſe are rolled round a rod of iron or hard wood, and to confine the card a piece of ſtrong paper is cemented over it. Larger ſerpents may be made by cementing two playing cards together, firſt moiſtened with water.

Maroons are ſmall cubical boxes, filled with a compoſition proper for making them burſt. To conſtruct theſe, cut a piece of paſteboard according to the method taught in geometry to form the cube (ſee *fig.* 5.); join theſe ſquares at the edges, leaving one only to be cemented, and fill the cavity of the cube with grained powder; then cement ſtrong paper in various directions over the body, and wrap round it two rows of packthread, dipped in ſtrong glue: then make a hole in one of the corners, and introduce into it a match. If the maroons are to be luminous, that is, which are to give out a brilliant light before they burſt, they muſt be covered with a paſte, the compoſition of which will be noticed below under *Stars*, and then rolled in meal powder to ſerve as a match or communication.

Sauciſſons differ from maroons only in form. The cartridges of the latter are round, and muſt be only four times their exterior diameter in length. They are choaked at one end in the ſame manner as a rocket, and a pellet of paper is driven into the aperture which has been left, in order to fill it up. They are then charged with corn powder, above which is placed a ball of paper, gently preſſed down to prevent the powder from being bruiſed; the ſecond end of the ſauciſſon being now choaked, the edges are to be pared on both ſides, and the whole is covered with ſeveral turns of packthread, dipped in ſtrong glue, and then left to dry.

Stars are ſmall globes which emit a moſt brilliant light, ſo that, momentarily, they may be compared to the light of the ſtars in the heavens. Theſe balls are not larger than a muſket-ball, and when put into rockets they muſt be wrapped up in tow, prepared for the purpoſe. The compoſition of theſe ſtars is as follows: To a pound of fine mealed gunpowder, add four pounds of ſaltpetre, and two pounds of ſulphur. When theſe ingredients are thoroughly mixed, take a piece as large as a ſmall nutmeg, and having wrapped

wrapped it in a linen rag, or paper, form it into a ball; then tie it clofely round with packthread, and pierce a hole through the middle of it, large enough to receive a piece of prepared tow, which is to ferve as a match. This, when lighted, will exhibit a moft beautiful appearance; becaufe the fire as it iffues from the two ends of the hole in the middle will extend to a great diftance, and will make it feem very much larger than it actually is.

There are other compofitions for ftars; *viz.* with three ounces of faltpetre, mix one ounce of fulphur, and two drachms of mealed gunpowder; or with eight ounces of mealed powder, mix four ounces of fulphur, and the fame quantity of faltpetre. When thefe materials have been well fifted, and fprinkled over with brandy, in which a fmall quantity of gum has been diffolved, the ftar is made in the following manner. Take a rocket mould eight or nine lines in diameter, and introduce into it a nipple, the piercer of which is of an uniform fize throughout, and equal in length to the height of the mould. Put into this mould a cartridge, and by means of a pierced rod load it with one of the preceding compofitions; when loaded, take it from the mould, without removing the nipple, the piercer of which paffes through the compofition, and then cut the cartridge quite round into pieces of the thickneſs of three or four lines. The cartridge being thus cut, draw out the piercer gently, and the pieces which refemble the men employed for playing at drafts, pierced through the middle, will be ftars, which muft be filed on a match thread, that may be covered with tow. To give more brilliancy to ftars of this kind, a cartridge thicker than that already defcribed, and thinner than that of a flying rocket of the fame fize, may be employed; but before it is cut in pieces, five or fix holes muft be pierced in the circumference of each piece to be cut. When the cartridge is cut, and the pieces have been filed, cement over the compofition fmall bits of a card, each having a hole in the middle, fo that thefe holes may correfpond to the place where the compofition is pierced.

Etoiles à Pet are made in the fame way nearly as fauciffons already defcribed, only that it will not be neceffary to cover them with packthread: it will be fufficient if they are pierced at one end, in order that ftars may be faftened to them, conftructed according to the firft method, the compofition of which is dry; for if the compofition be in the form of paſte, there will be no need to tie it. In this caſe, a little more of the paper muft be left hollow at the end of the fauciffon which has been pierced for the purpofe of introducing the compofition, and to place in the vacuity, towards the neck of the fauciffon, fome grained powder, which will communicate fire to the fauciffon when the compofition is confumed.

Shower of Fire.—To form this fort of fire-work, mould fmall paper cartridges on an iron-rod two lines and a half in diameter, and make them two inches and a half in length. They muft not be choaked, it being fufficient to twift the end of the cartridge, and having put the rod into it to beat it, in order to make it aſſume its proper form. When the cartridges are filled, which is done by immerfing them in the compofition, fold down the other end, and then apply a match. This will fill the furrounding air with an undulating fire. The following compofitions are given as proper for ftars of this kind.

Chinefe Fire.—Mealed gunpowder one pound, fulphur two ounces, iron-fand of the firft order five ounces.

Ancient Fire.—Mealed gunpowder one pound, charcoal two ounces.

Brilliant Fire.—Mealed gunpowder one pound, iron-filings four ounces. The firft of thefe compofitions is thought to be the moft beautiful.

Sparks differ from ftars only in their fize and duration, for they are made fmaller than ftars, and are confumed fooner. They are thus prepared. Having put into an earthen veffel an ounce of mealed gunpowder, two ounces of pulverized faltpetre, one ounce of liquid faltpetre, and four ounces of camphor reduced to powder, pour over this mixture fome gum-water, or brandy in which gum has been diffolved, till the compofition becomes of the conſiſtence of thick foup. Then take fome lint which has been foaked in brandy, or in vinegar, or even in a folution of faltpetre, and being dried and unravelled, throw into the mixture fuch a quantity of it as is fufficient to abforb it entirely, taking care to ftir it well. This compofition may be formed into fmall balls about the fize of a pea, and being dried in the fhade, and fprinked with mealed powder, they will readily catch fire.

Sparks may be made by the following method: Take faw-duft of fir, poplar, &c. and boil it in water in which faltpetre has been diffolved. When the water has boiled fome time, it is to be poured off, that the faw-duft may remain in the veffel. When nearly dry, it is to be fpread out on a table, and fprinkled with fulphur fifted through a very fine fieve, to which may be added a little mealed powder.

Golden Rain.—Some flying rockets, which, as they fall, make fmall undulations in the air like frizzled hair, are called by the French writers *fusées chevelues*, and by us bearded rockets; they finifh with a kind of fhower of fire, which is called golden rain, and they are conftructed in the following manner. Fill the barrels of fome goofe-quills with the compofition of flying rockets, and place upon the mouth of each a little moift gunpowder, both to keep in the compofition, and to ferve as a match. If a flying rocket be then loaded with thefe quills, they will produce at the end a beautiful fhower of fire, which is denominated golden rain.

Conrantins, or Rockets that fly along a Rope.—A rocket may be made to run along an extended rope, by affixing to the rocket an empty cartridge, and introducing into it the rope which is to carry it along. Place the head of the rocket towards that fide to which you intend it to move; if it be then fet fire to, it will run along the rope without ftopping till the matter it contains is entirely exhaufted. If the rocket is to move in a retrograde direction, firft fill one half of it with the compofition, and cover it with a fmall round piece of wood, to ferve as a partition between it, and that put into the other half; then make a hole below this partition, fo as to correfpond with a fmall canal filled with bruifed powder, and terminating at the other end of the rocket. By thefe means the fire, when it ceafes in the firft half of the rocket, will be communicated through the hole into the fmall canal, which will convey it to the other end; and this end being then kindled, the rocket will move backwards, and return to the place from whence it fet out.

Two rockets of equal fize, bound together by ftrong packthread, and fo arranged that the head of the one fhall be oppofite to the neck of the other, in order that when the fire has confumed the compofition in the one, it may be communicated to that in the other, and oblige both of them to move in a retrograde direction, may likewife be adjufted to the rope by means of a piece of hollow reed. Rockets of this kind are generally employed for fetting fire to various other pieces when large fire-works are exhibited; and to render

render them more ſtriking, they are made in the form of different animals, ſuch as ſerpents, dragons, &c.

To give a rocket a kind of rotatory motion around the rope along which it advances, it will be ſufficient to tie to it another rocket, placed in a tranſverſal direction. But the aperture of the latter, inſtead of being at the bottom, ought to be in the ſide, near one of the ends. If both rockets be fired at the ſame time, the latter will make the other revolve around the rope, while it advances along it.

Rockets which burn in the Water.—In theſe there muſt be a conſiderable variation in the conſtruction of the mould, and alſo in the materials of which they are compoſed. The mould may be eight or nine inches in length, and an inch in diameter: the former, on which the cartridge is rolled up, may be nine lines in thickneſs. The compoſition ſhould conſiſt of three materials mixed together, *viz.* three ounces of mealed powder, one pound of ſaltpetre, and eight ounces of ſulphur. If the rocket is to appear on the water with a beautiful tail, the compoſition muſt conſiſt of eight ounces of gunpowder, one pound of ſaltpetre, eight ounces of pounded and finely ſifted ſulphur, and two ounces of charcoal. When the compoſition has been prepared according to theſe proportions, and the rocket has been filled in the manner above deſcribed, apply a fauciſſon to the end of it, and having covered the rocket with wax, pitch, &c. attach to it a ſmall rod of white willow, about two feet in length, that the rocket may conveniently float. If it be required that theſe rockets ſhould plunge down, and again riſe up, a certain quantity of mealed gunpowder, without any mixture, muſt be introduced into them, at certain diſtances.

A rocket which is fired in the water, and, after burning there half the time of its duration, mounts into the air with great velocity, may be thus conſtructed. Take a *flying* rocket, furniſhed with a rod, and by means of a little glue attach it to a water-rocket, but only at the middle, A, (*fig.* 6.) in ſuch a manner that the latter ſhall have its neck uppermoſt, and the other its neck downward. Adjuſt to their extremity, B, a ſmall tube, to communicate the fire from the one to the other, and cover both with a coating of pitch, wax, &c. that they may not be damaged by the water. Then attach to the flying rocket, after it has been thus cemented to the aquatic one, a rod, as D, and from F ſuſpend a piece of packthread, to ſupport a muſket bullet E, made faſt to the rod by means of a needle or piece of iron wire. When theſe arrangements have been made, ſet fire to the part C after the rocket is in the water; and when the compoſition is conſumed to B, the fire will be communicated through the ſmall tube to the other rocket; the latter will then riſe and leave the other, which will not be able to follow it, on account of the weight adhering to it.

Globes and Fire-Balls are made in different forms, *viz.* ſpherical, ſpheroidal, or cylindrical. The ſpherical are made in the following manner. Conſtruct a hollow wooden globe of any ſize at pleaſure, and very round both within and without, ſo that its thickneſs, A C or B D, (*fig.* 7.) may be about the ninth part of its diameter A B, and having an aperture, L M or O N, equal to the thickneſs A C or B D, that is, to the ninth part of the diameter A B. It is through this aperture that fire is communicated to the globe, when it has been filled with the proper compoſition, through the lower aperture I K. A petard of metal, loaded with good grained powder, is to be introduced alſo through the lower aperture, and to be placed horizontally. The aperture I K, which is nearly equal to the thickneſs, E F or G H, of the cylinder E F G H, is to be cloſed by means of a wooden tompion dipped in warm pitch; and melt over it ſuch a quantity of lead that its weight may cauſe the globe to ſink in water, till nothing remain above it but the part G H; which will be the caſe if the weight of the lead, with that of the globe and the compoſition, be equal to the weight of an equal volume of water. If the globe be then placed in the water, the lead, by its gravity, will keep the aperture, I K, directly downwards, and the cylinder, E F G H, in a perpendicular direction, to which fire muſt have been previouſly applied. The compoſition with which the globe muſt be filled, is as follows: to a pound of corned powder, add thirty-two pounds of ſaltpetre, eight pounds of ſulphur, one ounce of ſcraped ivory, and eight pounds of ſawduſt previouſly boiled in a ſolution of ſaltpetre, and dried in the open air.

Globes which leap or roll on the Ground.—Having conſtructed a wooden globe A, (*fig.* 8.) with a cylinder C, ſimilar to the one juſt deſcribed, and having loaded it with the ſame compoſition, introduce into it four or even more petards, loaded with good corned powder to their orifices, as is ſhewn at A B, which muſt be well ſtopped with paper or tow. If a globe, prepared in this manner, be fired by means of a match at C, it will leap about as it burns, on a ſmooth horizontal plane, according as the petards are ſet on fire. The petards may be affixed to the exterior ſurface of the globe, as is ſeen in the figure, which they will cauſe to roll and leap as they catch fire.

Aerial Globes, called Bombs.—Theſe globes are called ærials, becauſe they are thrown into the air from a mortar. Though they are of wood, and have a ſuitable thickneſs, yet they are liable to burſt unleſs the charge be nicely proportioned to their ſtrength. The uſual quantity is an ounce of powder for a globe of four pounds weight; two ounces for one of eight, and ſo on. As the chamber of the mortar may be too large to contain the exact quantity of powder ſufficient for the fire-ball, which ought to be placed immediately above the powder, in order that it may be expelled and ſet on fire at the ſame time, another mortar may be conſtructed of wood, or of paſte-board with a wooden bottom, which may be put into the large iron mortar, to be loaded with a quantity of powder proportioned to the weight of the globe. This ſmall mortar muſt be of light wood, or of paper paſted together, and rolled up in the form of a cylinder, but the bottom muſt be of wood. The chamber for the powder muſt be pierced obliquely, ſo that the aperture may correſpond to the aperture of the metal mortar, then the fire applied to the latter may be communicated to the powder which is at the bottom of the chamber, immediately below the globe.

The globe muſt be filled with ſeveral pieces of reed or cane, or common reed equal in length to the interior height of the globe, and charged with a ſlow compoſition, made of three ounces of mealed gunpowder, an ounce of ſulphur moiſtened with a ſmall quantity of petroleum oil, and two ounces of charcoal; and in order that theſe reeds or canes may catch fire the ſooner, and with more facility, they muſt be charged at the lower ends, which reſt on the bottom of the globe, with pulverized gunpowder moiſtened with petroleum oil or brandy, and then dried. The bottom of the globe ought to be covered with gunpowder, partly mealed and partly corned, which, when ſet on fire, will communicate the fire to the lower part of the reed. Inſtead of reeds, the globe may be charged with running rockets, or paper petards, and a quantity of fiery ſtars or ſparks mixed with mealed powder placed above theſe petards, which muſt be choaked at unequal heights, that they may produce their effects at different times.

Jets of Fire are a ſort of fixed rockets, the effect of which is to throw up into the air jets of fire ſimilar to jets of water.

They ſerve alſo to repreſent caſcades, for if a ſeries of ſuch rockets be placed horizontally on the ſame line, it may be eaſily ſeen that the fire which they emit will reſemble a ſheet of water. When arranged in a circular form, like the radii of a circle, they form what is called a fixed ſun. To form jets of this kind, the cartridge for brilliant fires muſt, in thickneſs, be equal to a fourth part of the diameter, and for Chineſe fire only a ſixth part. The cartridge is loaded on a nipple, having a point equal in length to the ſame diameter, and in thickneſs to a fourth part of it; but as it generally happens that the mouth of the jet becomes larger than is neceſſary for the effect of the fire, the cartridge muſt be filled equal to a fourth part of the diameter with clay, which muſt be rammed down. This will make the jet aſcend much higher. When the charge is completed with the proper compoſition, the cartridge muſt be cloſed with a tompion of wood, above which it muſt be choaked. Jets intended for repreſenting ſheets of fire ought not to be choaked. They muſt be placed in a horizontal poſition, or inclined a little downwards. The following are the principal compoſitions for jets of fire.

1. *For Jets of half an Inch or leſs in Diameter.—Chineſe fire:* Saltpetre and mealed powder 1lb. each; ſulphur 8 ounces; charcoal 2 ounces.—*White fire:* Saltpetre 1lb.; mealed powder 8 ounces; ſulphur 3 ounces; charcoal 2 ounces; iron-ſand of the firſt order 8 ounces.

2. *For Jets of an Inch or leſs in Diameter.—Brilliant fire:* Mealed powder 1lb., iron-filings 5 ounces.—*White fire:* Saltpetre and mealed powder 1lb. each; ſulphur 8 ounces; charcoal 2 ounces.—*Chineſe fire:* Saltpetre 16 ounces; ſulphur 5 ounces; charcoal 5 ounces; iron-ſand of the third order 12 ounces.

3. *For Jets of* 15 *or* 18 *Lines in Diameter.—Chineſe fire:* Saltpetre 16 ounces; ſulphur 7 ounces; charcoal 5 ounces; of the ſeveral different kinds of iron-ſand mixed 12 ounces.

Fires of different Colours.—For *white fire* the gunpowder muſt be mixed with iron or rather ſteel-filings: for *red fire*, iron-ſand of the firſt order muſt be employed in the ſame way. Camphor mixed with the uſual compoſition is ſaid to make the flame appear of a *pale white* colour. Raſpings of ivory give a clear flame of a ſilver colour.

Paſte for repreſenting Animals, &c. in Fire.—Take ſulphur reduced to a very fine powder, and having formed it into a paſte with ſtarch, cover it with the figure of the thing to be repreſented, having firſt coated it with clay to prevent it from being burnt. After the figure is covered with the paſte, it muſt be ſprinkled, while moiſt, with gunpowder; and when the whole is perfectly dry, arrange about it ſeveral ſmall matches, that the fire may be ſpeedily communicated to it on all ſides. In this way all ſorts of garlands, feſtoons, and other ornaments, may be imitated by fire of different colours.

Suns, fixed and moveable.—For fixed ſuns, let a round piece of wood be cut, into the circumference of which are to be ſcrewed twelve or fifteen pieces in the form of radii, to which are to be attached jets of fire, of the compoſition deſcribed above; ſo that they may appear as radii tending to the ſame centre, the mouth of the jet being towards the circumference. Apply a match in ſuch a manner that the fire communicated at the centre, may be conveyed at the ſame time to the mouth of each of the jets, by which means, each throwing out its fire, there will be produced the appearance of a radiating ſun, that is, ſuppoſing the wheel is placed in a poſition perpendicular to the horizon. The rockets or jets may be ſo arranged as to croſs each other in an angular manner, in which caſe, inſtead of a ſun, you will have a ſtar, or a croſs. Some of theſe ſuns are made alſo with ſeveral rows of jets, which are called glories. For revolving ſuns, provide a wooden wheel, and attach to the circumference fire-jets placed in the direction of the circumference: they muſt not be choaked at the bottom, and ought to be arranged in ſuch a manner, that the mouth of the one ſhall be near the bottom of the other, ſo that when the fire of the one is ended, it may immediately proceed to another. When the fire is applied to one of theſe jets, the recoil of the rocket will make the wheel turn round, unleſs it be too large and ponderous. For this reaſon, when theſe ſuns are of a conſiderable ſize, that is, when they conſiſt of perhaps twenty rockets, fire muſt be communicated at the ſame time to the firſt, the ſixth, eleventh, and ſixteenth, from which it will proceed to the ſecond, the ſeventh, the twelfth, the ſeventeenth, and ſo on. Theſe four rockets will make the wheel turn round with great rapidity. If two ſimilar ſuns be placed one behind the other, and are made to turn in a contrary direction, they will produce a fine effect of croſs-fire.

Making, loading, and firing Pots des Brins.—Theſe are made of paſte-board, and muſt be rolled pretty thick; uſually made three or four inches in diameter, and four diameters long, and pinched with a neck at one end, like common caſes. A number of theſe are placed on a plank thus: having fixed on a plank two rows of wooden pegs, cut in the bottom of the plank a groove the whole length under each row of pegs; then, through the centre of each peg, bore a hole down to the groove at bottom, and on every peg fix and glue a pot, whoſe mouth muſt fit tight on the peg: through all the holes run a quick-match, one end of which muſt go into the pot, and the other into the groove, which muſt have a match laid in it from end to end, and covered with paper, ſo that, when lighted at one end, it may diſcharge the whole almoſt inſtantaneouſly: in all the pots put about one ounce of meal and corn powder; then in ſome put ſtars, and others rains, ſnakes, ſerpents, crackers, &c.; when they are all loaded, paſte paper over their mouths. Two or three hundred of theſe pots being fired together, make a very pretty ſhow, by affording ſo great a variety of fires. *Fig.* 9. is a range of pots des brins, with the leader A, by which they are fired.

Caduceus Rockets, in riſing, form two ſpiral lines, or double worm, by reaſon of their being placed obliquely, one oppoſite the other; and their counterpoiſe is in their centre, which cauſes them to riſe in a vertical direction. Rockets for this purpoſe muſt have their ends choaked cloſe, without either head or bounce, for a weight at top would be a great obſtruction to their mounting; though they have been known ſometimes to be bounced, but then they did not riſe ſo high as thoſe that were not; nor do any caduceus rockets aſcend ſo high as ſingle, becauſe of their ſerpentine motion, and likewiſe the reſiſtance of air, which is much greater than two rockets of the ſame ſize would meet with, if fired ſingly.

By *fig.* 10. we ſee the method of fixing theſe rockets: the ſticks for this purpoſe muſt have all their ſides equal, which ſides ſhould be equal to the breadth of a ſtick proper for a ſky-rocket of the ſame weight as thoſe we intend to uſe, and to taper downwards as uſual, long enough to balance them, one length of a rocket, from the croſs ſtick, which muſt be placed from the large ſtick, ſix diameters of one of the rockets, and its length ſeven diameters; ſo that each rocket, when tied on, may form with the large ſtick an angle of ſixty degrees. In tying on the rockets, place their heads on the oppoſite ſides of the croſs ſtick, and their ends on the oppoſite ſides of the long ſtick; then carry a leader from the mouth of one into that of the other. When theſe rockets are to be fired, ſuſpend them between two hooks or

nails,

nails, then burn the leader through the middle, and both will take fire at the ſame time. Rockets of one pound are a good ſize for this uſe.

Illuminated ſpiral Wheel.—Firſt have a circular horizontal wheel, made two feet in diameter, with a hole quite through the nave; then take three thin pieces of deal, three feet long each, and three quarters of an inch broad each: one end of each of theſe pieces nail to the fell of the wheel, at an equal diſtance from one another, and the other end nail to a block with a hole in its bottom, which muſt be perpendicular with that in the block of the wheel, but not ſo large. The wheel being thus made, take a hoop planed down very thin and flat; then nail one end of it to the fell of the wheel, and wind it round the three ſticks in a ſpiral line, from the wheel to the block at top: on the top of this block fix a caſe of Chineſe fire; on the wheel you may place any number of caſes, which muſt incline downwards, and burn two at a time. If the wheel ſhould conſiſt of ten caſes, you may let the illuminations and Chineſe fire begin with the ſecond caſes. The ſpindle for this wheel muſt be a little longer than the cone, and made very ſmooth at top, on which the upper block is to turn, and the whole weight of the wheel to reſt. See *fig.* 11.

Fruiloni Wheels.—Firſt take a nave, made nine inches long, and three in diameter: near the bottom of this nave fix eight ſpokes, with a hole in the end of each, large enough to receive a two or four-ounce caſe: each of theſe ſpokes may be fourteen inches long from the block. Near the top of this block fix eight more of the ſame ſpokes, exactly over the others, but not ſo long by two inches. As this wheel is to run horizontally, all the caſes in the ſpokes at top muſt play obliquely upwards, and all of them in the ſpokes at bottom obliquely downwards. This being done, take a ſmall horizontal wheel, made with eight ſpokes, each five inches long from the block; on the top of this wheel place a caſe of brilliant fire: all the caſes on this wheel muſt play in an oblique direction downwards, and burn two at a time, and thoſe on the large wheel four at a time; that is, two of thoſe in the top ſet of ſpokes, and two of them in the bottom ſet of ſpokes. The four firſt caſes on the large wheel, and the two firſt on the ſmall, muſt be fired at the ſame time, and the brilliant fire at top, at the beginning of the laſt caſes. The caſes of the wheels may be filled with a grey charge. When theſe wheels are completed, you muſt have a ſtrong iron ſpindle, made four feet ſix inches long, and fixed perpendicular on the top of a ſtand: on this put the large wheel, whoſe nave muſt have a hole quite through, from the bottom to the top. This hole muſt be large enough to turn eaſy round the bottom of the ſpindle, at which place there muſt be a ſhoulder, to keep the wheel from touching the ſtand: at the top of the ſpindle put the ſmall wheel, and join it to a large one with a leader, in order to fire them both together.

Illuminated Globes, with horizontal Wheels.—The hoops for theſe globes may be made of wood, tin, or iron wire, about two feet in diameter. For a ſingle globe take two hoops, and tie them together, one within the other, at right angles; then have a horizontal wheel made, whoſe diameter muſt be a little wider than the globe, and its nave ſix inches long, on the top of which the globe is fixed, ſo as to ſtand three or four inches from the wheel: on this wheel you may put any number of caſes, filled with what charge you like; but let two of them burn at a time: they may be placed horizontally, or to incline downwards, juſt as you chooſe. Now, when the wheel is clothed, fix on the hoops as many illuminations as will ſtand within two inches and a half of each other: theſe you faſten on the hoops with ſmall iron binding wire; and when they are all on, put on your pipes of communication, which muſt be ſo managed as to light them all with the ſecond or third caſe on the wheel. The ſpindle on which the globe is to run muſt go through the block of the wheel, up to the inſide of the top of the globe, where muſt be fixed a bit of braſs or iron, with a hole in it to receive the point of the ſpindle, on which the whole weight of the wheel is to bear, as in *fig.* 12, which repreſents a globe on its ſpindle. By this method may be made a crown, which is done by having the hoops bent in the form of a crown. Sometimes globes and crowns are ordered ſo as to ſtand ſtill, and the wheel only to turn round; but when you would have the globe or crown to ſtand ſtill, and the wheel to run by itſelf, the block of the wheel muſt not be ſo long, nor the ſpindle any longer, than to juſt raiſe the globe a little above the wheel, and the wheel-caſes and illumination muſt begin together.

Dodecahedron, ſo called becauſe it nearly repreſents a twelve-ſided figure, and is made thus. Firſt take a ball, turned out of ſome hard wood, fourteen inches in diameter: when done, divide its ſurface into fourteen equal parts, from which bore holes an inch and a half in diameter perpendicular to the centre, ſo that they may all meet in the middle: then let there be turned in the inſide of each hole a female ſcrew; and to all the holes, but one, muſt be made a round ſpoke, five feet long, with four inches of the ſcrew at one end, to fit the holes; then in the ſcrew end of all the ſpokes bore a hole, five inches up, which muſt be bored ſlanting, ſo as to come out at one ſide, a little above the ſcrew; from which cut a ſmall groove along the ſpoke, within ſix inches of the other end, where you make another hole through to the other ſide of the ſpoke: in this end fix a ſpindle, on which put a ſmall wheel, of three or four ſides, each ſide ſix or ſeven inches long: theſe ſides muſt have grooves cut in them, large enough to receive a two or four-ounce caſe: when theſe wheels are clothed, put them on the ſpindles, and at the end of each ſpindle put a nut, to keep the wheel from falling off: the wheels being thus fixed, carry a pipe from the mouth of the firſt caſe on each wheel, through the hole in the ſide of the ſpoke, and from thence along the groove, and through the other hole, ſo as to hang out at the ſcrew end about an inch. The ſpokes being all prepared in this manner, you muſt have a poſt, on which you intend to fire the work, with an iron ſcrew in the top of it, to fit one of the holes in the ball: on this ſcrew fix the ball; then in the top hole of the ball put a little meal powder, and ſome looſe quick-match; then ſcrew in all the ſpokes, and in one ſide of the ball bore a hole, in which put a leader, and ſecure it at the end; and your work will be ready to be fired. By this leader the powder and match in the centre are fired, which will light the match at the ends of the ſpokes all at once, whereby all the wheels will be lighted at once. There may be an addition to this piece, by fixing a ſmall globe on each wheel, or one on the top wheel only. A grey charge will be proper for the wheel-caſes.

Yew-tree of brilliant Fire, is repreſented by *fig.* 13, as it appears when burning. Firſt, let A be an upright piece of wood, four feet long, two inches broad, and one thick: at top of this piece, on the flat ſide, fix a hoop, fourteen inches in diameter; and round its edge and front place illuminations, and in the centre a five-pointed ſtar; then at E, which is one foot and a half from the edge of the hoop, place two caſes of brilliant fire, one on each ſide: theſe caſes ſhould be one foot long each: below theſe fix two more caſes of the ſame ſize, and at ſuch a diſtance, that their mouths may almoſt meet them at top: then, cloſe to the ends of theſe caſes, fix two more of the ſame caſes; they muſt ſtand pa-

rallel to them at E. The cafes being thus fixed, clothe them with leaders, ſo that they, with the illuminations and ſtar at top, may all take fire together.

Illuminated Yew-tree.—Firſt have a tree made of wood, ſuch as is ſhewn by *fig.* 14. The middle piece, or ſtem, on which the branches are fixed, muſt be eight feet ſix inches high: at the bottom of this piece draw a line, at right angles, two feet ſix inches long at each ſide; then from L, which is one foot ſix inches from the bottom, draw a line on each ſide to C and D; theſe lines will give the length of the two firſt branches. Then put on the two top branches parallel to them at bottom: let the length of each of theſe branches be one foot from the ſtem: from the ends of theſe two branches draw a line to C and D; then fix on five more branches at an equal diſtance from each other, and their length will be determined by the lines A C and E D. When the branches are fixed, place illuminating port-fires on the top of each, as many as you chooſe: behind the top of the ſtem faſten a gerbe, or white fountain, which muſt be fired at the beginning of the illuminations on the tree.

Moon and Seven Stars.—Let *fig.* 15. be a ſmooth circular board, ſix feet diameter; out of the middle of it cut a circular piece twelve or fourteen inches diameter, and over the vacancy put white Perſian ſilk, on which paint a moon's face; then let I, I, I, &c. be ſtars each four or five inches in diameter, cut out with five points, and covered with oiled ſilk: on the front of the large circular board draw a ſeven-pointed ſtar, as large as the circle will allow; then on the lines which form this ſtar bore holes, wherein fix pointed ſtars. When this piece is to be fired, it muſt be fixed upon the front of a poſt, on a ſpindle, with a wheel of brilliant fire behind the face of the moon; ſo that while the wheel burns, the moon and ſtars will appear tranſparent, and when the wheel has burnt out, they will diſappear, and the large ſtar in front, which is formed of ſtars, will begin, being lighted by a pipe of communication from the laſt caſe of the vertical wheel, behind the moon: this pipe muſt be managed in the ſame manner as thoſe in regulated pieces.

Pin Wheels.—Firſt roll ſome paper pipes, about fourteen inches long each; theſe pipes muſt not be made thick of paper, two or three rounds of elephant paper being ſufficient. When your pipes are thoroughly dried, you muſt have made a tin tube, twelve inches long, to fit eaſy into the pipes: at one end of this tube fix a ſmall conical cup, which done is called a funnel; then bend one end of one of the pipes, and put the funnel in at the other, as far as it will reach, and fill the cup with compoſition; then draw out the funnel by a little at a time, ſhaking it up and down, and it will fill the pipe as it comes out. Having filled ſome pipes, and made ſome ſmall blocks, about an inch in diameter, and half an inch thick; round one of theſe blocks wind and paſte a pipe, and to the end of this pipe join another; which muſt be done by twiſting the end of one pipe to a point, and putting it into the end of the other, with a little paſte; in this manner join four or five pipes, winding them one upon the other, ſo as to form a ſpiral line. Having wound on your pipes, paſte two ſlips of paper acroſs them, to hold them together: beſides theſe ſlips of paper the pipes muſt be paſted together.

There is another method of making theſe wheels, called the French, which is, by winding on the pipe without paſte, and ſticking them together with ſealing wax, at every half-turn; ſo that, when they are fired, the end will fall looſe every time the fire paſſes the wax; by which means the circle of fire will be conſiderably increaſed. The formers for theſe pipes are made from one-half to four-ſixteenths of an inch diameter, and the compoſition for them as follows; meal powder eight ounces, ſaltpetre two ounces, and ſulphur one: among theſe ingredients may be mixed a little ſteel-filings, or the duſt of caſt-iron: this compoſition ſhould be very dry, and not made too fine, or it will ſtick in the funnel. Theſe wheels may be fired on a large pin, and held in the hand with ſafety.

Placing Fire-works to be exhibited, with the *Order of Firing*. Nothing adds more to the appearance of fire-works, than the placing them properly; though the manner of placing them chiefly depends on the judgment of the maker. We ſhall give ſuch rules here, as have been generally obſerved; for example, whether your works are to be fired on a building, or on ſtands. If they are a double ſet, place one wheel of a ſort on each ſide of the building; and next to each of them, towards the centre, place a fixed piece, then wheels, and ſo on, leaving a ſufficient diſtance between them, for the fire to play from one without burning the other. Having fixed ſome of your works thus in front, place the reſt behind them, in the centre of their intervals: the largeſt piece, which is generally a regulated or tranſparant piece, muſt be placed in the centre of the building, and behind it a ſun, which muſt always ſtand above all the other works: a little before the building, or ſtands, place your large gerbes; and at the back of the works, fix your maroon batteries, pots des aigrettes, pots des brins, pots des fauciſſons, air-balloons, and flights of rockets: the rocket-ſtands may be fixed behind, or any where elſe, ſo as not to be in the way of the works.

Single collections are fired on ſtands, which ſtands are made in the ſame manner as theodolite ſtands, only the top part muſt be long or ſhort occaſionally: theſe ſtands may be fixed up very ſoon without much trouble. Having given ſufficient inſtructions for placing of fire-works, we ſhall proceed with the manner of firing them.

Order of Firing.

1. Two ſignal
2. Six ſky
3. Two honorary
4. Four caduceus

} rockets.

5. 6. 7. Two { vertical / ſpiral } wheels illuminated. / tranſparent ſtars.

8. A line rocket of five changes.
9. Four tourbillons.

10. 11. 12. 13. 14. Two { horizontal wheels. / air-balloons illuminated. / Chineſe fountains. / regulating pieces of four mutations each. / pots des aigrettes.

15. Three large gerbes.
16. A flight of rockets.

17. 18. Two { balloon wheels. / caſcades of brilliant fire.

19. Twelve ſky-rockets.

20. 21. Two { illuminated yew-trees. / air-balloons of ſerpents, and two compound.

22. Four tourbillons.

23. 24. Two { Fruiloni wheels. / illuminated globes with horizontal wheels.

25. One pot des fauciſſons.
26. Two plural wheels.
27. Marron battery.
28. Two chandeliers illuminated.
29. Range of pots des brins.
30. Twelve ſky-rockets.
31. Two yew-trees of fire.

32. Neſt of ſerpents.
33. Two double cones illuminated.
34. Regulating piece of ſeven mutations, *viz.*
    1. Vertical wheel illuminated.
    2. Golden glory.
    3. Octagon vertical wheel.
    4. Porcupine's quills.
    5. Croſs fires.
    6. Star piece with brilliant rays.
    7. Six vertical wheels.
35. Brilliant ſun.
36. Large flight of rockets.

When water-works are to be exhibited, divide them into ſeveral ſets, and fire one ſet after every fifth or ſixth change of land and air-works. Obſerve this rule in firing a double ſet of works; always to begin with ſky-rockets, then two moveable pieces, then two fixed pieces, and ſo on; ending with a large flight of rockets, or a maroon battery: if a ſingle collection, fire a fixed piece after every wheel or two, and now and then ſome air and water-works. Jones's Fire-works, 8vo. 1776.

PYROTECHNICAL SPUNGE. See SPUNGE.

PYROTICS, Πυρωτικα, formed from πυρ, *fire*, in *Medicine*, cauſtics, or remedies, either actually or potentially hot; and which, accordingly, will burn the fleſh, and raiſe an eſchar.

PYROUET. See PIROUETTE.

PYROXENE, in *Mineralogy*. See AUGITE and LAVA.

According to Haüy, the mineral called augite by Werner is the black or greeniſh-black variety of pyroxene found in volcanic countries and in baſalt. The primitive form of the cryſtals of pyroxene is an oblique rhomboidal priſm.

The greyiſh-green tranſparent pyroxene, with the forms of the cryſtals diſtinctly marked, from the department of the Po, is the alalite of Bouvoiſin. Journal des Mines, N° 115.

The greyiſh-green, or whitiſh-grey variety, the primitive cryſtals of which are indiſtinct, from the ſame deparment, were called by Bouvoiſin maſſite. Both theſe varieties have been called by ſome mineralogiſts diopſide.

The greyiſh-green and obſcure green perioctahedral variety of pyroxene, is the ſahlite of Werner, called alſo malocolithe by Haüy. The mineral called coccolite, diſcovered by Dandrada at the iron mines of Sudermannland and Nerika, in Sweden, and Arendahl in Norway, is alſo brought under the ſpecies pyroxene by Haüy. Tableau Comparatif.

By reducing many varieties of minerals under one ſpecies, Haüy may be conſidered as having rendered an additional ſervice to mineralogy, already too much loaded with pedantic or unmeaning terms; but the term pyroxene itſelf may be juſtly objected to, as being founded not on any diſtinct character, but on the hypothetical aſſumption that theſe cryſtals are foreign to the igneous products in which they are imbedded, an aſſumption for which there does not appear ſufficient proof. The conſtituent parts of pyroxene, its ſpecific gravity and hardneſs, ſo nearly agree with thoſe of baſaltic hornblende, that theſe ſubſtances ought perhaps to be claſſed as varieties of the ſame ſpecies, without regarding the ſmall difference of their cryſtalline forms. See HORNBLENDE.

PYROXENE *en Roche*, or *Rock Pyroxene*. In the Journal des Mines, Nov. 1812, a deſcription is given of entire rocks compoſed of pyroxene, diſcovered by J. Charpentier in the Pyrenées. The ſubſtance is homogeneous, of a texture commonly granularly lamellar, which in ſome pieces becomes flaty. Its moſt common colour is green of various ſhades, from an olive green to an emerald green, ſometimes cloudy but often clear. From a greeniſh-grey it paſſes to a reddiſh-brown and ochre yellow. It is amorphous. The luſtre is ſplendent. Its fracture is lamellar, and has a two-fold cleavage equally perfect, croſſing at an angle of about 92°. In other directions the fracture is either imperfectly lamellar or conchoidal. It ſcratches glaſs, and gives ſome ſparks with ſteel. It melts with great difficulty by the blowpipe, but with borax it eaſily forms a green glaſs. M. Vogel has analyſed this mineral, and diſcovered chrome in the green ſpecimen. From the detailed deſcription of this rock, it appears nearly allied to ſchiſtoſe, ſpar, and ſerpentine. It is frequently intimately combined with talc, in which ſtate it is not eaſy to diſtinguiſh it from ſerpentine. Rock pyroxene is found in beds in the primitive limeſtone, that forms vaſt mountains ſuperincumbent on granite, extending from the valley of Vicdeſſos, in the department of Arriege, to St. Beat, in the valley of Garonne. The maſſes of rock pyroxene are of extraordinary ſize, extending in length 5000 toiſes. Its thickneſs is difficult to determine, but is ſuppoſed to exceed 300 toiſes. Charpentier is diſpoſed to claſs rock pyroxene as an intermediate rock between hornblende and ſerpentine, and ſubordinate to primitive limeſtone. It neither contains foreign beds nor mineral veins, and is leſs liable to decompoſition when pure, than almoſt any other rock. When intermixed with talc it decompoſes rapidly.

PYRRHA, in *Ancient Geography*, a town of the iſle of Leſbos, between the promontory Sigrium and the town of Ereſſus, according to Ptolemy. The town took its name from a ſtrait between Aſia Minor and the iſle of Leſbos, and gave it to a foreſt in the ſame iſle.—Alſo, a town of Macedonia, in Magneſia. Pliny.—Alſo, a town of Aſia Minor, in Lycia. Pliny.—Alſo, a town of Aſia Minor, in Ionia, ſituated at the entrance of the northern part of the Latmic gulf, E.N.E. of the town of Miletus, and S.S.E. of that of Myus. Strabo places it at 100 ſtadia from Heraclea—Alſo, a promontory of Theſſaly, upon the coaſt of the Phthiothide. Strabo ſays, that before this promontory were two iſles; one called Pyrrha, and the other Deucalion.—Alſo, a town of Greece, in the Phocide. Pliny.—Alſo, a town ſituated in the vicinity of the Palus-Mæotis; ſubmerged according to the relation of Pliny.—Alſo, a town of Aſia Minor, in Caria.

PYRRHICHA, Πυρρίχη, in *Antiquity*, a kind of exerciſe on horſeback; or a feigned combat, for the exerciſe of the cavalry.

It was thus called from its inventor Pyrrhicus, or Pyrrhus, in Cydonia, who firſt taught the Cretans to march in meaſure and cadence to battle, and to obſerve the pace of the Pyrrhic foot. Others derive the name from Pyrrhus, ſon of Achilles, who inſtituted this exerciſe at the obſequies of his father. Ariſtotle ſays, that it was Achilles himſelf who invented it.

The Romans alſo called it *ludus Trojanus*, the Trojan game; and Aulus Gellius *decurſus*. It is doubtleſs this exerciſe, that we ſee repreſented on medals, by two cavaliers in front, running with lances, and the word *decurſio* in the exergum.

PYRRHICHIUS, Πυρρίχιος, in the Greek and Latin *Poetry*, a foot conſiſting of two ſyllables, both ſhort; as *deus*.

Among the ancients this foot is alſo called *periambus*; by others *hegemona*.

PYRRHICUS, in *Ancient Geography*, a town of Laconia, upon the ſtream of Scyrax, S. of Hypſus. Here were two temples, one of Diana Aſtratæa, and another of the Amazonian Apollo. The ſtatues of theſe deities were of wood, and it is ſuppoſed they were placed here by the Amazons themſelves.

PYRRHO. See PYRRHONIANS.

PYRRHOCORAX, in *Ornithology*, a ſpecies of *Corvus* (which ſee), the Alpine crow of Latham, and the Choucas des Alpes of Buffon.—Alſo, the Monedula, Coracias of Aldrovand, &c., Corniſh chough, red-legged crow of Pennant and Latham, and Corvus *Graculus*, which ſee.

PYRRHONIANS, Pyrrhoneans, or *Pyrrhoniſts*, a ſect of ancient philoſophers, ſo called from their founder Pyrrho, a Greek philoſopher, born at Elea, in Peloponneſus, who in early life ſtudied painting, but aſpiring to philoſophical purſuits he became a diſciple of Anaxarchus, and accompanied him as far as India. In this journey he followed Alexander the Great; and hence we may know in what time he flouriſhed. In India he converſed with the Brachmans and Gymnoſophiſts, imbibing from their doctrine whatever might ſeem favourable to his natural diſpoſition towards doubting; a diſpoſition which was cheriſhed by his maſter, who had formerly been a diſciple of a ſceptical philoſopher, Metrodorus of Chios. As he was involved in freſh uncertainty by every advance he made in the ſtudy of philoſophy, he left the ſchool of the Dogmatiſts, who profeſſed to be poſſeſſed of certain knowledge, and eſtabliſhed a new ſchool, in which he taught, that every object of human inquiry is involved in uncertainty, ſo that it is impoſſible ever to arrive at the knowledge of truth.

The diſtinguiſhing character of this philoſopher was, that he profeſſed to doubt of every thing, maintaining that men only judge of truth and falſehood from appearances, which deceive. On this principle he kept himſelf in continual ſuſpenſion of mind, never determining on any thing; to avoid the inconveniencies of error and falſe judgments.

He found in all things (ſays Bayle) reaſons to affirm and to deny; and therefore he ſuſpended his aſſent after he had well examined the arguments *pro* and *con*, and reduced all his concluſions to a *non liquet*, let the matter be farther enquired into. Hence it is (ſays he) that he ſought truth as long as he lived, but he ſo contrived the matter, as never to grant that he had found it. Though he is not the inventor of that method of philoſophizing, yet it goes by his name. The art of diſputing about every thing, without doing any thing elſe but ſuſpending one's judgment, is called Pyrrhoniſm, or Scepticiſm.

Some have ſaid, that this philoſopher acted upon his own principles, and carried his ſcepticiſm to an extreme ſo ridiculous, that his friends were obliged to accompany him wherever he went, that he might not be run over by carriages, or fall down precipices. Theſe reports, however, are inconſiſtent with the reſpect that is paid to him by ancient writers, and with the general hiſtory of his life, and are charged, as calumnies, upon the Dogmatiſts, whom he oppoſed. A great part of his life was ſpent in ſolitude; and he always preſerved a ſettled compoſure of countenance, undiſturbed by fear, or joy, or grief. He endured bodily pain with great fortitude; and in the midſt of dangers he manifeſted no ſigns of apprehenſion. As a diſputant, he was celebrated for the ſubtlety of his arguments, and the perſpicuity of his language. So highly was Pyrrho eſteemed by his countrymen, that they honoured him with the office of chief prieſt, and from reſpect to him, paſſed a decree by which all philoſophers were indulged with an exemption from public taxes. Of the poets, and particularly of Homer, he was a great admirer; and frequently repeated paſſages from his poems. He flouriſhed about the 110th olympiad, and died about the 90th year of his age, probably in the 123d olympiad, B.C. 288. After his death, the Athenians honoured his memory with a ſtatue; and a monument, as Laertius informs us, was erected to him in his own country. His ſcepticiſm may in a great meaſure be aſcribed to his early acquaintance with the ſyſtem of Democritus. Having learned from this philoſopher to deny the real exiſtence of all qualities in bodies, except thoſe that are eſſential to primary atoms, and to refer every thing elſe to the perceptions of the mind produced by external objects, that is, to appearance and opinion, he concluded, that all knowledge depended upon the fallacious report of the ſenſes, and conſequently, that there can be no ſuch thing as certainty. In this notion he was encouraged by the general ſpirit of the Eleatic ſchool, in which he was educated, which was unfavourable to ſcience. But his ſcepticiſm was more confirmed by the ſubtleties of the Dialectic ſchool, in which he was inſtructed by Bryſon, the ſon of Stilpo. Regarding mental tranquillity as the great end of all philoſophy, and obſerving that nothing contributed ſo much to diſturb it, as the diſſenſions which agitated the ſchools of the Dogmatiſts, and alſo inferring from their endleſs diſputes the uncertainty of the queſtions which they debated, he had recourſe to the doctrine of univerſal uncertainty; and thus it happened in his caſe, as in that of many others, that controverſy became the parent of ſcepticiſm.

Pyrrho had ſeveral diſciples, but none who merit particular notice except Timon, the Phliaſian, who lived to the age of 90 years, and flouriſhed in the time of Ptolemy Philadelphus. The public ſucceſſion of profeſſors in the Pyrrhonic ſchool terminated with Timon, and in Cicero's time this ſchool was extinct. The diſciples of Timon choſe to ſcreen their ſcepticiſm under the authority of the Academy; and after ſome interval, the ſchool itſelf was revived by Ptolemæus, a Cyrenian, and continued at Alexandria by Œneſidemus, a contemporary with Cicero: the latter wrote a treatiſe "On the Principles of the Pyrrhonian Philoſophy," the heads of which are preſerved by Photius. From his time it was tranſmitted, through a ſeries of preceptors little known, to Sextus Empiricus, who has given a ſummary of the ſceptical doctrine; for an account of which, ſee Sceptics. As for Pyrrho and his followers, they rather endeavoured to demoliſh every other philoſophical ſtructure, than to erect one of their own. They aſſerted nothing; but propoſed poſitions merely in the way of enunciation, without attempting to determine on which ſide, in any diſputed queſtion, the truth lay, or even preſuming to aſſert, that one propoſition was more probable than another.

Thoſe now diſtinguiſhed by the name of Pyrrhonians, or Sceptics, are perſons who, from the great number of things that are dark and obſcure, and from the averſion they bear to popular credulity, maintain, that there is nothing certain in the world.

The truth is, Pyrrhoniſm has ſome foundation in nature: we do not judge of things from their real eſſences, but from their relations to ourſelves. Moſt of our ideas we receive by means of our ſenſes; but our ſenſes are not given us to judge of the eſſences, but of the relations of things to themſelves; *i. e.* how they may affect us ſo as to do us good or harm.

Thus, *e. gr.* our eyes do not give us the real magnitudes of objects, but their relative ones only.

The Academics differed from the Pyrrhonians, in that they owned there were ſome things more like or more near akin to truth than others, which the Pyrrhonians peremptorily denied. On account of the ſimilarity of the opinions of this ſect and thoſe of the Platonic ſchool in the Middle and New Academy, it happened, that many of the real followers of Pyrrho choſe to ſcreen themſelves from the reproach of univerſal ſcepticiſm, by calling themſelves *Academics* (which ſee); and hence the appellation of Pyrrhoniſts

rhoniſts fell into diſuſe, whilſt the doctrine of Pyrrho had many advocates. For the difference between them, ſee SCEPTICS.

Le Clerc obſerves, that the Pyrrhonians, in affirming that there is nothing certain, were the moſt aſſuming and deciſive of all philoſophers; ſince they muſt firſt have examined all things, to be able to determine preciſely that all things are uncertain.

It may be added, that the very principle of the Pyrrhonians deſtroys itſelf; for if there be nothing certain, then muſt that dogma itſelf be precarious; and if no one thing be more probable, or liker to truth than another, why ſhall the principle of the Pyrrhonians be believed preferably to the oppoſite one? ſince itſelf is come at in the ſame way as our other knowledge. Brucker's Hiſt. of Philoſ. by Enfield, vol. i.

PYRRHUM, in *Ancient Geography*, a town of Pannonia, on the route from Pætovio to Siſcia, between Aquaviva and Dautona, according to the Itin. of Antonine.

PYRRHUS, in *Biography*, king of Epirus, one of the moſt diſtinguiſhed warriors of the period in which he flouriſhed, ſuppoſed to be deſcended from Pyrrhus, the ſon of Achilles, was the ſon of Æacides, who was expelled the kingdom by a revolt of his ſubjects. When Pyrrhus was only twelve years of age, he was placed on the throne of his anceſtors by Glaucias, king of Illyria, who had protected him in his infancy. He reigned in peace till he was about ſeventeen years of age, when, being abſent from his kingdom, his ſubjects ſeized his treaſures, and conferred the crown upon his great uncle, Neoptolemus. Pyrrhus being poſſeſſed of no force to enable him to recover his authority, repaired to Demetrius Poliorcetes, the ſon of Antigonus, who had married his ſiſter, and under that eminent commander he learned the art of war, in company with many officers and ſoldiers of Alexander the Great. At the battle of Ipſus, in the year B.C. 301, he greatly diſtinguiſhed himſelf, and after its loſs by Demetrius, he ſecured for him the Greek cities, with the care of which he had been entruſted. When a treaty of peace was concluded between Demetrius and Ptolemy Lagus, king of Egypt, Pyrrhus conſented to be one of the hoſtages ſent into that country for the performance of the conditions. In the Egyptian court he excited general admiration by his amiable and correct behaviour, and his dexterity in martial exerciſes; and he obtained from the king his daughter Antigone in marriage. The next ſtep was to reſtore him to his throne, which was effected by an armament ſupplied by Ptolemy, with the aid of which he defeated Neoptolemus. That prince, however, being ſupported by his allies, Pyrrhus conſented to allot him a ſhare of his dominions; but ſuch a partnerſhip was not likely to be durable, and Neoptolemus, it was ſaid, attempted to poiſon Pyrrhus, which gave the latter a pretence to order his death. He being ſettled on the throne of Epirus, began to execute thoſe ſchemes of ambition, in which the remainder of his life was ſpent. A civil war raging between the two ſons of Caſſander, in Macedonia, one of them, Alexander, applied to Pyrrhus for aſſiſtance. He gladly took occaſion of interfering in the affairs of that kingdom, and being put in poſſeſſion of all its maritime towns, proceeded to conquer the reſt for Alexander. A peace was made, by which Macedonia was divided between the two brothers, and Pyrrhus ſeems to have withdrawn his troops to his own country. Shortly after, Demetrius made himſelf maſter of the kingdom, and notwithſtanding their former friendſhip, hoſtilities enſued between him and Pyrrhus, who haraſſed him by incurſions into Theſſaly. They mutually invaded each other's kingdoms; and in one inſtance, Pyrrhus gained ſo complete a victory over the principal general of his antagoniſt, and diſplayed ſo much courage, that he ſtruck with admiration the Macedonians whom he had defeated, who deſerted their own king, and choſe Pyrrhus for their ſovereign. This occurred in the year B.C. 287. He held this crown, however, a ſhort time; for Lyſimachus, in the following year, entering the country with a powerful army, and remonſtrating againſt the injuſtice of conferring the kingdom on a foreigner, in prejudice to him, a native and commander under Alexander the Great, the allegiance of the Macedonians ſeemed to Pyrrhus ſo little to be relied on, that he withdrew from the conteſt, and returned to Epirus. The Romans, engaged in a war with the Tarentines, looked for aſſiſtance to Pyrrhus. This prince eagerly liſtened to the propoſal, and communicated his determination to his prime-miniſter Cyneas, who, being more prudent than his maſter, endeavoured to diſſuade him from it. The enterprize was, however, reſolved on, and Cyneas was ſent with a body of troops to Tarentum, where he ſubverted the Roman influence, which was beginning to prevail, and obtained the command of the citadel for an Epirot officer. Pyrrhus followed, and having left his ſon Ptolemy regent of Epirus, landed in Italy, in the year 280 B.C., bringing with him an army of about 25,000 men, of whom 7000 were Macedonians, the veteran ſoldiers of Alexander the Great. He alſo brought a number of war-elephants, which was the firſt time that theſe animals were ſeen, in that character, in Italy. He was greatly endangered in his paſſage by a ſtorm, which diſperſed his fleet, and deſtroyed ſome of the ſhips that kept company with him. On his arrival at Tarentum, he began to correct the licentious manners of the inhabitants, and enure them to military diſcipline. At length he marched out to meet the Roman conſul Valerius Lævinus, who was waiting for him on the bank of the Siris, in Lucania. The engagement was extremely obſtinate, and Pyrrhus, who exerted himſelf in a manner worthy of his high reputation, was in great perſonal danger. Victory, however, decided in his favour, and he took poſſeſſion of the enemy's camp. In interring the dead he made no diſtinction between his own men and the ſoldiers of his antagoniſt, but beſtowed due encomia upon the bravery of his fallen foes. He followed up his victory, and had proceeded ſo far as to obtain a diſtant view of Rome. The advance of the other conſul obliged him to retire, and he finiſhed his campaign by returning to Tarentum. Senſible that he had engaged in no eaſy taſk, he was delighted to receive an embaſſy from the Romans, which he imagined was to ſolicit peace, but it was only to negociate an exchange of priſoners. In this embaſſy was included the virtuous Fabricius, whom he in vain attempted to gain to his intereſt by large offers. He then attempted to make a treaty, and ſent his miniſter, Cyneas, to Rome for that purpoſe, but was unſucceſsful.

In the next campaign, two conſuls with their armies marched againſt the king of Epirus; the battle was extremely bloody, and the victory ſo indeciſive, that both parties claimed it: one of the conſuls was killed, and Pyrrhus was ſeverely wounded; and ſuch was the loſs of men, that to one who congratulated him as having been the conqueror, he frankly replied, "ſuch another victory will ruin me." Both the conſuls of the next year, one of whom was Fabricius, were employed to oppoſe Pyrrhus, who had received freſh reinforcements from Epirus. They advanced to the Tarentine territory, where, while they were ſeeking an opportunity to engage, an offer was made them by the phyſician of Pyrrhus, to take him off by poiſon. Deteſting

ing the treachery, they informed the king of his danger, which ſo affected him, that he immediately liberated all his Roman priſoners without a ranſom. He now ſent Cyneas to Rome to renew the attempt at negociation, but was again unſucceſsful. During the ſtate of perplexity which a refuſal had thrown him into, he was invited by the Syracuſans and others to lend his aid againſt the Carthaginians, who had eſtabliſhed themſelves in Sicily. He accordingly ſeized the pretext for changing the field of action, and embarked the whole army for that iſland, leaving only a ſtrong garriſon in Tarentum. On his arrival he was received with general acclamations, and all the public force of Syracuſe was put into his hands. He was ſoon ſo completely ſucceſsful, that the Carthaginians ſent deputies to Pyrrhus to treat for peace, but he refuſed to liſten to any other condition, than that of their entirely evacuating the iſland. In confidence of ſucceſs, he cauſed a ſon to be proclaimed king of Sicily, and then made preparations to croſs over into Africa, and carry the war into the Carthaginian territories. Theſe projects were not agreeable to the Sicilians, who became alienated from him, and whom he treated not as friends, but as a conquered people. After this he quitted Sicily, and embarked for Italy; in his voyage he was encountered at ſea by a Carthaginian fleet, which ſunk a number of his veſſels and diſperſed the reſt, ſo that he reached a port in Italy with no more than twelve ſail. Six years did he conſume in Italy and Sicily, inflicting and ſuffering all the evils of war, and finally exhauſted in force, and with diminiſhed reputation. His reſtleſs ſpirit was not ſubdued; and for the purpoſe of employing and paying his ſoldiers, in conjunction with a body of Gauls, he made an irruption into Macedonia, where Antigonus Gonatus then reigned. His ſucceſs was beyond his expectations, for he not only obtained the pillage of many cities, but defeated Antigonus in battle, and wreſted from him almoſt the whole kingdom. He now marched with a powerful army into the Peloponneſus, at the requeſt of Cleonymus, and appearing before Sparta, required the inhabitants to receive his friend as their king. Upon their determination to reſiſt this mandate, he attacked the city, but was repulſed with the loſs of many men: he now retired to Argos, where, through the treachery of Ariſteas, a bloody conflict enſued, during which, a woman, who ſaw Pyrrhus juſt going to kill her ſon, hurled a tile from the top of the houſe, which brought the king to the ground. In this ſtate a Macedonian dragged him to a porch, and was going to cut off his head, when Pyrrhus opened his eyes, and gave him ſo fierce a look, that his trembling hand failed in its office, and it was not till after repeated ſtrokes, that he could execute his purpoſe. Thus in the year 272 B.C. terminated the life and exploits of this great warrior, whoſe career of reſtleſs enterprize death alone could ſtop. His military ſkill was held in the higheſt eſtimation by the Romans, who were ſo well able to judge of it by experience. Hannibal conſidered Pyrrhus as ſecond only to Alexander, as a great general. He is ſaid to have been the firſt who underſtood the art of encampments, and of properly drawing up an army, and ſome treatiſes which he wrote on theſe ſubjects are mentioned by the ancients. He was brave to the borders of raſhneſs, and ſometimes loſt the commander in the ſoldier. He had unbounded ambition, and a diſpoſition perpetually to engage in new enterprizes, for which, as we have ſeen, he readily abandoned ſuch as proved more difficult than he had expected. He was fond of glory, but was poſſeſſed of generoſity, which diſpoſed him to acts of kindneſs, and to a grateful acknowledgment of obligations. All his ſons were warlike, and he encouraged the diſpoſition by the declaration, that he would leave the kingdom of Epirus to him who had the ſharpeſt ſword.

PYRRHUS *Campus*, or *Pyrrhon Pedium*, in *Ancient Geography*, a canton of Africa, in Mauritania Tingitana, in the country of the Nectiberes, according to Ptolemy.

PYRRHUS *Campus*, a canton of Africa, in Interior Libya, between the country of the Leucæthiopes and that of the Perorſi, according to Ptolemy.

PYRRHUS *Mons*, a mountain of India, on the ſea-coaſt, on this ſide of the Ganges, according to the Periplus of Arrian.

PYRRSTEIN, in *Geography*, a town of Auſtria; 10 miles N.W. of Lintz.

PYRSEPHORUS, Πυρσηφορος, in the Athenian feſtival, Hephæſtia, the ſame with Lampadephorus.

PYRULARIA, in *Botany*, ſo called, as it ſeems, becauſe the fruit reſembles a little pear, Michaux Boreali-Amer. v. 2. 231; has received a new appellation from Willdenow in his v. 4. 1114, *Hamiltonia*, which Mr. Purſh adopts, in his Flora, 178.—This genus, referred by Michaux and Willdenow to *Dioecia Pentandria*, is placed by Purſh in *Pentandria Monogynia*, though he allows it to be dioecious. It is ſaid to be allied to Nyssa. See that article.

Eſſ. Ch. Calyx ſuperior, five-cleft. Corolla none. Nectary a five-toothed diſk. Drupa. Flowers dioecious.

1. *Hamiltonia oleifera* of Purſh, *Pyrularia pubera* of Michaux, is the only known ſpecies, a native of ſhady woods, on the mountains of Pennſylvania, in Virginia, near the ſweet ſprings, and in Carolina, flowering in May and June. This is a *ſhrub*, from four to ſix feet high, very downy, with alternate, oblong, pointed, entire *leaves*. *Stipulas* none. *Flowers* very ſmall, greeniſh-yellow, in terminal *cluſters*. *Fruit* known in North America by the name of Oil-nut. The *root* is ſaid by Michaux to have an unpleaſant ſmell.

PYRUS, an ancient Latin name, which botaniſts have adopted, but of which the moſt correct orthography perhaps would be *Pirus*. This will appear as we trace its etymology, but more trouble than good would now ariſe from ſuch a correction. The generality of critics have given rather a forced derivation of this word, from its Greek ſynonym, απιος, the *a* being ſuppoſed cut off, and an *r* introduced; but De Theis has propoſed a much more probable one, from the Celtic *peren*, whence the Anglo-Saxons have taken *pere*, the Engliſh *pear*, and the French *poire*. According to the ſame writer, *api*, the Celtic name of a fruit of the ſame kind, is the origin of the Greek απιος, the German *apfel*, and our *apple*. *Api* is even the particular name of one ſort of apple, in the French language.—Linn. Gen. 251. Schreb. 339. Willd. Sp. Pl. v. 2. 1012. Mart. Mill. Dict. v. 3. Sm. Fl. Brit. 531. Prodr. Fl. Græc. Sibth. v. 1. Ait. Hort. Kew. v. 3. 207. Purſh 339. Juſſ. 335. Tourn. t. 404. Lamarck Illuſtr. t. 435. Gærtn. t. 87. (Malus; Juſſ. 334. Tourn. t. 406. Cydonia; Juſſ. 335. Tourn. t. 405. Sorbus; Linn. Gen. 250. Schreb. 338. Juſſ. 335. Lamarck Illuſtr. t. 434. Cratægus; Linn. Gen. 250. Schreb. 338. Juſſ. 335. Lamarck Illuſtr. t. 433.)—Claſs and order, *Icoſandria Pentagynia*. Nat. Ord. *Pomaceæ*, Linn. *Roſaceæ*, Juſſ.

Gen. Ch. *Cal.* Perianth ſuperior, of one leaf, concave, with five ſpreading ſegments, permanent. *Cor.* Petals five, roundiſh, concave, inſerted by their claws into the calyx. *Stam.* Filaments twenty, awl-ſhaped, ſhorter than the corolla, inſerted into the calyx; anthers ſimple, roundiſh. *Piſt.* Germen inferior, roundiſh; ſtyles from two to five, thread-ſhaped, the length of the ſtamens; ſtigmas bluntiſh.

Peric.

Peric. Apple roundiſh, umbilicated, fleſhy, with from two to five membranous, more or leſs rigid, cells. *Seeds* two, rarely more, in each cell, oblong, obtuſe, pointed at the baſe, convex on one ſide, flat on the other.

Eſſ. Ch. Calyx five-cleft. Petals five. Apple inferior, of from two to five cells. Seeds two in each cell.

Our remarks under the article MESPILUS apply equally to the preſent genus, as to the propriety of referring to it the whole Linnæan genus of *Sorbus*, and ſome ſpecies of *Cratægus* and *Meſpilus*; diſregarding the difference in the number of their ſtyles, which is evidently uncertain and variable, and diſtinguiſhing *Meſpilus* by its berry, *Pyrus* by its apple. Even this diſtinction proves, in ſome inſtances, obſcure enough. We ſhall, for convenience, follow Willdenow in the order of the ſpecies, introducing our additional ones according to their affinities.

1. P. *arbutifolia.* Arbutus-leaved Dwarf Apple. Linn. Suppl. 256. Willd. n. 1. Ait. n. 1. Purſh n. 1. Wangenh. Amer. 89. t. 28. f. 64. (Meſpilus arbutifolia; Linn. Sp. Pl. 685. Cratægus virginiana, foliis arbuti; Mill. Ic. t. 109.)—Leaves obovate, pointed, ſerrated; downy beneath; their mid-rib glandular above. Flowers corymboſe. Calyx downy.—Common in low copſes and ſwamps, from Canada to Carolina, flowering in May and June. *Purſh.* Frequent in gardens. A buſhy *ſhrub*, without thorns, three or four feet high. *Leaves* two inches long, neatly ſerrated, more or leſs downy. *Flowers* white, terminal. *Fruit* red, the ſize of a currant, mealy, and not eatable.

2. P. *melanocarpa.* Black Bilberry Apple. Willd. Enum. 525. Purſh n. 2. (P. arbutifolia β; Willd. Sp. Pl. n. 1. and Ait. n. 1. Meſpilus arbutifolia; Schmidt Arb. 86. *Purſh.*)—Leaves obovate-oblong, pointed, ſerrated; ſmooth beneath; their mid-rib glandular above. Flowers corymboſe. Calyx ſmooth.—Found in the bogs of Canada, and on the high mountains of Pennſylvania, Virginia, and Carolina, flowering in May and June. The *fruit* is large and black, reſembling in taſte the berries of *Vaccinium penſylvanicum. Purſh.*

3. P. *Botryapium.* Snowy Berry Apple. Linn. Suppl. 255. Willd. n. 2. Ait. n. 2. Purſh n. 3. Wangenh. Amer. 90. t. 28. f. 65. (Meſpilus canadenſis; Linn. Sp. Pl. 685. Schmidt Arb. t. 84.)—Leaves oblong-elliptical, ſerrated, minutely pointed, finally ſmooth. Flowers racemoſe. Petals linear-lanceolate. Germen downy. Segments of the calyx ſmooth.—Native of woods and hedges from Canada to Carolina, bloſſoming in April and May. *Purſh.* Frequent in our ſhrubberies. A ſmall tree. The young *leaves* are covered with denſe woolly deciduous down. *Flowers* pure white, in lax terminal *cluſters*. *Fruit* black, ſaid by Mr. Purſh to have a very agreeable taſte. It is ſeldom perfected with us.

4. P. *ovalis.* Oval Berry Apple. Willd. n. 3. Purſh n. 4. (Meſpilus Amelanchier? Walt. Carol. 148. Cratægus ſpicata; Lamarck Dict. v. 1. 84.)—Leaves roundiſh-elliptical, acute, ſerrated, ſmooth. Flowers racemoſe. Petals obovate. Germen and ſegments of the calyx downy.—Native of ſwamps, from New Jerſey to Carolina, flowering in April and May. A ſmall *ſhrub*; the *fruit* black, eatable. *Purſh.* Lamarck, who firſt diſtinguiſhed this ſpecies, ſays it is twice or thrice as tall as the following, at leaſt in the French gardens, with rounder *leaves* and ſmaller *flowers*, while the *fruit* is larger, being as big as a ſloe. The narrow coloured deciduous *bracteas* moreover, which occur in both ſpecies, are in the preſent longer than each partial *flower-ſtalk*, which is not the caſe with *P. Amelanchier.*

5. P. *Amelanchier.* Alpine Berry Apple. Linn. Suppl. 256. Willd. n. 4. Ait. n. 3. (Meſpilus Amelanchier; Linn. Sp. Pl. 685. Jacq. Auſtr. t. 300. Mill. Ic. t. 178. f. 1. Vaccinia alba; Ger. Em. 1416.)—Leaves roundiſh-elliptical, acute, ſerrated; downy beneath. Flowers racemoſe. Petals lanceolate. Germen ſomewhat downy. Segments of the calyx ſmooth.—Native of rocky mountainous ſituations in Germany, Switzerland, France, and the iſle of Crete; common in ſhrubberies, ever ſince Gerarde's time, bloſſoming in May. From three to ſix feet high, or more when cultivated, making an elegant appearance with its copious drooping cluſters of ſnowy *flowers*, whoſe *ſtalks* are very woolly. *Fruit* blueiſh-black, ſweet, the ſize of a currant.

6. P. *cretica.* Cretan Berry Apple. Willd. n. 5. Prodr. Fl. Græc. n. 1157. (Chamæceraſus Idæa; Alpin. Exot. 4.)—Leaves roundiſh, emarginate, with a ſmall point, ſerrated; woolly beneath. Flowers racemoſe. Petals lanceolate. Germen and ſegments of the calyx woolly.—Found on the mountains of Crete. This differs from the laſt, of which it is juſtly ſuſpected of being a mere variety, in having rounder *leaves*, whoſe pubeſcence underneath is more permanent; as well as in having more woollineſs about the *flowers.*

7. P. *ſanguinea.* Red Berry Apple. Purſh n. 5. (Meſpilus canadenſis γ, rotundifolia; Michaux Boreali-Amer. v. 1. 291.)—"Leaves oval, obtuſe at each end, pointed, finely ſerrated; ſomewhat heart-ſhaped at the baſe. Cluſters of few flowers. Calyx ſmooth. Petals linear, obtuſe."—Found in Canada, and on the banks of the Columbia, flowering in April and May. A ſmall *tree*, with blood-red *branches*. *Fruit* red, eatable. *Purſh.*

8. P. *communis.* Common Pear-tree. Linn. Sp. Pl. 686. Willd. n. 6. Ait. n. 4. Sm. Fl. Brit. n. 1. Engl. Bot. t. 1784.—Leaves ovate, ſerrated, finally ſmooth. Flower-ſtalks corymboſe. Fruit elongated at the baſe.—Native of various parts of Europe, but even more general as a cultivated plant, the varieties of whoſe fruit are many of them highly valuable for the table. The truly wild, or iron, pear is not eatable. It bloſſoms in April or May. The *tree* is tall and handſome; the wood light, fine-grained, and tolerably hard, making neat furniture. The *branches*, at firſt erect, ſubſequently become curved downwards, and pendulous. The ſerratures of the *leaves* commonly diſappear by culture, as do the ſtrong *thorns* found on the wild tree. When young, the *leaves* are downy beneath, and fringed with white. *Flowers* white, with pale red *anthers*; their inflorescence corymboſe, not umbellate as in the apple. *Fruit* obovate, more or leſs elongated at the baſe.

9. P. *pollveria.* Woolly-leaved Pear-tree. Linn. Mant. 2. 244. Willd. n. 7. Ait. n. 5. (P. pollwilleriana; Bauh. Hiſt. v. 1. 59. Munch. Hauſv. v. 3. part 2. 333.)—Leaves ovate, ſtrongly ſerrated; moſt downy beneath. Flower-ſtalks corymboſe, ſubdivided.—Native of Germany, according to baron Munchhauſen. John Bauhin firſt met with it in the garden of baron Pollwill, in Alſatia. It was ſent to Kew, in 1786, by the late Mr. Græffer. This differs from the common Pear-tree in having the *leaves* downy on both ſides, but eſpecially beneath; the *flowers* cream-coloured, much ſmaller and more numerous, even forty in each *corymb*, their partial ſtalks being branched and forked. The *fruit* is ſmall, ſometimes but an inch long, and falls eaſily when ripe.

10. P. *nivalis.* Snow Pear-tree. Jacq. Auſtr. v. 2. 4. t. 107. Linn. Suppl. 253. Willd. n. 8.—Leaves obovate, obtuſe, pointed, entire; hoary beneath. Flower-ſtalks corymboſe. Fruit nearly globoſe.—Native of mountains in Auſtria, about the borders of woods and vineyards,

found it in Greece, as well as on mounts Hæmus and Athos, and in woods near Conſtantinople. Ray ſpeaks of it as wild in the mountainous parts of Cornwall and Staffordſhire. It is now rarely cultivated, being, though a handſome tree, yet of ſlow growth, and inferior in the value of its fruit to the Medlar. A ſolitary individual of this ſpecies now and then occurs, about ancient manſions and very old orchards. It bloſſoms in May. The *leaves* are larger, and the *flowers* twice the dimenſions of the laſt, being the ſize of hawthorn-bloſſoms, rather panicled than corymboſe. *Fruit* like a ſmall pear, reddiſh, above an inch long, with five cells, anſwerable to the five *ſtyles;* its cells with two valves, like thoſe of a Common Pear; and though only one *ſeed* is perfected in each cell, Gærtner obſerved two in an early ſtate. This *fruit*, if taſted before it is mellow, occaſions a moſt intolerable ſoreneſs at the back of the palate, laſting many hours. When ripe it is ſoft, brown, and agreeably acid. The name *Service* is evidently a corruption of *Sorbus*.

27. P. *torminalis*. Wild Service Pear-tree. Ehrh. Beitr. faſc. 6. 92. Sm. Fl. Brit. n. 3. Willd. Sp. Pl. n. 21. Ait. n. 17. (Cratægus torminalis; Linn. Sp. Pl. 681. Engl. Bot. t. 298. Fl. Dan. t. 798. Jacq. Auſtr. t. 443. Mill. Illuſtr. t. 42. Sorbus torminalis; Ger. Em. 1471. Matth. Valgr. v. 1. 239.)—Leaves ſimple, ſomewhat heart-ſhaped, ſerrated, acute, ſmooth, ſeven-lobed; the lower lobes ſpreading.—Native of Germany, Switzerland, England, and the Levant, in woods, flowering in April or May. A moderate-ſized *tree*, with a hard wood, and ſmooth bark. *Leaves* on long ſtalks, without *ſtipulas*, unequally lobed, pointed; their ribs ſometimes downy beneath. *Corymbs* downy, much branched. *Flowers* ſmaller than the laſt. *Styles* three, four, or five. *Fruit* brown, dotted, twice the ſize of a haw, very pleaſantly acid and pulpy, when touched by froſt, and often ſold in the London fruit-ſhops. By the ſpecific name, it ſhould ſeem to be of a griping quality. Tragus, in his p. 1010, repreſents it as powerfully expelling worms.

28. P. *hybrida*. Mule Service Pear-tree. Willd. n. 22. Moench. Weiſſenſt. 90. t. 6. *Willd.* — Leaves elliptical, ſerrated, downy beneath; ſimple or pinnate, the terminal one largeſt. Flowers corymboſe. Calyx hairy.—This is aſſerted by Profeſſor Willdenow, from whom we have ſpecimens, to be a mule production, from the firſt ſpecies, *P. arbutifolia*, impregnated by the 25th, *aucuparia*. It retains indeed as great a reſemblance to both parents as it poſſibly could to what are ſo diſſimilar to each other. The ſimple *leaves* are two inches or more in length, obtuſe, ſtrongly ſerrated; the lateral *leaflets*, of the compound ones, half, or one-third, as large, unequal at the baſe. *Stipulas* ovate, toothed, recurved. *Flowers* not much unlike the laſt, but their *cymes* ſomewhat ſmaller, with hairy, rather than downy, ſtalks. It is curious that the rib of each *leaf*, on its upper ſide, retains ſome portion of the brown glands characteriſtic of *P. arbutifolia*.

29. P. *anthyllidifolia*. Kidney-vetch-leaved Service-tree. —Leaves pinnate, entire; ſilky beneath. Corymbs axillary and terminal, of few flowers.—Gathered in the Sandwich iſlands, by Mr. Menzies, to whom we are obliged for ſpecimens, under the name of *Sorbus*, to which, now aboliſhed, Linnæan genus there can be no doubt that this tree belongs, though we have not ſeen the fruit. The *leaves* are all uniformly pinnate, two or three inches long, of eight or nine pair, beſides an odd one, of equal, oblong or obovate, obtuſe, minutely pointed, entire leaflets, half an inch at leaſt in length; ſmooth and ſhining above; paler and ſilky beneath. *Stipulas* lanceolate, a little hairy, deciduous. *Flower-ſtalks* axillary and terminal, nearly the length of the leaves, downy, corymboſe, though each bears but three or four *flowers*, which are about the ſize of *P. aucuparia*. *Bracteas* awl-ſhaped. *Calyx* woolly. *Styles*, as far as we can ſee, three, hairy at the baſe. The *leaves* of this very pretty and remarkable ſpecies ſtrikingly convey the idea, at firſt ſight, of ſome kind of *Anthyllis*, eſpecially *A. Barba Jovis*.

Pyrus, in *Gardening*, contains plants of the fruit-tree kind, of which the ſpecies cultivated are the common pear-tree (P. communis); the common apple-tree (P. malus); the Chineſe apple-tree (P. ſpectabilis); the Siberian crab-tree (P. prunifolia); the ſweet-ſcented crab-tree (P. coronaria); and the quince-tree (P. cydonia.)

With reſpect to the firſt, it is obſerved that "the wild pear, the mother of all the orchard and garden varieties, is thorny. The ſtipules are ſetaceous, white (or reddiſh), deciduous; the peduncles alternate; and the calyx clothed with a ferruginous wool."

There are numerous varieties; but thoſe of moſt importance for cultivation are,

The little muſk, which is often termed the ſupreme. The fruit, when ripe, is of a yellow colour; the juice ſomewhat muſky; and, when gathered before it be too ripe, it is a good fruit. It becomes ripe about the latter end of July, but continues good only a very ſhort time.

The chio, or little baſtard muſk, which is pretty much like the other, but ſmaller. The ſkin, when ripe, has a few ſtreaks of red on the ſun ſide.

The green chiſſel, or Haſtings, which is a middle-ſized fruit, that always remains green, and is full of juice when ripe. It becomes ripe in the beginning of Auguſt.

The red muſcadelle, which is a large early pear, of great beauty; the ſkin is of a beautiful yellow, ſtriped with red, and the fleſh has a rich flavour. It ſometimes produces two crops in a year; the firſt about the end of July, and the ſecond in September, or thereabouts.

The little muſcat, which is a ſmall pear, having the ſkin very thin, and of a yellowiſh colour, when ripe. This fruit has a rich muſky flavour, but does not keep long. It becomes ripe about the beginning of Auguſt.

The lady's thigh, which is here commonly called jargonelle, is of a ruſſet-green colour from the ſun, but towards it inclining to an iron colour; the fleſh is breaking, and has a rich muſky flavour. It becomes ripe about the middle of Auguſt.

The Windſor, which has a ſmooth ſkin, and when ripe is of a yellowiſh-green colour; the fleſh is very ſoft, and, if permitted to hang but two or three days after it is ripe, grows mealy, and is good for nothing. It becomes ripe about the latter end of Auguſt.

The jargonelle, which is commonly called cuiſſe madame. According to Mr. Forſyth, it is certainly the true French jargonelle, and the pear that commonly goes by that name here is the real cuiſſe madame, or lady's thigh; it being very probable that the names have been changed, in coming to this country. This pear is ſomewhat like the Windſor; the ſkin is ſmooth, and of a pale green colour. It is a plentiful bearer; but the fleſh is apt to be mealy, if it ſtands to be ripe, which is about the middle of Auguſt. It bears beſt on ſtandards.

The orange muſk, which is of a yellow colour, ſpotted with black; the fleſh is muſky, but very apt to be dry. It ripens about the latter end of Auguſt.

The great blanquet, or bagpipe of Anjou, which has a ſmooth ſkin of a pale green colour; the fleſh is ſoft, and full

full of juice of a rich flavour. It ripens about the middle of Auguſt.

The little blanquet, which is much leſs than the former, of a pale colour, and the fleſh tender, and full of a rich muſky juice. It ripens about the latter end of Auguſt.

The long-ſtalked blanquet has a very ſmooth ſkin, white, and a little coloured towards the ſun, and is full of a rich ſugary juice. It becomes ripe at the latter end of Auguſt.

The ſkinleſs or early ruſſelet, which is of a reddiſh colour, the ſkin extremely thin, and the fleſh melting and full of a rich ſugary juice. It ripens in the latter end of Auguſt.

The muſk robine, or queen's pear, (alſo called the amber pear,) which is ſmall, and of a yellow colour when ripe; it has a rich muſky flavour, and is a great bearer. It ripens about the latter end of Auguſt.

The muſk drone, which has a ſkin of a yellow colour when ripe, and a rich muſky taſte; but is apt to grow mealy, if left too long on the tree. It ripens about the beginning of September.

The red orange, which is of a greeniſh colour, but the ſide next the ſun changes to a purple colour, when ripe; the fleſh is melting, and the juice ſugary, with a little perfume. It ripens in the beginning of Auguſt.

The caſſolette, or green muſcat, is a ſmall greeniſh pear, with ſome ſpecks in the ſkin. It is full of a rich perfumed juice, and ripens in the latter end of September.

The great onion, brown admired, or king of ſummer, which is of a browniſh colour next the ſun, and becomes ripe in the beginning of September.

The muſk orange, in which the ſkin is green, and the fleſh melting. It ripens in the beginning of September.

The avorat, or Auguſt muſcat, which has a ſmooth ſkin of a whitiſh yellow colour; the juice is richly ſugared and perfumed, and it is eſteemed one of the beſt ſummer pears yet known. It is a great bearer, and becomes ripe in the beginning of September.

The roſe, or thorny roſe, which is ſhaped like the great onion pear, but much larger, of a yellowiſh-green colour, but a little inclining to red next the ſun. The fleſh is breaking, and the juice muſky. It becomes ripe in the beginning of September.

The poire du puchet, which has the fleſh ſoft and tender, and the juice ſugary. It ripens in the beginning of September.

The perfumed pear, which is of a deep red colour, ſpotted with brown; the fleſh melting, but dry, and has a perfumed flavour. It ripens in the beginning of September.

The ſalviati, which is red and yellow next the ſun, but whitiſh on the other ſide; the fleſh is tender, and the juice ſugary and perfumed. It ripens about the middle of September.

The roſe water, which has the ſkin rough, and of a brown colour, the juice very ſweet, taſting like roſe-water. It ripens in the latter end of September.

The ruſſelet, in which the fleſh is ſoft and tender, and the juice agreeably perfumed. It ripens in the latter end of September.

The great mouthwater, which has the fleſh melting and full of juice. It ripens about the latter end of September.

The prince's pear, which has a highly-flavoured juice, and is a great bearer, ripening about the latter end of September.

The ſummer bergamot, which is ſometimes called Hamden's bergamot. The fleſh is melting, and the juice highly perfumed. It ripens about the latter end of September.

The autumn bergamot, which is ſmaller than the former; the fleſh is melting, and the juice highly perfumed. It is a great bearer, and ripens in the beginning of October.

The ſummer bonchrêtien, which is very full of juice, and is of a rich perfumed flavour. It ripens about the middle of September.

The beurré rouge, (the red butter pear,) which has the fleſh very melting and full of a rich ſugary juice. It ripens in the beginning of October, and, when firſt gathered from the tree, is one of the very beſt ſorts of pears.

The dean's pear, which has the fleſh melting and full of juice, which is very cold. It is a great bearer, and ripens in the beginning of October.

The Swiſs bergamot has a melting fleſh, and is full of juice. It ripens in the beginning of October.

The long green, in which the fleſh is melting and full of juice. It ripens in the latter end of October. It is, by ſome, reckoned the ſame with the mouthwater.

The white and grey monſieur John, which are the ſame; the difference of their colour proceeding from the different ſoils and ſituations wherein they grow, or the ſtocks on which they are grafted. If this pear be rightly managed, there are not many ſorts in the ſame ſeaſon to be compared with it. The fleſh is breaking, and full of a rich ſugared juice. It ripens in the latter end of October or beginning of November.

The flowered muſcat, which is an excellent pear; the fleſh is very tender, and of a delicate flavour. It ripens in November.

The vine pear, which is of a dark red colour; the fleſh very melting, and full of a clammy juice. It comes into eating in November.

The rouſſeline pear, which is of a deep red colour, with ſpots of grey; the fleſh is very tender and delicate, and the juice very ſweet, with an agreeable perfume. It ripens about the latter end of October, but does not keep.

The knave's pear, which has the fleſh fine and tender, and the juice very much ſugared. It ripens in the latter end of October.

The marquis pear is a pear which, when it does not change yellow in ripening, is ſeldom good; but if it does, the fleſh will be tender, delicate, and very full of juice, which is ſugared. It comes into eating in November.

The Craſane pear, which has the fleſh extremely tender and buttery, and full of a rich ſugared juice. It is the very beſt pear of the ſeaſon, and comes into eating about the latter end of December.

The Lanſac, or Dauphiné pear, which has the fleſh yellow, tender, and melting; the juice is ſugared, and a little perfumed. It is in eating the beginning of December.

The martin ſec (the dry martin), which is almoſt like the ruſſelet in ſhape and colour; the fleſh is breaking and fine; and the juice ſugared, with a little perfume. It is in eating about the beginning of December.

The amadot, which is rather dry, but high-flavoured: it is in eating about the middle of December.

The little lard pear, which is extremely fine; the fleſh melting; the juice much ſugared, and has an agreeable muſky flavour. It is in eating the latter end of December, and is eſteemed one of the beſt fruits in that ſeaſon.

The Louiſbon (the good Lewis), which has the fleſh extremely tender, and full of a very ſweet juice. It is in eating about the middle of December.

The Colmar pear, which is very tender, and the juice greatly ſugared. It is in eating about the beginning of January, and is eſteemed an excellent fruit.

The l'eſchaſſerie, which has the fleſh melting and buttery;

the

the juice is ſugary, with a little perfume. It is in eating about the firſt of January. It bears beſt on ſtandards.

The virgouleuſe pear, which is eſteemed by ſome as one of the beſt fruits of the ſeaſon; the fleſh is melting, and full of a rich juice. It is in eating about the firſt of January. In dry and cold ſeaſons it is very apt to crack, which greatly diminiſhes its value.

The ambrette, which is eſteemed a very good pear; the fleſh is quite melting, and full of ſweet perfumed juice. It comes into eating about the beginning of January.

The epine d'hyver (the winter thorn pear), which has a very tender buttery pulp, of an agreeable taſte, with a ſweet juice highly perfumed. It is in eating about the latter end of December.

The St. Germain pear, which is a fine fruit and keeps long; the fleſh is melting, and very full of juice, which in a dry ſeaſon, or if planted on a warm dry ſoil, is very ſweet. It is in eating from December till February. Mr. Forſyth remarks, that it is "an excellent bearer, when planted as a dwarf ſtandard, and comes in ſucceſſion after the ſame ſort of pears on wall-trees are over."

The St. Auſtin, which is pretty full of juice, and which is often a little ſharp; the fleſh is tender but not buttery. It is in eating the latter end of December, and continues good two months or longer.

The Spaniſh bonchrêtien, which is a large fine pear; the fleſh is breaking, and the juice ſweet. It is in eating in January.

The wilding of Caſſay, which is alſo called the ſmall winter butter pear, is a ſmall fruit; the fleſh is melting, and the juice very rich: it is an excellent bearer on ſtandards. It is in eating in January.

The martin ſire, or the lord martin, which is a good fruit; the fleſh is breaking and full of juice, which is very ſweet and a little perfumed. It is in eating in January.

Th winter ruſſelet, which has the fleſh buttery and melting, and generally full of a ſweet juice. It is in eating in the latter end of January.

The franc real, or the golden end of winter, which is only eſteemed for baking.

The brown beurré, which is of a reddiſh-brown colour on the ſide next the ſun, and yelloviſh on the other ſide. The fleſh is melting, and full of a rich juice. It ripens in October, and is eſteemed an excellent pear.

The Holland bergamot, amoſelle, or lord Cheney's, which is a very good pear; the fleſh is half buttery and tender, and the juice is highly flavoured. It keeps from the end of January till April.

The German muſcat, which is an excellent pear; it is buttery and tender, and the juice is highly flavoured. It is in eating from February till April or May.

The pear of Naples, or Eaſter St. Germain, which is half-breaking; the juice is ſweet, and a little vinous. It is in eating in March.

The winter bonchrêtien, which is very large; the fleſh is tender and breaking, and is very full of a rich ſugared juice. It is in eating from the end of March till June.

The la paſtorelle, which is tender and buttery, and the juice ſweet. It is in eating in March.

The St. Martial, or the angelic pear, which has the fleſh tender and buttery, and the juice very ſweet. It is in eating in March.

The wilding of Chaumontelle, which is melting, the juice very rich, and a little perfumed. It is in eating in January.

The brown St. Germain, which is a very fine high-flavoured pear on dwarfs and ſtandards, and comes in after the wall St. Germain. It continues in eating from December to the end of March.

The pear d'Auch, which was introduced by the late duke of Northumberland. It much reſembles the Colmar, but is fuller towards the ſtalk. It is in eating from Chriſtmas to April, and is, without exception, the beſt of all the winter pears.

The ſwan's egg, which is a middle-ſized pear, in a ſhape like an egg; it is of a green colour, thinly covered with brown; the fleſh is melting, and full of a pleaſant muſky juice. It comes in eating in November. It is healthy, and bears well either as a ſtandard or in any other way.

The bergamot de paſque, which has alſo the following names: the terling, the amoſelle, the Paddington, and the Tarquin. It is a fine handſome fruit, green when gathered, and of a yelloviſh or ſtraw-colour when ripe. It comes into eating about the month of April, continues till June, and makes a very handſome appearance at table.

The golden beurré, which is a very fine pear; it is of a beautiful ſcarlet colour next the ſun, and of a gold colour on the other ſide. The fleſh is melting, and the juice high-flavoured. It ripens in October. It ſucceeds beſt on an eaſt aſpect, and a loamy ſoil. It is a plentiful bearer. Mr. Forſyth obſerves, that it "was introduced from Burgundy by the late marſhal Conway, and was firſt raiſed, in this country, at his ſeat of Park Place, near Henley-upon-Thames, now the ſeat of lord Malmeſbury."

The Williams's feedling pear, which reſembles a ſummer bonchrêtien, but is more juicy, is a great bearer, and ripens in September. Mr. Forſyth ſays that it "will be a valuable acquiſition to the market-gardeners, as it immediately ſucceeds the Windſor pear."

The citron de Carmes, which is a middle-ſized pear, of a yelloviſh-green caſt, full at the eye; of a round ſhape, but tapering a little towards the ſtalk, which is long. It becomes ripe in July.

And the true golden beurré, which in ſhape and ſize reſembles the brown beurré; but is of a reddiſh-brown colour next the ſun. It is a very fine pear, but does not keep long. It comes into eating in October.

Mr. Forſyth gives the following ſelection from Anderſon's and Co's. Catalogue of Edinburgh.

Of the Summer Kinds.—The pear James, which is ſoon ripe, and ſoon rotten, has a little flavour, and is the earlieſt pear in Scotland.

The early carnock, which is indifferent, of a yellow colour, and bright-red towards the ſun; making a beautiful ſtandard tree.

The lemon, lady's lemon, or lady Lamont, which is indifferently good, but principally valued for coming early, and being a good bearer in common.

The green pear of Pinkey, which is a ſmall green pear, nearly round, of a ſweetiſh taſte or flavour.

The forrow cow, a Clydeſdale pear, which is a large pear with a ſhort ſtalk; flat towards the eye; the colour red and yellow; the fleſh tender, and muſked in its flavour.

The pear ſanch, a Clydeſdale pear, which is a big-bellied beautiful pear; the tree large, a great bearer, and fit for an orchard; but the fruit is not very good.

The grey honey, which is a pretty good pear.

The green orange pear, or orange vert, which is a very good pear.

The brute bone, chaw good, or the pope's pear, which is only an indifferent ſort.

The golden knap, ſuppoſed Scotch, which is a ſmall ſummer pear, of tolerably good qualities.

The

The early achan, an indifferent fruit; greatly inferior to the winter pear of that name.

The hanging leaf, which is the name in Clydeſdale, is good and beautiful; almoſt round; its colour red and yellow; a delicious ſweetneſs is found in its taſte.

The Scots bergamot, which is a large good pear, of a yellow and red colour; the fleſh tender and juicy.

The Longueville, which is very good, but a precarious bearer; ſuppoſed French, though not in their catalogues under that name.

The muſked bonchrêtien, gratioli, cucumber, or Spinola's pear, which is a very good pear when grafted on a free ſtock; its pulp being ſomewhat between ſhort and tender, with a great deal of perfumed juice, its colour red on one ſide, and white on the other.

And the ſaffron pear, which is a pretty large well-ſhaped pear, fit for the orchard or the field.

Of the Autumnal Kinds.—The keather, which is a Clydeſdale pear, of middling ſize, and oblong ſhape, its juice agreeable.

The French carnock, which is tolerably good.

The elſhin haft, or good-man pear, which is a long pear, flat towards the eye: its colour green and yellow; its fleſh hard, dry, and ſweet in the taſte.

The Drummond, or late Scotch carnock, which is very good, if eaten before it grows mealy; its colour a bright red and yellow.

The vicar, an oblong pear, with the colour yellow, red, and ſtriped; tender, ſweet, and muſked, but dry in eating.

The royal orange bergamot, which differs from the orange bergamot in being yellower, and ſometimes having a faint red on one ſide.

The green pear of Yair, which is ſweet, juicy, and melting; of a moderate ſize; taking its name from Yair, on Tweed-ſide, where it was firſt diſcovered.

The rob hind, which is very indifferent.

The le beſideri, the wilding of the foreſt of Ileri, in Bretagne, which is a yellowiſh pear, of middle ſize, but which is indifferent.

The unicorn pear, which is of a beautiful red and yellow colour; but rather auſtere in the taſte or flavour.

Of the Winter Kinds.—The winter achan, which is a Scotch pear; among the beſt early winter pears, and equal to moſt of thoſe of the French kind.

The brier buſh, which is Scotch; a good pear, and will ripen in moſt ſeaſons; it is a ſmall pear, of a firm ſubſtance, and ſweet taſte.

The Brompton park, which is a ſeedling ſent by Jefferys of that name.

The round winter, which is a Clydeſdale pear, a very excellent winter pear.

The poir portrail, or gate pear, which is proper for baking.

The la double fleur, or the double-flowering pear, which is a large flat beautiful pear, with a ſmooth ſkin, and bluſh colour on one ſide, and yellow on the other: it is the beſt to preſerve, taking a beautiful red colour from the fire.

And to theſe the following liſt is added:—The Ambroſia pear, the Aſhton town, the autumn muſk bonchrêtien, the biſhop's thumb, the bloody pear, proper for baking, the brocas bergamot, the barland, proper for perry, the beſideri, fit for baking, the beurré du roi, the black pear, or Worceſter, fit for baking, the Britannia, the burdelieu, the Doyenne, or St. Michael, the caſtillac, fit for baking, the Eaſter St. Germain, the Ganſel's bergamot, the golden beurré, the grey beurré, the grey good-wife, the green ſugar, the green bergamot, the Huntingdon pear, the huff-cap, proper for perry, the king's Catharine, the lammas, the London ſugar, the muſcat almain, the muſk blanquet, the Oldfield, proper for perry, the orange bergamot, the pear piper, the pyrus pollveria, the red admirable, the rough cap, proper for perry, the Scotch bergamot, the ſeven-angled, the ſilver-ſtriped, the Spaniſh red warden, beſt for baking, the ſquaſh, proper for perry, the ſtriped verte longue, and the white beurré.

And for ſmall gardens, where there is room only for a few trees, the following are recommended as proper for furniſhing a regular ſucceſſion of fruit.

Summer Kinds.—The muſk pear, the green chiſſel, the jargonelle, the ſummer bergamot, and the ſummer bonchrêtien.

Of the Autumn Kinds.—The orange bergamot, the autumn bergamot, the Ganſel's bergamot, the brown beurré, the Doyenne, or St. Michael, and the ſwan's egg.

Of the Winter Kinds.—The Craſſane, the Chaumontelle, the St. Germain, the Colmar, the d'Auch, the l'eſchaſſerie, the winter bonchrêtien, and the bergamot de paſque.

And the ſecond ſort, in its wild ſtate, is called the crab, or wilding, and is armed with thorns, as well as the wild pear. Miller mentions two varieties in the fruit of the crab, one white, the other purple towards the ſun; but it is commonly yellowiſh-green with a tinge of red. And alſo a variety with variegated leaves.

There are a great many varieties of the apple, but the following are given by Mr. Forſyth as the moſt deſerving of attention.

The Acklam's ruſſet, which is a ſmall Yorkſhire apple, of a ruſſet colour toward the ſun, and yellow on the other ſide; it becomes ripe in January, and keeps till March.

The aromatic pippin, which is a very good apple, of a bright ruſſet next the ſun; and the fleſh has a fine aromatic flavour. It ripens in October.

The Baxter's pearmain, which is a real Norfolk apple, of a handſome ſize, and pale-green colour, full of ſmall dark ſpots. It is a fine kitchen fruit, and will keep till April. It is alſo a good eating apple.

The beauty of Kent, which is a fine large apple, reſembling a codlin. It is ſtreaked with a fine red towards the ſun, and of a beautiful yellow, with ſome ſtreaks of red on the other ſide. It is a very good apple, coming into eating in September, and keeping till the latter end of April.

The belle griſdeline, which is a new ſeedling raiſed at Norwich, of much beauty, and never failing to afford crops. It was firſt propagated by Mr. Lindley, who gave it this name. It is a handſome apple, reſembling the burſdoff, of a yellow colour, with red towards the ſun, and an excellent table apple, keeping till March.

The Bell's pearmain, which is a real Norfolk apple, large and handſome; red toward the ſun, and yellow on the other ſide. It is a fine kitchen fruit, and pretty good to eat raw, keeping till June.

The beſt pool, which is a middle-ſized apple, of a pale-green colour, ſtreaked with red towards the ſun. It is a good apple, in eating from January to April.

The black apple, which is a middle-ſized fruit, of a dark mahogany colour next the ſun, but fainter on the other ſide. It is of a pleaſant ſweet taſte, keeping till the middle of April.

The Bland's ſummer pippin, which is a handſome apple, of a gold colour, and an agreeable flavour. It is a great bearer, ripe in September, and keeps till Chriſtmas.

The Blatche's fine ſmall table apple, which is about the

ſize

ſize of a ſmall golden pippin; red toward the ſun, and green on the other ſide. It has a ſugary taſte, and comes into eating in January.

The boomrey, which is a pretty large handſome apple, of a flat ſhape, and deep-red colour; and the fleſh is ſtreaked with red. It is not fit to eat raw, but will do well for cyder, or for the kitchen. It keeps till April.

The Bovey redſtreak, which is a handſome apple, of a flattiſh ſhape, beautifully ſtreaked with a bright red next the eye, which is ſmall, and of a yellow colour about the footſtalk. It keeps till the latter end of October.

The broad-eyed pippin, which is a fine large apple, with a very large eye; the colour is a greeniſh-yellow, with a little red toward the ſun. It is a good apple, and keeps till May.

The brandy apple, which is about the ſize of a golden pippin, flat-ſhaped, and of a yellowiſh ruſſet colour. It is of a pleaſant flavour; comes into eating in January, and keeps till March.

The burſdoff, or queen's apple, which is a beautiful fruit, red next the ſun, and of a fine yellow on the other ſide. It is a very fine apple; in Mr. Forſyth's opinion, next in perfection to the golden pippin, and about the ſame ſize. It is of a good flavour; ripening in January, and keeping till March.

The carnation apple, which is a beautiful middle-ſized fruit, finely ſtriped with red. It is ripe in January, and keeps till May.

The Carbury pippin, which in ſize and ſhape reſembles the French crab, and is of a deep green colour. It is a good baking apple, keeping till March.

The caraway ruſſet, which is a handſome ruſſet-coloured apple, about the ſize of a nonpareil.

The calville, red and white, which are good apples, and of a vinous taſte. Some have a red and ſome a white pulp, the white being reckoned of a moſt delicious taſte. They are in eating in September, and the following month.

The cat's-head, which is a large oblong apple, of a greeniſh-yellow colour, with a little browniſh-red next the ſun; ſometimes the colour inclines to a ruſſet. It is a good baking apple, and is in eating from October to December.

The cockagee, which is a conical-ſhaped middle-ſized apple, red on that ſide next the ſun, and of a fine yellow colour on the other. If properly managed, the fruit keeps till February. It is a famous cyder apple, and alſo bakes well.

The codlin, which is generally the firſt apple that is brought to market. Its fruit is ſo well known that it needs no deſcription. It is in eating from July to December; and is good either for baking or boiling.

The Corniſh nonpareil, which is rather under the middle ſize, is a little flatted, and of a ruſſet colour. It is a very good apple, and keeps till the middle of March.

The Corniſh pearmain, which is of a middling ſize, and long ſhape; of a dull-green colour on one ſide, and ruſſet on the other. It is a very good apple, and keeps till the latter end of April.

The Court-of-Wick pippin, which is deſcribed by Mr. Billingſly, in his "Survey of Somerſetſhire," as "the favourite apple, both as a table and cyder-fruit, taking its name from the ſpot where it was firſt produced. It originated from the pip or ſeed of the golden pippin, and may be conſidered as a beautiful variety of that fruit. In ſhape, colour, and flavour, it has not its ſuperior: the tree is large, handſome, and ſpreading, and a very luxuriant bearer. On the whole, it cannot be too ſtrongly recommended." It is larger than the golden pippin, of a yellowiſh-green colour, and a little tinged with red next the ſun. It comes into eating in January

The Cockles pippin, which is a handſome oval-ſhaped apple, below the middle ſize, of a ruſſet colour, mixed with yellow and red. It keeps till April.

The corpendu, or hanging body, which is a very large apple, and has a red caſt on the ſide towards the ſun; but is pale on the other ſide. It takes its name from always hanging downwards; and comes into eating in September.

The Dalmahoy pippin, which is about the ſize of a golden pippin, of a green colour, and a little ſtreaked with red towards the ſun. It has a tolerably good flavour, rather ſharp; and is in eating from September to February.

The Dimock's red, which is under the middle ſize, of a fine red colour, intermixed with a little yellow on the ſide from the ſun. It is ripe in January, and keeps till March.

The Dredge's ſeedling, which is a fine large apple, ſtriped with red next the ſun, and of a yellowiſh-green on the other ſide. This is an excellent kitchen apple, of a pleaſant taſte, and keeps till the latter end of January.

The Dredge's beauty of Wilts, which is a beautiful apple, of a good ſize, and one of the fineſt yet known in point of general utility. It is of a fine bright yellow colour, ſpotted with red towards the ſun; and has an excellent vinous flavour. It is good either for the table or baking, and keeps till March.

The Dredge's ruſſet, which is a ſmall apple, of a greeniſh-ruſſet colour, and of a pleaſant flavour. It is ripe in November, and keeps till Midſummer.

The Dredge's white lily, which is a fine apple, of an exceeding high flavour, and keeps till March.

The Dredge's fair maid of Wiſhford, which is a fine middle-ſized apple, of a yellowiſh-green colour, with ſome ruſſet next the ſun, of an excellent flavour. It is a great bearer, and is in eating from Chriſtmas to Eaſter, being an excellent deſert apple.

The Dredge's queen Charlotte, which is a beautiful middle-ſized apple, of a gold colour, with red towards the ſun. It is of an excellent flavour, comes into eating about Chriſtmas, and keeps till February.

The Dredge's fame, which is a good ſized apple, red towards the ſun, and ſtreaked like the Ribſton pippin on the other ſide. It is a moſt excellent apple, being in eating from Eaſter to Midſummer.

The dumpling apple, which is a handſome apple, and rather above the middle ſize, flat ſhaped, and of a greeniſh-yellow colour, with ſome faint ſtreaks of red. It keeps till March.

The Dutch queening, which is a large apple, ſomewhat reſembling the cat's-head in ſhape. The colour is red next the ſun, and green on the other ſide, with ſometimes a little red. The fruit is fit only for the kitchen, and for making cyder. It is ripe in January, keeping till the end of March.

The Elton's yellow kernel, which is a handſome middle-ſized apple, of a yellow colour. It is a good table apple, being in eating from January to March.

The Engliſh rennet, which is a handſome apple, beautifully ſtreaked with red, but darkeſt towards the ſun; of a tolerable flavour, but apt to grow mealy when kept too long. It keeps till the middle of May.

The embroidered apple, which is pretty large, and the ſtripes of red very broad, from which circumſtance it takes its name. It is commonly uſed as a kitchen apple, becoming ripe in October.

The everlaſting ſtriped apple, which is below the middle

ſize, of a conical ſhape. The colour is a ſtriped green towards the footſtalk, and red towards the eye.

The fameuſe, which is a pretty large apple, of a beautiful dark red, with a little yellow on the ſide from the ſun. Its fleſh is very white, and full of a rich ſugary juice; coming into eating about the latter end of October. It was introduced from Canada by Mr. Barclay of Brompton.

The fenouillet, ou pomme d'anis, the fennel or aniſe apple, which is a middle-ſized fruit, of a grey colour; the pulp is tender, and has a ſpicy taſte, like aniſeed. It becomes ripe in September and October.

The flower of Kent, which is a large handſome apple, of a yellow colour, and pretty good flavour. It keeps till the middle of April.

The fox-whelp, which is a ſmall apple, ſtreaked with red. It is ripe in January. It is a cyder apple.

The Franklin's golden pippin, which is a handſome middle-ſized apple, of a conical ſhape and gold colour, beautifully marked with dark ſpots. The fruit has a fine aromatic flavour, and deſerves the firſt place at the table; but it is a very ſhy bearer. It comes into eating about the middle of November.

The French crab, which is a large handſome apple, of a deep green colour, with a little red next the ſun. It will keep all the year; is a good baking apple, and, if the ſummer be warm, pretty good for eating, and is a great bearer.

The French codlin, which is a pretty large apple, of a conical ſhape, and green colour, with red towards the ſun, coming into eating in January.

The Fearn's pippin, which is of the ſhape and ſize of a nonpareil. It is of a beautiful ſcarlet next the ſun, and of a golden yellow on the other ſide. It makes a fine ſhow at table, and keeps till the latter end of February.

The French Spaniard, which is a large apple, in form of a hexagonal priſm with the angles a little rounded, and of a yellowiſh-green colour; it is pretty good, and keeps till the latter end of April.

The French or white rennet, which is a large fruit, of a yellowiſh-green colour, with ſome grey ſpots. It has a ſugary juice, and is good either for eating or baking.

The Gargey pippin, which is a handſome conical-ſhaped apple, under the middle ſize, of a greeniſh-yellow colour, with a little red towards the ſun. This is a pretty good apple, and keeps till May.

The gilliflower, which is a fine handſome apple, red towards the ſun, and of a yellowiſh-green on the other ſide, having a fine flavour, and keeping till the latter end of March.

The golden rennet, which is a beautiful apple, a little flatted; of a fine red colour towards the ſun, and yellow on the other ſide. It is a good eating apple, and keeps till February.

The golden ruſſet, which is a fine middle-ſized apple, of a golden ruſſet colour, from which it takes its name. It is a good apple, and keeps long.

The golden pearmain, which is a fine apple, above the middle ſize, of a fine deep red towards the ſun, with a little yellow on the other ſide; when much expoſed to the ſun it is ſometimes red all over.

The golden Mundi, which is a fine handſome apple, beautifully ſtreaked with red; of a good flavour, excellent for baking, and will keep till January. It is a good ſauce apple.

The golden Gloceſter, which is a handſome middle-ſized apple, of a flat ſhape, and gold colour, with red toward the ſun. It is a good apple, and keeps till March.

The golden knob is a handſome though rather ſmall apple, of a fine gold colour, ſometimes inclining to a ruſſet. It has a pleaſant flavour.

The golden pippin is well known; and the French own it to be of Engliſh origin. It is almoſt peculiar to this country; for there are few countries abroad where it ſucceeds well. It is yellow as gold; the juice is very ſweet; the ſkin (eſpecially where expoſed to the ſun) is often freckled with dark yellow ſpots. It is certainly the moſt ancient, as well as the moſt excellent, apple that we have. It ripens in October, and keeps through the winter. It has ſeveral ſub-varieties.

The Godolphin apple, which is a very handſome large fine fruit, ſtreaked with red on the ſide next the ſun, and of a yellowiſh colour on the other ſide. It is in eating from the latter end of September to December.

The green dragon, which is a fine large apple, of an excellent flavour, and pale-green colour. It is rather too large for the table, and is therefore moſtly uſed as a kitchen apple. It keeps till March.

The great or large ruſſet, which is a middle-ſized fruit, of a ruſſet colour, with a little dark-red toward the ſun. A pretty good apple, and keeps till April.

The Griddleton pippin, which is a large angular-ſhaped apple, of a green colour, with a little bluſh towards the ſun. It is a baking apple, and keeps till March.

The Grumas's pippin, which is about the ſize and ſhape of a golden pippin; of a dingy-green colour next the ſun, and of a dull yellow on the other ſide. It is ripe in January, and keeps till April.

The Hagloe crab, which is a yellow-coloured conical-ſhaped apple, below the middle ſize. It is ripe in January; but is only fit for making cyder, or for baking.

The hall-door, which is a fine large apple, of a flat ſhape, beautifully ſtreaked with red toward the ſun, and of a greeniſh-yellow on the other ſide. It is of a fine flavour, and is in eating from January till March.

The Hallingbury, which is a large flat-ſhaped apple, with large ridges from the baſe to the crown. It is of a beautiful red toward the ſun, and of a yellowiſh colour on the other ſide and towards the eye.

The Hampſhire nonſuch, which is a pretty large well-ſhaped apple, of a greeniſh-yellow colour, ſtreaked with red. It keeps till the latter end of November.

The Harvey's ruſſet, which is ſo called in Cornwall, is a large ruſſet-coloured apple, with a little red toward the ſun. It is a famous kitchen fruit, and tolerably good raw, with a muſky flavour.

The Holland pippin, which is a middle-ſized apple of a flattiſh ſhape. Its colour is yellow, in ſome places inclining to green, with, ſometimes, a little red toward the ſun. It is a pretty good apple, keeping till the middle of April.

The hollow-eyed pippin, which is a middle-ſized apple, of a yellow colour, beautifully ſpotted with red toward the ſun; and the eye is pretty deep. It is a good ſharp-flavoured apple, keeping till the middle of May.

The hollow-eyed rennet of Cornwall, which is a handſome flat-ſhaped apple, under the middle ſize, of a greeniſh-yellow colour, ſometimes intermixed with ruſſet. It is of an excellent flavour, and keeps till April.

The hedge apple, which is a new fruit, of middle ſize and handſome conical ſhape, red toward the ſun, and of a ſtraw colour on the other ſide. It is of a tolerably good flavour, and keeps till the latter end of April.

The hogſhead apple, which is a ſmall red fruit; the fleſh is red, and the taſte auſtere. It is a cyder apple, becomes ripe in January, and keeps till March.

The Hubbard's, or the ruſſet pearmain, which is a real Norfolk apple; and, though not handſome, is one of the beſt table apples. It is of a dark ruſſet colour, becomes ripe in January, and keeps till April.

The John apple, which is a middle-ſized handſome fruit, of a green colour, with a little red toward the ſun; the footſtalk being very ſmall. It is an excellent cyder and baking apple, from Devonſhire; it is of an excellent flavour, and keeps till March.

The Iſle of Wight pippin, which is a handſome middle-ſized apple, of a greeniſh-yellow colour.

The juneting, or jenneting, which is a ſmall yellowiſh apple, red on the ſide next the ſun. It is a pretty fruit for early variety, and ripens about the latter end of June or beginning of the following month.

The kernel redſtreak, which is of a greeniſh-yellow, with broad ſtreaks of a dark-red all over it, and a yellow ground finely ſpeckled with red next the ſun.

The kernel pearmain, which is a ſmall handſome apple, red toward the ſun, and of a yellowiſh-green mixed with red on the other ſide. It is of a good flavour, keeping till the middle of May.

The Kentiſh pippin, which is a good ſized apple, finely ſtreaked with red. It is of a fine flavour, comes into eating about Chriſtmas, and keeps till February.

The Kentiſh nonpareil, which is a handſome flat-ſhaped apple, of a light-ruſſet colour, inclining to red toward the ſun. It is of a good flavour, and keeps till May.

The king of the pippins, which is a middle-ſized apple, of a fine gold colour, a little ſtreaked with red towards the ſun. It is ripe in January, and keeps till the latter end of March, when it becomes mealy.

The king apple, which is a middle-ſized apple, of a conical ſhape; and its colour is that of a beautiful red intermixed with a little yellow on one ſide. This apple is of a pleaſant ſugary taſte, and keeps till the latter end of April.

The Kirke's ſeedling, which is a beautiful apple of a fine red colour towards the baſe, and yellow towards the eye. The footſtalk is ſlender, and the eye large.

The Kirke's ſcarlet pearmain, which is a handſome middle-ſized apple, of a beautiful red toward the ſun, and a little yellow on the other ſide; becoming ripe in January.

The Kirke's ſcarlet admirable, which is a good apple for baking, and of a beautiful ſcarlet colour, is in eating about the month of January.

The Kentiſh fill-baſket, which is a ſpecies of codlin, of a large ſize, and generally uſed for baking. It is in eating from Auguſt to October.

The Kirton or crack'd pippin, which is a middle-ſized apple, of a greeniſh-yellow colour, with little dark ſpots. The coat is generally rough towards the footſtalk. It is a good apple for the table, coming into eating in September.

The lady's finger, which is an excellent table apple, of a conical ſhape; red next the ſun, and of a yellowiſh caſt on the other ſide, having a ſweet pleaſant flavour, and keeping till May.

The large ſtyre, which is a handſome cyder apple, of a yellow colour, with a little red next the ſun. It becomes ripe in November.

The Liſbon pippin, which is a handſome middle-ſized apple, of a flat ſhape, a fine red toward the ſun, and a reddiſh-yellow on the other ſide. The fleſh is firm, and has a ſharp pleaſant taſte. It comes into eating in November.

The Loan's pearmain, which is a large oval-ſhaped apple, of a dull green colour intermixed with a browniſh-red, deepeſt next the ſun. It is a pretty good table apple, of a ſharp taſte, ripening in September, and keeping till May, but is apt to grow mealy.

The London pippin, or five-crowned pippin, which is a fine large apple, of a green colour, ſtreaked with red toward the ſun. It reſembles the Ribſton pippin, but is larger. It has a pretty agreeable taſte; and will come into eating about the latter end of November. It is good for the kitchen and table; and a moſt abundant bearer. It keeps till the middle of April.

The le calville d'automne, the autumn calville, which is a large fruit, of an oblong figure, and of a fine red colour toward the ſun, having a vinous juice, and is much eſteemed by the French.

The long laſter, which is a middle-ſized apple, of an angular ſhape, and fine yellow colour, with a beautiful red next the ſun. It is of a tolerable flavour, and keeps till the middle of May, but is apt to become mealy.

The lemon pippin, which is a handſome oval-ſhaped apple, of a gold colour. It is of a fine flavour, and will keep till the beginning of March.

The long ſeam, which is a large angular-ſhaped baking apple of a pretty good flavour, with light green colour. It keeps till the latter end of January.

The lord Cheney's green, which is a middle-ſized Yorkſhire apple, reſembling the Yorkſhire greening. It is of a dark green colour, with a little of a chocolate colour next the ſun. It is a baking apple, and keeps till the middle of May.

The lord Arundel's apple, which is large, of an angular ſhape; the colour is green, with a little dingy red towards the ſun. It is from France, and good for ſauce, keeping well.

The lord Camden's rennet, which is a good-ſized ſeedling, of a yellow colour, with a little browniſh-red next the ſun. It is a good flavoured apple, and keeps till March.

The Lucas's pippin, which is a handſome, middle-ſized, cylindrical-ſhaped apple, of a beautiful orange colour. It is a pretty good fruit, and keeps till the latter end of April.

The maiden's bluſh, which is a ſmall apple, of a dark mahogany colour next the ſun, but paler on the other ſide, and ſometimes of a greeniſh caſt. The taſte is auſtere, and of courſe this fruit is not fit for the table; but does very well for baking, or for cider. It keeps till the beginning of March.

The Mansfield tart, which is a large Nottingham apple, but moſt known in Yorkſhire. It is handſome, of a green colour, having a little caſt of browniſh-red, with dark ſpots next the ſun, being a baking apple, and keeping till February.

The May gennet, which is rather under the middle ſize, of a greeniſh-yellow colour, ſlightly ſtreaked with red next the ſun. It keeps till April.

The major Hemmings's apple, which is a handſome middle-ſized fruit, of a light green colour, with a little browniſh-red towards the ſun. It is an excellent apple.

The margil, which is an excellent apple, about the ſize of a nonpareil. It is of a red colour, with ſome yellow on one ſide; continues in uſe from November to the latter end of March; and is often ſold in the London markets for a nonpareil.

The Margaret apple, which is a fine and beautiful fruit, yellow, ſtriped with red, of a delicate taſte, ſweet ſcent, and generally eaten off the tree. It is ripe in Auguſt.

The Minchall crabb, which is a handſome middle-ſized Lancaſhire apple, of a yellow colour, with ſome brown ſpots.

ſpots. It is common in the Mancheſter markets, and keeps till April.

The monſtrous rennet, which is a very large apple, turning red towards the ſun, and of a dark green on the other ſide. It is generally preſerved on account of its magnitude, as the fleſh is apt to be mealy. It becomes ripe in October.

The mother rennet, which is rather under the middle ſize, of a greeniſh colour, with a little bluſh towards the ſun. The eye is large and deep, and the footſtalk ſmall.

The New-England pippin, which is a large angular-ſhaped apple, of a green colour, with a little browniſh-red towards the ſun. It has a pretty good flavour, and keeps till March.

The Newton pippin, which, according to Mr. Forſyth, is an American apple, but ſaid to be originally from Devonſhire. It is a fine large apple, of a greeniſh-yellow colour and red, with dark ſpots next the ſun. When much expoſed, it is of a beautiful red towards the ſun, and of a gold colour on the other ſide. It has a fine flavour when not kept till it is too ripe, as then it becomes mealy. It is in eating from November to January.

The new red muſt, which is a fine large apple, of a pale red towards the footſtalk, and of a greeniſh colour towards the eye. It is a cider apple, and fit for baking.

The new red pippin, which is a beautiful middle-ſized apple, of a dark red colour, with a mixture of yellow on the ſide from the ſun. It keeps till March.

The nonſuch, which is a good bearer, and very fit either for the table or kitchen; the cooks, however, complain that it makes but a very ſmall proportion of ſauce. It is ripe in September and October.

The nine-ſquare, which, according to Forſyth, is a Glouceſterſhire apple. It is a large angular-ſhaped fruit, of a fine red towards the ſun, and yellow on the other ſide, with a ſmall mixture of red, keeping till April.

The Norfolk colman, which is a middle-ſized apple, of a mahogany colour towards the ſun, and a dark green on the other ſide. It keeps till Auguſt.

The Norfolk beefin, which is a good-ſized apple, rather flatted, of a deep red colour towards the eye, but paler towards the footſtalk.

The Norfolk paradiſe, which is a large apple, of a dark red colour towards the ſun, and green on the other ſide. It is a nice baking apple, and of a tolerable flavour for eating. It keeps till the middle of May.

The Norfolk ſtoring, which is a pretty large apple, of a dark red colour towards the footſtalk, and green towards the eye. It is of a pleaſant ſharp flavour, being in eating from the latter end of January to the latter end of April.

The northern greening, which is a fine oblong apple, full at the footſtalk, of a pale green colour, with a little red towards the ſun. It is nearly of an equal ſize from the baſe to the crown, and has a fine flavour, being ripe in January.

The nonpareil, which is a fruit deſervedly valued for the briſkneſs of its taſte. It is ſeldom ripe before Chriſtmas, and, if well preſerved, will keep till May. It is juſtly eſteemed one of the beſt apples that have been yet known.

The oak peg, or oaken pin, which is an oval-ſhaped middle-ſized fruit, of a green colour ſtriped with white. It is very full towards the footſtalk, which is ſmall, keeping till June.

The old Engliſh pearmain, which is an oval-ſhaped apple, of a middle ſize, and fine red colour, with a little yellow towards the eye. It is of a pleaſant ſweet flavour; and is in eating from January to March.

The old red muſt, which is a fine large apple, ſomewhat reſembling the new red muſt, both in ſhape and colour, with the addition of dark red ſpots towards the footſtalk.

The old red pippin, which is a middle-ſized apple, red towards the ſun, and of a greeniſh colour on the other ſide. It is a good apple, and keeps till March.

The orange pippin, which is about the ſize of a large golden pippin; of a beautiful gold colour, with a little pale red towards the ſun. It is a handſome apple, of a good flavour, and makes a fine appearance at table, being in eating in October, and keeps till March, but gets flat in the taſte when too long kept.

The Orleans pippin, which is a ſmall flat-ſhaped apple, of a dark red colour, reſembling the Orleans plum.

The paradiſe pippin, which is a handſome middle-ſized apple, of a reddiſh caſt. It comes into eating in October, but will not keep. It grows mealy when too ripe.

The pauſon, which is below the middle ſize, of a conical ſhape, and of a greeniſh-yellow, or light green colour. It is ripe in January.

The Pile's ruſſet, which is a middle-ſized longiſh-ſhaped apple, ruſſet about the footſtalk, yellow towards the middle, and of a browniſh-red about the eye. It is a very firm fruit, of a ſharp acid flavour, being much eſteemed for baking. It ripens in October, and will keep till April.

The pigeonette, which is rather below the middle ſize, of a conical ſhape. It is of a pink colour, pretty dark towards the ſun.

The Pearſon's pippin, which is a nice apple, about the ſize of a large golden pippin, of a yellowiſh colour, and the form a little flat. In Devonſhire, according to Mr. Forſyth, they put theſe pippins into the oven juſt after the bread is drawn, laying a weight over them to flatten them, in the ſame manner as they do the beefin in Norfolk, and bring them to table as a ſweetmeat. It is a very good deſert-apple, and keeps till March.

The pomme griſe, which is a fine apple, from Canada, of a flattiſh form, and ruſſet colour, ſtreaked beautifully with red. It ripens late, and keeps till March. It is an excellent eating apple.

The pomme d'api, which is much valued for its colour, being of a bright red. The tree is a good bearer, and the fruit is not ſubject to be ſhaken with high winds. The fruit ſhould be ſuffered to hang on the tree till October or November, if the froſt do not ſet in. It comes into eating in February and March, and keeps long; but is more admired for its beauty than its flavour, or fineneſs of taſte.

The pomme violette, the violet apple, which is a pretty large fruit, of a pale green, ſtriped with red towards the ſun. It has a fugary juice, and a flavour of violets, from which it takes its name. It ripens in October, and continues in eating till February, or later.

The pomroy, or king's apple, which ripens nearly as ſoon as the juneting, and though not ſo beautifully covered, is larger and much better taſted. It has a ſub-variety, which is a winter apple.

The pound pippin, which is a large handſome apple, of a greeniſh colour, and is good for baking. It becomes ripe in January.

The poor man's profit, which is a dingy coloured oval-ſhaped apple, below the middle ſize. It is raiſed freely from cuttings; and keeps till January.

The queening, which is from Glouceſterſhire, is a large apple, of irregular ſhape, having large ridges from the baſe to the crown. It is of a dark red, but deepeſt towards the ſun. It is a good cider apple, and bakes well, keeping till the latter end of November.

The queening's kernel, which is a fine apple, above the middle ſize, of a deep red colour. Covered very thick with ſmall whitiſh ſpecks. It is a tolerably good apple, and keeps till the latter end of April.

The queen's pippin, which is a ſmall handſome apple, of a yellowiſh-green colour, ſometimes inclining to red on the ſide next the ſun. It is a fine-flavoured apple, very fit for the table, coming into eating in January, and keeping till May, but is apt to grow mealy when kept too long. Mr. Forſyth ſays, "the tree never grows to the height of other apple-trees."

The quince-apple, which is a middle-ſized fruit, of a yellow colour, with a little red towards the eye. It is of a pleaſant ſharp flavour, ripe in January, and keeps till April.

The Ramborn, which is a large fruit, of a fine red next the ſun, and ſtriped with a yellowiſh-green. It ripens about the middle of September.

The red pearmain, which is ſmaller than the pearmains in general. It is of a deep red, with a little yellow on one ſide. A pleaſant ſweet apple, and keeps till the middle of April.

The red-ſtreak, which is a handſome middle-ſized apple, beautifully ſtreaked with red. It is a good cider apple, becoming ripe in January.

The red-ſtreak ſeedling, from Longleat, which is from the Dorſetſhire red-ſtreak, is a beautiful apple, of a yellow colour, ſtreaked with red, particularly next the ſun. Forſyth ſays, it is ſold in the Bath and Briſtol markets in the latter end of September, and beginning of October. It is a pretty good apple, but does not keep long.

The red bag, which is a beautiful large Herefordſhire apple, of a longiſh ſhape, ſtreaked all over with a dark red; and is in eating about the middle of October.

The red muſt, which reſembles the old red muſt in ſhape; but is of a dark red colour towards the ſun, and yellow on the other ſide. It is ripe about the middle of November.

The rennette griſe, which is a middle-ſized fruit, of a grey colour next the ſun; it is a very good juicy apple, of a quick flavour, and ripens about the latter end of October.

The red ſweet, which is a ſmall round apple, red towards the ſun, and of a greeniſh-yellow on the other ſide. It is a good bearer, according to Forſyth, "and much eſteemed among the country people of Cornwall, for making a kind of tart or pie, one of their dainties at Chriſtmas." It is a pretty good table apple, and keeps till March.

The Ribſton pippin, which is a fine apple, from Ribſton Hall, near Knareſborough, in Yorkſhire. It is a little ſtreaked with red towards the ſun, and yellow on the other ſide, being one of the beſt apples for eating and baking, and continues in uſe from the end of October till April. It bears very well as a dwarf, and no garden ſhould be without it.

The Robinſon's pippin, which is about the ſize of a golden pippin, of a green colour, and partakes of the flavour both of a golden pippin, and a nonpareil. It keeps till May.

The royal George, which is a fine large apple, of a beautiful yellow on one ſide, and green on the other. It is a good apple, and keeps till June; but then grows mealy.

The royal nonpareil, which is a handſome apple, of a flattiſh ſhape, with a ſmall footſtalk and fine eye. It is about the ſize of a common nonpareil, of a green colour, with red towards the ſun. It is ripe in January, and keeps till the latter end of March.

The royal pearmain, which is a fine large apple, beautifully ſtreaked with red. It is ripe in January, and keeps till March, being a pretty good apple.

The royal ruſſet, or leather-coat ruſſet, which is a large fruit, and one of the beſt kitchen apples that we have. It is alſo a pleaſant eating apple, and a great bearer, being in uſe from October to April.

The ruſſet pippin, which is of a rough ruſſet colour towards the ſun, and of a green colour, ſometimes inclining to yellow, on the other ſide. It is a good keeping apple, and fit either for baking or eating raw. It is ripe about the beginning of February, and keeps till March.

The ſummer pearmain, which is ſtriped with red next the ſun; the fleſh is ſoft, but ſoon turns mealy; ſo that it is not much eſteemed. It is in eating in Auguſt and September.

The ſilver pippin, which is a handſome middle-ſized conical-ſhaped apple, of a fine yellow colour, with a faint bluſh towards the ſun. The fleſh is firm and very white, and of an excellent flavour. It keeps till the middle of May, or later.

The ſeek no farther, which is a handſome apple, rather above the middle ſize, of a pale green colour, a little ſtreaked with red. It is of a pleaſant though not very high flavour; and is in eating from January to May; but is apt to be mealy when kept longer than the beginning of April.

The Sykehouſe, which is a handſome middle-ſized apple, from Sykehouſe in Yorkſhire, of an orange colour towards the ſun, ſometimes inclining to red, and yellow on the other ſide. This is a fine eating apple; ripe in January, and keeps till April.

The ſtone pippin, which is of a green colour, ſtreaked with red towards the ſun. It is of a ſharp taſte, and is in eating from January till the middle of May.

The Stoup codlin, which is a large handſome apple, of a pale-green colour, with a little red towards the ſun. It is a baking apple, of a pleaſant taſte, and keeps till May.

The ſtriped nonpareil ruſſet, which is a handſome apple, of a greeniſh-ruſſet colour, with a little browniſh-red towards the ſun. It is about the ſize of a large nonpareil, is ripe in January, and keeps till March.

The ſpice apple, which is a handſome middle-ſized angular-ſhaped apple, of a yellow colour, and a pleaſant flavour. It is ripe in January, and keeps till March.

The Skerm's kernel, which is a conical-ſhaped middle-ſized apple, beautifully ſtreaked with red, deepeſt towards the eye, and having a good deal of yellow towards the footſtalk. It is ripe in January, and keeps till March.

The ſpice rennet, which is a handſome apple, below the middle ſize, red towards the ſun, and yellow on the other ſide.

The Spaniſh pearmain, which is a middle-ſized oblong apple of a carnation colour, and dark-red towards the ſun. It is a pretty good apple, and keeps till the beginning of May.

The Spaniſh onion, which is a handſome round apple of a ruſſet colour, with a dull red towards the ſun. This apple, which is rather below the middle ſize, is very good for deſert, keeping till March.

The Sharp's ruſſet, which is below the middle ſize, of a browniſh-red colour towards the ſun, and a pale-green on the other ſide. It is ſhaped like the fruſtum of a cone; is of a pretty good flavour; and keeps till May.

The Spencer's pippin, which is a middle-ſized apple, of a yellowiſh colour, with many dark ſpots, being a baking apple, and keeping till the middle of May.

The Tankerton, which is a conical-ſhaped yellow apple, with ſometimes a little bluſh towards the ſun. It is an excellent

excellent ſauce apple, and bakes well, being of an agreeable taſte, but too large for the table. It will keep till February.

The tranſparent apple, which was introduced from St. Peterſburg; but it is more curious than uſeful: a tree or two, therefore, will be ſufficient for a garden. It ripens in September or October.

The Trevoider rennet, which is a ſmall handſome ruſſet-coloured apple, of an excellent flavour, and will keep till May.

The white corpendu, which is a middle-ſized long-ſhaped apple, of a yellowiſh colour. It is a good eating apple, and ripens in January.

The ward apple, which is a beautiful flat-ſhaped apple, rather below the middle ſize, of a fine red towards the eye, and of a yellowiſh-green towards the footſtalk. It is a ſharp flavoured fruit, and keeps till June.

The Wheeler's ruſſet, which is of middling ſize, the fleſh firm, and of a quick acid flavour; it is an excellent kitchen fruit, and keeps long. It ripens in October.

The wine ruſſet, which is a middle-ſized conical-ſhaped apple, of a dark ruſſet colour, and ſharp flavour. It keeps till the latter end of April.

The Wheeler's extreme, which reſembles the pomme griſe, and is about the ſize of a nonpareil. It is a flat-ſhaped apple, beautifully clouded with red on a yellowiſh-ruſſet ground; is of an excellent flavour, and keeps till April.

The white muſt, which is a middle-ſized handſome apple, of a greeniſh-yellow colour, with a little red towards the ſun; the flavour is rather tart, but agreeable. It is ripe in January.

The Whitmore pippin, which is a good-ſized handſome apple, ſtreaked with red towards the ſun, and of a pale-yellow on the other ſide. It has firm fleſh, of a tolerably good flavour, and is in eating from November to the latter end of April, or later.

The Wiltſhire cat's-head, which is a large handſome apple, red towards the ſun, and green on the other ſide. It is a very fine baking apple, and of a good flavour, being ripe in January.

The winter pearmain, or Herefordſhire pearmain, which is of a fine red next the ſun, and ſtriped with red on the other ſide; the fleſh is juicy, and ſtews well. It is fit for uſe in November, and, if properly managed, will keep till the latter end of March.

The winter pomroy, which is a pretty large conical-ſhaped apple, of a dark-green colour, a little ſtreaked with red towards the ſun. The coat is rather tough. It is a good baking apple, keeping till January.

The winter box apple, which is a middle-ſized fruit, of a light green colour, and keeps till February.

The woodcock, which is a good-ſized apple, of a dark red next the ſun, and paler, with a little mixture of yellow, on the other ſide. It is ripe in January, and keeps till March, being a good cider apple.

The Wright's nonpareil, which is a Salopian apple, being a great bearer, of a good ſize, and a little flatted. It is a good kitchen apple, and keeps till June. The tree is ſmaller in ſize than moſt other apple-trees.

The Yorkſhire greening, which is a good-ſized flatted apple, of a dull-red colour, with a little green towards the eye. It keeps till Auguſt, or often later.

The ſorts of apples adviſed for a ſmall garden are the following: the juneting, the golden pippins, the nonſuch, the Ribſton pippin, the nonpareils, the queen's apple, the Sykehouſe, the golden rennet, the aromatic pippin, the grey Leadington, the ſcarlet pearmain, the lemon pippin, the pomme griſe, the French crab, and different ſorts of ruſſetins and codlins, for baking.

But there are other varieties and ſub-varieties that may be equally valuable with many of the above ſorts.

Of the ſixth ſort there are the following varieties: the pear quince, with oblong-ovate leaves, and an oblong fruit lengthened at the baſe; the apple quince, with ovate leaves and a rounder fruit; the Portugal quince, with obovate leaves, and an oblong fruit, which is more juicy and leſs harſh than the others, and therefore the moſt valuable.

The quince is a very beautiful tree when in flower, as well as when the fruit is ripe in the autumn, and was cultivated in this country at an early period. According to Mr. Forſyth, the beſt ſort for planting in the fruit-garden is the Portugal, being the fitteſt for baking or ſtewing. It is of a fine purple colour when dreſſed, and is much better for marmalade than any of the other ſorts. The oblong kind, and the apple quince, are alſo planted in theſe ſituations, and other ſorts are employed in the ſhrubberies for producing variety. The above ſorts are likewiſe valuable for mixing with apples in making pies, puddings, &c. as they add a quickneſs to the flavour when flat.

Method of Culture in the Pear Kind.—Theſe trees are raiſed by grafting and budding upon any kinds of pear ſtocks; occaſionally upon quince ſtocks; and ſometimes upon white-thorn ſtocks; but the firſt ſort are preferable for general uſe to have large trees, and the ſecond for moderate growers.

The numerous varieties of theſe trees having been firſt accidentally obtained from ſeed, and as theſe ſeedlings rarely produce the ſame ſorts again, the approved kinds are continued and increaſed only by grafting or budding upon ſtocks raiſed from the kernels of the kinds juſt mentioned. In order to reſtrain the growth of theſe trees, white-thorn ſtocks have alſo been uſed; but theſe are not ſo generally ſucceſsful, and are almoſt in total diſuſe in the nurſeries: of courſe pear ſtocks are proper for general uſe, for principal large trees, both for walls, eſpaliers, and ſtandards; and quince ſtocks for ſmaller growths. For raiſing the ſtocks, the ſeeds or kernels of the different ſorts ſhould be ſown in the latter end of autumn, as November, or December, or early in the ſpring, in beds of light earth, covering them near an inch deep; they come up in the ſpring: and in autumn, winter, or ſpring following, the ſtrongeſt ſhould be planted out in nurſery-rows to remain for grafting and budding, for which, after having from one to two or three years' growth, they will be of proper ſize.

The operations of grafting and budding ſhould be performed in the uſual method; the former in the ſpring, and the latter in ſummer. (See GRAFTING and BUDDING.) For this purpoſe the grafts and buds ſhould be procured from ſuch trees as produce the fineſt fruit of the reſpective ſorts; thoſe deſigned as dwarfs for walls, eſpaliers, or ſtandard-dwarfs, being grafted or budded near the bottom; and in thoſe for half or full ſtandards, the ſtocks may either be previouſly trained up from three or four to ſeven or eight feet high to form a ſtem, then grafted near the top, or be grafted low in the ſtock, like the dwarfs, and the firſt main ſhoot trained for a ſtem the above height: the grafted trees, both dwarfs and ſtandards, ſhoot the ſame year, but the budded ones not till the ſpring after; and when their heads are two years old from the grafting and budding, they may, if thought proper, be planted out for good, or remain longer in the nurſery, as may be found convenient.

The dwarfs for walls, eſpaliers, &c. whether they remain longer in the nurſery, or be tranſplanted at a year old into the garden, ſhould have the firſt ſhoots from the graft or

bud, when a year old, headed down in March to five or ſix eyes, to force out a proper ſupply of four, ſix, or more lateral branches near the ground, to furniſh the wall or eſpalier with bearers quite from the bottom, theſe readily producing others to cover the upper part.

Standards, ſuppoſing them to be grafted on high ſtocks, may either be headed near the top of the ſtock, or permitted to run up, as the caſe may require, ſo that if ſhortened it will force out laterals near the head of the ſtem, and form a more ſpreading full head; and if ſuffered to run up with the firſt ſhoots entire, they form higher and generally more upright heads in the end. Such ſtandards, however, as are grafted or budded as low in the ſtock as for dwarfs, muſt have the firſt ſhoot trained upright at full length, ſix or ſeven feet high for a ſtem: if for full ſtandards, they may either be topped at ſix feet height, to force out laterals near that part to form a ſpreading head, or ſuffered to run and branch in its own way to form a more erect and higher head.

The headed trees, both dwarfs and ſtandards, on being cut down in the ſpring, ſoon branch out from all the eyes immediately below; when care ſhould be taken during the ſummer to trim off all ſhoots from the ſtem, ſuffering all the top ſhoots to remain entire; when they will form handſome beginning young heads by the end of ſummer, and in autumn, winter, or ſpring following, may be finally planted out into the garden, &c.

When from neceſſity they are retained longer in the nurſery, the whole ſhould have proper pruning to reform irregular growths, and the different trees be trained accordingly, ſuffering the whole to branch away at full length, not ſhortening any after the above general heading down, when a year old, except it ſhould ſeem occaſionally neceſſary, either to reduce any caſual irregularity, or to procure a more full ſupply of lower branches; after which no further general ſhortening ſhould be practiſed to theſe ſort of trees; for, after having obtained a proper ſet of regular branches near the head of the ſtem, they readily furniſh more in their turn to increaſe the head on the upper part.

In regard to planting out the trees, they are moſtly of proper growth for this purpoſe when from one or two to four or five years old, from the graft or bud; but if larger trees are required, thoſe of ſix or eight years old may be ſafely tranſplanted; younger trees, however, always ſucceed well, even when only two or three years old.

In ſelecting pear-trees for planting, Mr. Forſyth adviſes the chooſing of the oldeſt trees that can be found inſtead of the young ones, and ſuch as have ſtrong ſtems; to have them carefully taken up, with as much of the roots as poſſible, and carefully planted, after cutting in the roots a little, ſpreading them as horizontally as can be done. Then to fill up all round the roots with light dry mould; forcing it in, about thoſe which lie hollow, with a ſharp-pointed ſtick; filling the whole up to the top without treading the mould, till the hole be firſt filled with as much water as it will contain, leaving it a day or two until the ground has abſorbed the water; then to throw on ſome freſh dry mould and tread it as hard as poſſible, filling the hole up again with mould to within an inch of the top, and giving it a ſecond watering, leaving the mould about three inches higher than the border, to ſettle of itſelf, and to receive the rain that falls, for at leaſt a month. When the mould has become quite dry, it may be trodden a ſecond time; then make a large baſon all round the tree, and giving it another watering, mulching the top over with ſome rotten leaves or dung, continuing to water the trees once a week in dry weather, and ſprinkling the tops frequently with a pot, or hand engine, to keep the wood from ſhrivelling till they have taken freſh root; and where the trees are planted againſt a wall, the ſtems ſhould ſtand ſloping towards it; the lower parts of them being ſix inches from the bottom of the wall, to give them room to grow, as when planted cloſe to the wall at bottom, the ſtems, in growing, will be confined on the back, grow flat, and be very unſightly. If any roots are in the way, to hinder it from being planted near enough to the wall, they muſt be cut off; at the ſame time taking care that the tree does not lean to either ſide, but that, when viewed in front, it appear perfectly upright. Sometimes ſtandards and half-ſtandards are ſeen planted a foot or two from the wall, which gives them a very diſagreeable appearance; ſix inches is, he thinks, quite ſufficient. Much care ſhould be taken not to wound the ſtem or root of the tree in planting.

When young trees have two ſtems, he adviſes always to cut off one of them, leaving the ſtouteſt and ſtraighteſt, planting that ſide outwards which has moſt buds on it.

It is added, that when the buds begin to break well, the trees ſhould be headed down to three or four eyes, to fill the wall with fine wood, but never afterward, except the leading ſhoot to fill the wall, leaving the fore-right ſhoots to be pruned, as hereafter directed. He has had ſome trees that had forty pears on them the ſecond year; while ſome of the ſame kind bore only eleven pears the fourteenth year after planting, with the common method of pruning. When ſuch old trees as recommended above cannot be procured, the ſtouteſt and cleaneſt of the one-year's old grafting ſhould be provided. Where any of theſe trees become ſtunted after a number of years, they ſhould be headed down as hereafter directed, which will bring them into freſh vigour and fruitfulneſs. The proper ſeaſon for planting them out is any time in open weather from the end of October till March, but the autumn or early winter are the moſt advantageous periods. They ſucceed well in any common garden ſoil, or good fertile orchard-ground, or field, that is not very wet, or of a ſtiff or ſtubborn quality, but moderately light and friable to the depth of one ſpade at leaſt, and if more the better. The ground ſhould be prepared by proper trenching one or two ſpades deep, as the depth of good ſoil will admit, wholly if for a full plantation, or only along the place for each row of trees, in the place for each tree; or only a hole for each tree at proper diſtances. The proper diſtance for planting the dwarf ſorts for walls or on eſpaliers, is for thoſe on free ſtocks at not leſs than twenty feet, but if twenty-five, or more, the better, eſpecially if the walls be rather low, &c. that there may be full ſcope to extend their branches conſiderably in a horizontal direction, as they will effectually fill that ſpace, or even much more if it be allowed them; but they are often planted much nearer together. It is however of importance to give theſe trees ſufficient room, and the higher the walls the better, as is evident by thoſe trees growing againſt the ends of high buildings, as they extend themſelves very conſiderably every way. Some plant cherry-trees or other moderate ſhooting fruit-trees in the intervals for a few years, till the pears advance in growth and approach one another, when they ſhould be removed. They are to be planted in the uſual way, with their heads entire. See PLANTING.

However, for trees that are dwarfed by grafting or budding upon quince ſtocks, from fifteen to eighteen feet may be a proper diſtance for planting, either for walls or eſpaliers. In reſpect to the diſtance at which pear-trees ſhould be planted againſt walls, it is obſerved by Mr. Forſyth that when they are grafted on free ſtocks, ſuch as colmars, pear d'auche, craſanes, l'eſchaſſeries, virgouleuſes, and winter and ſummer bonchrêtiens, it ſhould at leaſt be twelve yards

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diſtant from each other, ſuppoſing the walls to be from welve to ſixteen feet high; but when they are only ten feet, fifteen yards will be little enough for the purpoſe.

And where they are planted on ſouth walls, vines, peaches, nectarines, or apricots, may be planted between them, till the trees extend ſo far as nearly to meet each other; then they may be removed to any other ſituation in the garden where they are wanted. And where the pears are planted on weſt walls, the ſame ſort of trees may be planted between them as on ſouth walls; the fruit on a weſt aſpect will come into uſe to ſucceed that on the ſouth. On an eaſt wall different ſorts of plums and cherries may be planted between the pear-trees till they almoſt meet, then tranſplanted as ſtandards or wall trees.

It is adviſed that the borders for pear-trees in a large garden ſhould not be leſs than from ten to twenty feet wide, with a foot-path about three feet from the wall, covered over at top with coal-aſhes or road-ſand, to make a dry walk for getting at the trees to cut and nail them, to gather the fruit, &c. And that the depth of the mould for them ſhould never be leſs than three feet, laying the beſt mould at top, to encourage the roots to come as near the ſurface as poſſible. If the bottom be clay, it will be very neceſſary, once in every five or ſix years, to open the ground round the roots of the trees, and cut off all the large ones that are inclining to run into the clay; as, by this practice, the trees will throw out freſh roots that will run near the ſurface, provided the mould is good near the top of the borders. And it is ſuggeſted that a crop of early peas, lettuces, ſpinach, or any other ſmall crops, may be grown on the borders, during the winter and ſpring; but no late crops by any means. If the ground can be ſpared, he would adviſe to have no ſummer crops, but keep the borders hoed, in particular after rain; otherwiſe the ground, if a ſtrong loamy or clayey ſoil, will be apt to crack in dry weather; but by frequent ſtirring between wet and dry this will in a great meaſure be prevented, and the ſun's rays admitted into the mould, which will greatly heighten the flavour of the fruit. When you can conveniently ſpare the borders in winter, they ſhould be ridged up to ſweeten the mould, which may be very well done if you ſow early peas on the ſides of the ridges; which is by far the beſt way to preſerve the peas from the froſt, and to prevent them from rotting, which will ſometimes happen, if the land be ſtrong, before they begin to vegetate; or, you may ſow an early crop of carrots or ſpinach on theſe borders.

With reſpect to the general management in the training and pruning of theſe trees, if the young wall and eſpalier trees thus planted are only one year old from the graft or bud, having their firſt ſhoots of a year old entire, theſe ſhould in the ſpring be headed down to five or ſix inches, to force out lower horizontal branches; but if they have been previouſly headed, as adviſed above, and have thrown out laterals to form a regular ſet of horizontal branches, conſiſting of ſix or more near the bottom, they ſhould not now be ſhortened, but trained to the wall or eſpalier at full length horizontally, preſerving an equal number on each ſide five or ſix inches aſunder; they will readily emit a further ſupply of horizontal ſhoots to cover the wall, &c. regularly upward, and at the ſame time not being ſhortened, they gradually form themſelves for bearing, as every ſhortening of the branches of theſe trees retards their bearing a year at leaſt; if, however, there is a want of branches, ſome of the middlemoſt may be pruned ſhort, and trained to the wall or eſpalier. According as the trees ſhoot in ſummer, a further ſupply of all the regular ſhoots in every part where they occur, ſhould be trained in at full length, unleſs it ſhall ſeem neceſſary to prune ſome ſtrong ſhoots to obtain a greater ſupply of horizontal branches the ſame year, in order to furniſh the head as ſoon as poſſible; at this time, however, diſplace all the fore-right and other irregular growths of the year, continuing the ſupply of regular ſhoots cloſe to the wall, as they advance in length during their ſummer's growth. And in the winter pruning, the ſupply of ſhoots attained in ſummer ſhould be well examined, ſelecting all thoſe that are well placed and properly ſituated for training in, to increaſe the number of horizontal branches on each ſide, which ſhould be left wholly entire, and at the ſame time retrenching any ſuperfluities and ill-placed ſhoots omitted in ſummer; then the whole ſupply of regular horizontal branches in every part ſhould be trained in ſtraight and cloſe to the wall or eſpalier, equally on both ſides of the tree, every branch at the full length, at four, five, or ſix inches apart. See WALL, ESPALIER-*Trees*, and PRUNING.

But there is another method ſometimes practiſed in training theſe trees for walls and eſpaliers, which is, that after their firſt heading down, and having thrown out ſeveral laterals, to ſelect three of the ſtrongeſt and moſt regularly placed, one on each ſide and one in the middle, nailing the two ſide ones horizontally at full length, and the middle one upright: the tree having produced a further ſupply of ſhoots in the following year, add two or four of them as ſide branches, arranging them on each ſide of the ſtem as the two former, training the middle ſhoot ſtill in an upright direction; obſerving that where it does not furniſh horizontals low enough, it may be ſhortened ſo as to make it throw out ſhoots at any requiſite height, continuing the middle one always upward for a ſtem, and the ſide ones for bearers. In either of theſe methods of training the trees, continue yearly increaſing the number of horizontal ſhoots, till the full ſpace of walling or eſpalier is regularly covered with bearers at equal diſtances, conſtantly continuing them all at full length, as far as the ſcope of walling, &c. will permit; as they naturally form fruit-ſpurs at every eye, almoſt their whole length, and the ſame branches continue in a fruitful ſtate a great length of time. When the trees have once filled the wall or eſpalier with branches, they need but very little further ſupply for many years, and that only occaſionally, according as any worn-out or decayed branch occurs, and wants renewing with young wood. See PRUNING.

And in the after-prunings in the ſummer, which ſhould be begun in May, or early in June, rub off all the ſuperfluous and unneceſſary ſhoots of the year, and all fore-right and other ill-placed ſhoots, retrenching them quite cloſe, being careful to leave the terminating ſhoot of every horizontal or bearer entire; and reſerving here and there a well-placed ſhoot, towards the lower parts in particular, and where there are any apparent vacancies, to train up between the mother branches, till winter pruning, when, if not wanted, they muſt be retrenched.

But in the winter pruning, which may be performed any time from the fall of the leaf until March, the branches ſhould be generally examined, to ſee if they are any where too much crowded, or trained irregularly; and where any ſuch occur, they ſhould be regulated as they may require; and where there are any vacancies, ſome contiguous ſhoots, reſerved in the ſummer dreſſing, ſhould be laid in, and all the other ſhoots not wanted muſt be cut clean out cloſe to the branches, being careful ſtill to preſerve the terminating ſhoot of every branch entire, in all parts, as far as the allotted ſpace admits, likewiſe all the fruit-ſpurs in every part, faſtening in all the branches regularly at full length. In pruning old trees at this ſeaſon, where decayed and worn-out branches occur, they ſhould be cut out, and young wood trained in

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its ſtead; likewiſe, where any branch, through age or any other defect, is become barren, it ſhould be retrenched, and ſome eligible lower young branch, or ſhoot, be laid in its place.

Where any of the choicer ſorts of theſe trees are become worn-out and barren, they ſhould be renewed with young bearers, by heading the branches wholly down near the bottom in winter or ſpring, when they break out in the old wood, and in the following ſummer furniſh a large ſupply of ſtrong young ſhoots, which ſhould be trained according to the rules already laid down, when they will ſoon form a ſort of new tree, and bear good fruit. After each winter pruning, the trees which are againſt walls and eſpaliers require a general nailing, &c. which ſhould always be done with great regularity. See WALL-*Trees*, and ESPALIER-*Trees*.

The mode of training dwarf ſtandard-trees of this ſort is ſhewn in ſpeaking of trees of that kind. See DWARF-*Trees*.

In reſpect to the culture of the borders where this ſort of wall or eſpalier-trees are growing, it is commonly digging them once more every year, adding manure occaſionally in common with the other parts of the garden; but if ſome good rotten dung be applied every other year, and the ground well dug or trenched every winter, it greatly promotes the ſize and perfection of the fruit. In regard to ſtandard-trees of this kind, any of the ſorts bear plentifully in any open ſituation, though the fruit may not always be ſo large and fine as thoſe of wall and eſpalier-trees: ſummer and autumn pears, however, ripen in great perfection on ſtandards, as alſo moſt of the common winter pears. In planting them, trees of from two or three to four or five years old, having tolerable heads, are of a proper age and ſize for the purpoſe, and are preferable to older trees for any general plantation. They ſhould be planted with all their heads entire, except retrenching any very irregular-placed branch, in the uſual manner of tree-planting. See PLANTING.

In their future growth they ſhould be ſuffered to branch naturally, ſo as to form large branchy heads, ſuffering them all to remain entire. The general culture of this ſort of trees, in reſpect to pruning, is very trifling, and only required occaſionally, probably only once in ſeveral years; ſuch as the retrenching any irregular growing branches, and thinning ſuch branches as are very much crowded, cutting out all the decayed wood, and eradicating ſuckers from the roots and ſtems. See PRUNING.

When ſtandard-trees are ſituated in a garden, in which the ground is neceſſarily dug over and trenched annually for the reception of the under crops, and occaſionally enriched with dung, they generally produce finer fruit than in orchards, or other places where the ground is not in ſimilar culture.

Mr. Forſyth obſerves, that the method of pruning pear-trees is very different from that practiſed for apple-trees in general, in which the conſtant practice has been to leave great ſpurs as big as a man's arm, ſtanding out from the walls, from one foot to eighteen inches and upwards. The conſtant pruning inevitably brings on the canker; and by the ſpurs ſtanding out ſo far from the wall, the bloſſom and fruit are liable to be much injured by the froſt and blighting winds, and thus the ſap will not have a free circulation all over the tree. The ſap will always find its way firſt to the extremities of the ſhoots; and the ſpurs will only receive it in a ſmall proportion, as it returns from the ends of the branches; and the fruit ſtanding at ſo great a diſtance from the wall is too much expoſed to the weather, and, of courſe, is liable to be hard, ſpotted, and kernelly.

The following method he has practiſed where the trees were all over cankered, and the fruit ſmall, and not fit to be ſent to the table. He cut the tops off as near as poſſible to where they were grafted, always obſerving to cut as cloſe to a joint or bud as poſſible. The buds are hardly perceptible, but it can always be known where the joints, or forks, are, by the branches breaking out of the ſides. He adds that finding the pear-trees in Kenſington gardens in a very cankery and unfruitful ſtate in the years 1784 and 1785, he took out the old mould from the borders againſt the walls, and put in freſh loam in its ſtead; at the ſame time he pruned and nailed the trees in the common way, and left them in that ſtate upwards of eighteen months, to ſee what effect the freſh mould would have on them; but to his great ſurpriſe he found that it had no effect. After this trial he began to conſider what ſhould be done in order to recover theſe old trees. In this attempt he began with cutting down four old and decayed pear-trees of different kinds, near to the place where they had been grafted: this operation was performed on the 15th of May, 1786. Finding that they put forth fine ſhoots, he headed down four more on the 20th of June in the ſame year (for by this time the former had ſhoots of a foot long), which did equally well, and bore ſome fruit in the following year. One of the firſt four he headed down was a St. Germain, which produced nineteen fine large well-flavoured pears next year, and in the third bore more fruit than it did in its former ſtate when it was four times the ſize. He left ſeven trees upon an eaſt wall, treated according to the common method of pruning, which bore the following number of pears upon each tree. Epine d'hyver produced eighty-ſix pears, and the tree ſpread fifteen yards; a craſane produced one hundred pears, and the tree ſpread fourteen yards; another craſane produced ſixteen pears, and the tree ſpread ten yards; a virgouleuſe produced one hundred and fifty pears, and the tree ſpread nine yards; a colmar produced one hundred and fifty pears, and the tree ſpread nine yards; another colmar produced ſeventy-nine pears, and the tree ſpread ten yards; a l'eſchaſſerie produced ſixty pears.

But ſeven trees headed down and pruned according to his own method, leaving the fore-right ſhoots in ſummer, bore as follows, in the fourth year after heading: a Louiſbonne bore four hundred and ſixty-three pears, and the tree ſpread nine yards; another Louiſbonne bore three hundred and ninety-one pears, and ſpread eight yards; a colmar bore two hundred and thirteen pears, and ſpread ſix yards; a brown beurré bore five hundred and three pears; another brown beurré bore five hundred and fifty pears; a craſane bore five hundred and twenty pears; a virgouleuſe bore five hundred and eighty pears. And he adds, that the branches of the four laſt trees ſpread nearly in the ſame proportion as the firſt three. He alſo ſtates that a young beurré, the ſecond year after heading, bore two hundred and thirty pears; and a St. Germain four hundred. All the above trees ſtood in the ſame aſpect and the ſame wall, and the fruit was numbered in the ſame year. A great many pears which dropped from the trees are not reckoned. The trees that were pruned according to the old practice covered at leaſt one-third more wall than the other.

From this ſtatement it appears that the trees headed down bore upwards of five times the quantity of fruit that the others did; and that it keeps increaſing in proportion to the progreſs of the trees. This is an important ſtatement in the culture and management of old trees of this ſort; and the following fact with reſpect to ſtandards is deſerving of great attention: — On the 20th of June he headed ſeveral ſtandards that were almoſt deſtroyed by the canker; ſome of them were ſo loaded with fruit the following year, that he

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was obliged to prop the branches, to prevent their being broken down by the weight of it. In the fourth year after theſe ſtandards were headed down, one of them bore two thouſand eight hundred and forty pears. There were three ſtandards on the ſame border with the above, two of which were St. Germain; the old tree was of the ſame kind. One of theſe trees, twenty years old, had five hundred pears on it, which was a great crop for its ſize: ſo that there were on the old tree, which had been headed down not quite four years, two thouſand three hundred and forty pears more than on the tree of twenty years' growth. When the men numbered the pears, there was near a barrowful of windfalls at the bottom of the old tree, which were not included. Theſe and other ſtatements are given in his uſeful treatiſe on the "Culture of Fruit-Trees."

The following is the method he purſues in training trees that are cut near to the place where they are grafted. In the month of March, every year, he ſhortens the leading ſhoot to a foot or eighteen inches, according to its ſtrength: this ſhoot will, if the tree be ſtrong, grow from five to ſeven feet long, in one ſeaſon; and, if left to nature, would run up without throwing out ſide-ſhoots. The reaſon for thus ſhortening the leading ſhoot is to make it throw out ſide-ſhoots, and if it be done cloſe to a bud, it will frequently cover the cut in one ſeaſon, leaving only a cicatrix. When the ſhoots are very ſtrong, he cuts the leading ones twice in one ſeaſon; by this method he gets two ſets of ſide-ſhoots in one year, which enable him the ſooner to cover the wall. The firſt cutting is performed any time during the ſpring, and the ſecond about the middle of June. When you prune the trees, and cut the fore-right ſhoots, which ſhould be done in February or March, always cut cloſe to an eye or bud, obſerving where you ſee the greateſt number of leaves at the lower bud, and cut at them; for at the footſtalk of every one of theſe will be produced a flower-bud. The ſame will hold good in cutting the ſuperfluous ſhoots on ſtandard pears. He adds, that you will have in ſome ſorts of pears, in a favourable ſeaſon, from five to nine pears in a cluſter. This cutting ſhould not be later than March, or the beginning of April, on account of the leading ſhoot beginning to grow: the next topping, when the leading ſhoot grows quick enough to admit of it, ſhould be about the middle of June; and the length of the ſhoots ſhould be according to their ſtrength, having from three eyes or buds, to ſix on a ſide. It is added, that the cankery part beginning to affect the new bark, he cut off all the canker at the bottom, and plaſtered the place with ſome cow-dung, mixed with wood-aſhes and powder of burnt bones, put into as much urine and ſoap-ſuds as would make it of the conſiſtence of thick paint; this he laid on with a painter's bruſh. After it had been applied about three hours, he patted it gently down, with his hand, cloſe to the tree. By ſo doing, he gets rid of all the air-bubbles that may be under the compoſition, and makes it adhere to the tree, preventing it from being waſhed off by heavy rains. And in the beginning of Auguſt he ſhortens the fore-right ſhoots to about four inches long; by this time the ſhoot will have made its full growth for the ſeaſon, and will produce fine ſtrong eyes for the following year. Such ſhoots as grow near the ſtem of the tree, if any are wanted to fill up the wall, may be tucked-in as directed for peaches. This will prevent them from looking unſightly, and ſave them from the fury of the autumnal and winter winds. He further adviſes, that whenever the trunk is hollow, it be followed under ground till you have cut out all the decayed parts and rotten roots, otherwiſe you will loſe the tree. By proceeding according to the foregoing directions, the roots will be renewed, while the tree is forming a fine handſome head. In the mean time the borders ſhould be trenched, taking up all the roots, and adding ſome freſh mould to them, if you can conveniently get it; if you cannot, remove all the four mould that is about the roots of the trees, and put in ſome taken from the border, at a diſtance from the wall; always remembering to lay the top ſpit next to the roots of the trees; alſo, to mix ſome vegetable mould, from the melon and cucumber beds, with rotten leaves, as a manure for the borders. He has headed down many trees that had not this preparation; and yet they throve very well, but did not ſend forth ſuch fine roots and ſhoots as thoſe that were ſo prepared. He concludes by obſerving, that if the above directions be followed, more pears will be procured in three or four years than can be done in twenty-five years by planting young trees, and pruning and managing them in the common way. It is added, that if it ſhould be found, that, before the pears arrive at half their natural ſize, they get ſtunted, after cold blighting winds, and froſty nights, he would recommend a new operation to be performed when the weather begins to grow mild, which is to take a ſharp penknife, and with the point of it make an inciſion through the rind of the pear from the footſtalk to the eye, in the ſame way as in ſcarifying a bark-bound tree, taking care to penetrate as little into the fleſh of the pear as poſſible. At the ſame time beat up ſome freſh cow-dung with wood-aſhes, and with your fore-finger rub in a little of this compoſition where you made the ſcarification; as the wound heals, the compoſition will be diſcharged from the fruit; this will prevent the pears from cracking and burſting, which renders them good for nothing. The ſorts that are moſt liable to this diſorder are, he obſerves, the colmar, virgouleuſe, and craſane. He only, however, recommends this operation for wall pears, as it may be thought by ſome a troubleſome operation, and it will certainly take up ſome time.

Signs of Ripeneſs in the Fruit.—The maturity of the pear is generally known by its changing from a green to a yellow, or reddiſh colour, &c. and by the frequent falling from the tree; and when, with a gentle twiſt or turn upwards, it eaſily quits its hold: but theſe ſigns of ripeneſs are more particularly obſervable in ſummer and autumn pears; as winter pears, not being maturely ripe when gathered, often require a good pull before they quit the branches.

The ſummer pears ripen in ſucceſſion in different ſorts, from about the beginning or middle of July till the middle of September; many of the earlieſt ripening all at once, as it were, and continuing good but a few days, either on the tree or when gathered, nor will any of the ſorts keep good long; and none of theſe ſorts ſhould hang on the tree till ſoft ripe, as in that caſe moſt of them would be mealy and inſipid. Theſe ſorts ſhould be gathered as ſoon as they are arrived to full growth, and juſt begin to colour and diſcover maturity, but before they become ſoft and mellow. For family uſe, they may be gathered from the tree according as they attain perfection; but the general crops of each ſort ſhould be always taken down before they ripen fully, and be laid in any dry room; none of the kinds will keep long, ſome only a few days, and ſcarcely any of them above a fortnight, though from different varieties ripening at different times, the ſucceſſion is continued for eight or ten weeks.

The autumn ſorts ripen in different varieties, from about the middle of September till the end of October; ſome of the forwardeſt become eatable on the tree, others requiring to lie ſome time after being gathered before they acquire perfection. The different ſorts of theſe pears ſhould be gathered according as they arrive to maturity: thoſe deſigned

to keep ſome time, may be gathered in dry weather, juſt when they have attained full growth, as ſhewn by their frequent dropping, and by their readily quitting the trees on being handled, and laid in a dry cloſe room, or in baſkets, each ſort ſeparately.

The winter kinds attain their full growth on the trees about the end of October or beginning of November; but the eatable kinds do not acquire maturity for that purpoſe on the tree, or for ſome conſiderable time after they are gathered, ſome probably in a month, others two or three, and ſome more, and ſome ſorts not till the ſpring following. But the baking kinds may be uſed any time from October or November during their continuance. All winter pears ſhould be indulged with as full growth on the tree as the weather will permit, even until the end of October, or firſt week in November, in the later kinds, if the ſeaſon continues mild: be cautious, however, to get them gathered before attacked by much froſt. And in gathering all the ſorts for keeping, dry weather ſhould be choſen, and when the fruit is alſo quite dry, being careful not to bruiſe them. See FRUIT.

Method of Forcing Pears.—Theſe ſorts of trees are ſometimes forced by artificial heat, in ſome of the prime early kinds, to obtain a portion of fruit as early in the ſeaſon as poſſible. This is effected by means of hot-walls and forcing-frames; having previouſly ſome trees of the choiceſt early ſummer pears, ſuch as the jargonelle, or any other early ſort, trained as wall-trees againſt a ſouth wall, till advanced to ſome tolerable ſtate of bearing; being then incloſed with glaſs frames, in the manner of forcing-frames or hot-walls, and having internally either flues for fire-heat, erected forward and extending long-ways, or otherwiſe a pit arranged in that direction, in the interval or ſpace between the trees and the glaſs-work, for a bark or dung hot-bed; and by one or other of theſe methods a proper degree of artificial heat is produced internally to force an early growth in the trees, and forward them to early flowering and fruiting, managing them in the common way, as other trees in forcing-frames, ſo as to have ſome ripe fruit early in June, or ſome time in that month.

Method of Culture in the Apple Kind.—The whole of the varieties of the apple were firſt accidentally obtained by raiſing them from the kernels of the fruit; but as theſe cannot be depended upon to continue the ſame ſort of fruit, grafting is the mode made uſe of to increaſe and continue the different varieties of them, which is performed upon crab, or any kind of apple ſtocks, raiſed from the kernels, for dwarfs as well as ſtandards: and ſometimes upon codlin and paradiſe apple ſtocks raiſed from cuttings and layers, when deſigned to have eſpaliers and other dwarf trees, or for ſmall ſtandards, as low as poſſible, to be confined within a moderate ſpace: ſome ſorts may alſo be raiſed by layers and cuttings, as the common codlin.

Stocks.—The method of raiſing the different ſorts of ſtocks for the purpoſe is, in the crab and apple ſtocks, from the kernels of the fruit; but in the codlin and paradiſe ſtocks by cuttings and layers, to continue them with certainty of the ſame kinds and moderate growths. The crab and apple ſtocks may be raiſed from the kernels of any of the ſorts, procuring them in autumn or winter, either from the fruit, or from ſuch as have been preſſed for verjuice and cider, clearing them from the groſſeſt part of the pulp; then ſowing them in beds of light earth, moderately thick, over the bed, or in drills, covering them about an inch deep. They come up in the ſpring; when, if the ſeaſon prove dry, they ſhould be watered occaſionally, to forward and ſtrengthen the growth of the plants; and in the autumn, winter, or ſpring following, the largeſt may be planted out in nurſery-rows, ſhortening their tap-roots a little, and placing them in lines two feet and a half aſunder, to remain for grafting: after having from one to two or three years' growth, they will be fit for grafting upon, particularly for dwarfs, or even for full and half ſtandards, if intended to form the ſtem from the graft, which is an eligible method for theſe trees; but if the ſtock is to form the ſtem, they require three or four years' growth, to riſe to a proper height, ſeven feet for full, and four or five for half ſtandards. The modes of grafting all the ſorts is the ſame as for other fruit-trees, and ſhould be performed in March, either by whip or cleft-grafting, according to the ſize of the ſtock. See GRAFTING.

Having provided proper grafts of the different ſorts of apples intended to be raiſed, the ſtocks deſigned for dwarfs of all ſorts muſt be grafted within ſix inches of the ground; and the ſtandards may alſo be grafted low, one ſhoot from the graft being trained up for a ſtem, or on tall ſtocks, at five or ſix feet in height, but for low and half ſtandards, at from two or three, to four or five feet, and lower for dwarf ſtandards. The grafts of all the ſorts ſhoot the ſame year; and, by the autumn following, the trees having formed little heads, conſiſting of two, three, or four ſhoots, may then be planted out finally where they are to remain, or be retained a year or two, or longer, in the nurſery, as may be requiſite, training them for the purpoſes intended, as dwarfs, eſpaliers, &c. &c., and uprights for ſtandards, heading the dwarfs down in March following, within ſix inches of the graft, to force out more lateral ſhoots below to form a fuller head, proceeding immediately to turn them near the bottom, ſo as to fill the eſpalier, &c. equally with branches, quite from within ſix or eight inches of the ground, regularly upward. In the ſtandards, thoſe grafted low muſt be trained with one ſhoot upright, at full length, for a ſtem, five or ſix feet high at leaſt, for full ſtandards before it is topped; though if grafted on tall ſtocks of height ſufficient for a ſtem, the ſhoots from the graft may either be headed to five or ſix eyes; or, if to form a more ſpreading head, remain entire, and aſpire more in height, and aſſume a more upright growth: in all the modes of training, care ſhould be taken to keep the ſtems clear from all lateral ſhoots, diſplacing all ſuch as ſoon as they appear, encouraging only a proper ſet of branches at top to form the head. When theſe trees have heads from one to two or three years old from the graft, they are of a proper age for planting out; though trees of four or five years old will alſo ſucceed very well, and even thoſe of ſix or eight years' growth may alſo be ſafely planted if required. The nurſery-grounds are moſtly furniſhed with all the varieties of theſe trees for ſale, either quite young from the graft, or trained of ſeveral years' growth.

Choice of Trees.—In chooſing the different kinds of trees for planting, care ſhould be taken to have a collection of the principal varieties, both in eſpaliers and ſtandards, in proportion to the extent of the ground, as the trees of the beſt ſorts are as eaſily raiſed and cultivated as the indifferent ones, allotting a ſmaller portion of the ſummer kinds, as ſuch as ripen from Auguſt to about the middle of September, for immediate uſe off the trees, as they will not keep long; a larger ſupply of the autumn ſorts, and moſt of all of the winter keeping apples: obſerving, in the ſummer kinds, that it is advifable to allot a principal ſupply of the common codlin in ſmall ſtandards, as being generally both a great bearer, and the fruit the moſt uſeful of the ſummer apples for culinary purpoſes, from its young green growth

growth in June or July, till its full maturity in Auguſt and September, when it becomes alſo a good eating apple: and as the tree is a moderate grower, it admits of being planted in ſmall ſtandards cloſer or more abundant in a ſmall extent of ground than moſt of the principal apple kinds.

In chooſing apple-trees from the nurſery, they ſhould, Mr. Forſyth ſays, have ſtrong, ſtraight, and clean ſtems. And he adviſes not to ſuffer the dwarf trees to run higher than twelve feet, as otherwiſe they become naked at bottom, the fruit is liable to be blown down, and the tops broken by high winds.

The proper ſeaſon for planting all the ſorts of apples is, in mild weather, from the end of October till March; but when planted in autumn, or early in winter, they eſtabliſh themſelves more firmly before the drought of the following ſummer. They ſucceed in any common ſoil and open ſituation, except in low very moiſt land, in which they are apt to canker, and ſoon go off: in a pliable mellow loam they generally anſwer very well. The ground ſhould be properly prepared, by good trenching, where the ranges of trees are to ſtand.

In the planting of eſpalier apple-trees they ſhould be ranged at no leſs than eighteen or twenty feet diſtance; the latter eſpecially for trees grafted on crab or apple ſtocks, which being free ſhooters, the branches readily fill that ſpace. For the trees grafted on codlin and paradiſe ſtocks, fifteen or eighteen feet may be ſufficient; though the latter, in particular, is ſometimes planted only twelve or fifteen feet aſunder, as being a very moderate ſhooter: it is, however, adviſable to allow every ſort full room, according to their growth, to have proper ſpace to extend their branches always at full length. The trees ſhould be planted with all their heads entire, only retrenching any very irregular growths, that do not range conſiſtently with the intended form, and pruning any broken roots. Then having opened a proper hole for each tree, plant them in the uſual manner, being careful to place them with their branches ranging the way of the eſpalier. As ſoon as the earth of the holes and of the roots is properly ſettled, all the branches ſhould be trained in horizontally to the right and left, an equal number on each ſide at full length, as above.

The general culture in eſpalier trees thus planted and trained, as the ſame branches or bearers continue fruitful many years, is to continue them as long as they remain of proper growths, conſtantly giving them a ſummer and winter pruning annually, as explained above. In wall-trees alſo, any of the principal choice varieties of eating apples may be trained, to forward and improve the growth, beauty, and flavour of the fruit; ſuch as jennetings, Margaret apple, golden pippins, golden rennets, pearmains, &c. or any other approved eating kinds, a tree or two of a ſort, againſt a ſouth, ſouth-weſt, or eaſt wall.

Standard apples, when planted in the garden, ſhould be arranged thinly, to admit of under crops growing freely, without being ſhaded by their ſpreading branches. Full ſtandards ſhould be chiefly planted for the general crops, and half and dwarf ſtandards for variety. The ſtandards, when trained as above, ſhould be planted out with all their heads entire, when in the kitchen garden, at thirty feet diſtance in the rows; and for an orchard, thirty feet diſtance every way. In planting, for each tree a wide hole ſhould be opened, trimming any long ſtraggling and broken roots, leaving all the others entire, and planting them with the uſual care. As ſoon as planted out, every tree ſhould be well ſtaked to ſupport them firmly upright, and prevent their being diſturbed in rooting by winds. See ORCHARD and PLANTING.

Smaller growing ſtandards, ſuch as codlins, or other low ſtandards grafted upon codlin ſtocks, and dwarfs upon theſe or paradiſe ſtocks, may, if required, be planted only at fifteen or twenty feet diſtance in the rows, and not leſs than twenty-five feet between the lines of trees; though, if there be room to allow a greater diſtance both ways, it will be advantageous, eſpecially in planting in kitchen gardens, in which it would be proper to allow double that diſtance between the rows of trees, of the larger growths of theſe kinds. The ſtandards thus planted with their heads entire, ſhould be ſuffered to advance with their branches at full length, and in general take their natural growth, when they ſoon form numerous natural ſpurs in every part for bearing.

In reſpect to pruning theſe ſtandards, little is required, only the occaſional retrenching any irregular croſs-placed bough, or the reducing to order any very long rambler; or when the head is become greatly crowded and confuſed, to thin out ſome of the moſt irregular growths, likewiſe all ſtrong ſhoots growing upright in the middle of the head, and all dead wood, and ſuckers from the ſtem and root.

As to half and dwarf ſtandards of theſe trees, they may be diſperſed in different parts of the garden to cauſe variety, managing them as the full ſtandards. The former on dwarf paradiſe ſtocks, being very moderate ſhooters, may be planted in a little compaſs; and are ſometimes planted in pots for curioſity, to place on a table, amidſt a deſert, with the fruit growing on them. See DWARF-*Trees*.

It is obſerved by Mr. Forſyth, that in heading down old decayed apple-trees, for the ſake of ſymmetry, it will be neceſſary to cut at the forked branch as near as can be to the upper ſide of the fork, cutting them in a ſloping manner to carry off the wet, at the ſame time rounding the edges. To begin at the lower branches, cutting juſt above the lower fork; and proceeding upwards, cutting the reſt of the branches from one to ſix joints, or forks, according to their ſtrength, till you have finiſhed cutting-in the whole head. If any of theſe branches ſhould have the canker, all the infected part muſt be cut out. When the tree is all prepared, the compoſition ſhould be immediately applied, beginning at the top of the tree, and finiſhing with the powder of wood-aſhes and burnt bones as you deſcend, which will ſave it from being rubbed off during the operation; and the compoſition will prevent the ſun and air from injuring the naked inner bark. A tree thus prepared, will in the courſe of three or four years, produce more and finer fruit than a maiden tree that has been planted upwards of twenty years.

Theſe directions, if properly attended to, will be ſufficient, it is ſuppoſed, to enable any one to bring old decayed trees into a healthy bearing ſtate.

It is believed, that in large orchards and gardens, it may be neceſſary, at firſt, to head down only every other tree; cutting ſome of the branches of the reſt, which are in a decayed and cankery ſtate, and which bear no fruit. This will be preparing them to throw out new wood, and furniſh the tree much ſooner with bearing branches. He recommends the performing of the operation as early as poſſible; as by ſo doing the wood will be the ſtronger, as in May, or the two following months.

And it is added, that when the trees are become hollow, the ſame method ſhould be followed as directed for plums; but by no means to cut them down unleſs the tops are quite decayed; obſerving to cut the looſe rotten wood clean out of the hollow and other decayed parts, applying the compoſition; at the ſame time to open the ground, and cut out

all the rotten parts that may be found in the lower part of the ſtem, together with all the decayed roots, which, if this be not done, will infallibly injure the freſh wood and bark, and prevent a cure from being effected. He would recommend heading down all apple-trees that are much cankered and have ill-ſhaped heads; as by ſo doing much labour will be ſaved, and the trees will amply pay the proprietor. He adviſes never to ſhorten the young branches, except they are very thin, when it will be neceſſary to do ſo to fill the trees with young wood: nor prune any of the young wood: nor prune any of the young ſhoots the ſecond year (he means the year after they are cut), as many of the eyes, almoſt to the end of the ſhoot, will, if it be ſtrong, become fruit-buds next year; and ſo on every year. It is contended, that in the month of May in the firſt year after the trees have been ſo cut, it will be neceſſary to go over them, and rub off with your finger and thumb all the ſuperfluous young ſhoots; leaving from three to ſix eyes on each ſhoot, according to the ſize and ſtrength of the branch cut. Theſe ſhoots will bear from three to four years; by which time they will be pretty much exhauſted by the great quantity of fruit produced from them: they ſhould then be cut down to two eyes to produce new wood. He always leaves three different years' branches on the tree, when the firſt ſhoot is cut off. This is fully ſhewn in a plate in his uſeful work; and the next ſhoot will be full of fruit-buds, if it has not been ſhortened: when it begins to grow weak, it ſhould be cut off; and the next cutting muſt be made when the former branch is tired of bearing: by proceeding thus all over the tree with care and attention, the advantages of this method of pruning, above the common mode, will ſoon be perceived; as by it you will be able to keep the trees in a conſtant ſtate of bearing, which, if left to nature, would only produce a crop of fruit once in two or three years. When the ſhoot that is done bearing is cut off, the compoſition ſhould conſtantly be applied, rubbing off the ſhoots where they are too numerous.

It is ſuppoſed, that the beſt time to prune apple-trees is in the month of April, or in May, after the operation has been performed on the peaches, nectarines, and cherries: and that ſoon after this pruning, about the middle of May, it will be proper to look over the trees, and to pick off any caterpillars that may be on them. It will then be ſeen what ſhoots are infected with the canker, and which might have eſcaped your notice at the time of pruning; and wherever you obſerve the leaſt appearance of infection, which may be known by the wood appearing of a browniſh colour, the ſhoot muſt be cut down till you come to the ſound white wood. The ſmall ſhoots that croſs each other ſhould be cut off, leaving the ſtrongeſt to fill up the tree, and make a fine handſome head. The ſuckers that ſpring from the root ſhould be carefully grubbed up, and the ſide-ſhoots from the ſtem cut off; for, if left to grow, they greatly weaken the tree. The knobs, where old branches have been cut off, ſhould alſo be pared away, leaving the ſurface of the tree as ſmooth as poſſible: after which, the compoſition ſhould be applied: the young bark will ſoon begin to grow, and by degrees cover the old wounds with a freſh ſmooth ſurface, and thus prevent the canker from gaining ground on the tree. He has ſeen ſome old wounds of conſiderable ſize, healed over in one year: and he adds, in confirmation of the utility of this practice, that the trees which he pruned and dreſſed, as above directed, in the courſe of the ſummer, 1795, are all perfectly cured, the wounds being filled up with ſound wood, and covered over with new bark: they all continue in a healthy ſtate, and bear fine handſome fruit. And he has adviſed ſeveral nurſerymen to follow the practice, heading down their apple-trees after the ſeaſon of drawing for ſale is over. Meſſrs. Gray and Wear have headed a great many of ſuch trees as were formerly thrown into the faggot-pile, and have been amply recompenſed for their trouble. Trees thus headed down, provided the ſtems be ſtrong, will, he thinks, in the firſt and ſecond year, produce as much fruit as will refund the purchaſe-money; beſides, a great deal of time will be ſaved, which would be loſt by planting younger trees: as, where you can procure trees of the above deſcription that have been headed down three or more years, they will be all covered with fruit buds; and, if carefully taken up and planted in the autumn, if the ſeaſon proves favourable, they will have a tolerable crop of fruit the firſt year. Such trees muſt not be headed down like maiden trees, but only thinned off where the branches run acroſs and rub againſt one another, which ſhould never be ſuffered in theſe caſes. He ſays, he would never recommend training apple-trees as eſpaliers; as by doing ſo the air is kept from the quarters of the garden; and by conſtant pruning and cutting off all the ſide-ſhoots which you cannot tie to the eſpaliers, you prevent them from bearing, and, moreover, bring on the canker. And when the dwarf trees have handſome heads, more and much finer fruit will be gotten from one of them than from ſix eſpaliers; at the ſame time, a free air is admitted to the crops in the quarters, and the conſtant expence of the ſtakes and labour, in laying the trees to the eſpaliers is ſaved. Eſpaliers may, he obſerves, be converted into dwarf ſtandards by ſhortening the branches at different lengths, ſo as that they may be able to ſupport themſelves without the ſtakes; but not to ſhorten them all regularly; and if cut with judgment, as near to a leading ſhoot, or an eye, as poſſible, they will in the courſe of two years form fine heads, and in the third year bear ſix times the fruit as they did in their former ſtate, and of a finer flavour. The ſame method of pruning as already laid down for ſtandard apple-trees is alſo applicable to eſpaliers.

It is remarked, that the borders where you make your croſſings in gardens ſhould be ſix or eight feet broad at leaſt, to let the trees ſpread on each ſide, at the diſtance of twelve feet from tree to tree, and they ſhould be well trenched, two feet and a half deep at leaſt. If there ſhould be gravel, or four clay, it muſt be taken out, and good mould put in its place; leaving the ground as rough as poſſible for the froſt and rain to mellow it. When you level the ground it ſhould be done after rain; you may then ſow ſome ſmall crops in the border; ſuch as lettuce or ſpinach, or cabbage for tranſplanting; but let not any of the braſſica tribe come to full growth. Leaving cabbage and broccoli on borders, near fruit-trees, draws the ground very much, fills the borders with inſects, and alſo prevents the ſun and air from penetrating into the ground. And when the ſun can have free acceſs to the border, it adds much to the flavour of the fruit. If you can ſpare the ground on the croſs-borders in winter, it will be of great ſervice to the trees to ridge it up as looſe as you can, and let it lie in that ſtate all winter, to mellow and ſweeten.

Where the ſoil is ſtrong, he would recommend planting of apple-trees that are grafted on paradiſe ſtocks; but if the ſoil be light, free ſtocks will do much better: and when the ground is ſtrong clay or brick-earth, it ſhould be mixed with old lime-rubbiſh or coal-aſhes, ſtreet-dung, or ſand: but what he uſes for the borders againſt the walls, and which he prefers to every other manure, is a vegetable mould produced from leaves of trees. Of this a good coat ſhould be given once in two or three years, which will be ſufficient, he thinks, for the borders where the wall-trees ſtand, and much better than dung, which he by no means approves

approves of for trees, unleſs it be perfectly rotten and mixed up with mould.

In reſpect to grafting old apple-trees, he ſays, it frequently happens, that through ſome miſtake or other, after waiting ten or twelve years for a tree to come into a bearing ſtate, it is found that the fruit is neither fit for the table nor kitchen; in ſuch caſes they ſhould always be grafted the following ſpring, obſerving to graft on the fineſt and healthieſt ſhoots, and as near as poſſible to the old graft, and where the croſs-ſhoots break out; as by ſo doing you will have ſome fruit the ſecond year; and in the third, if properly managed, you will have as much as on a maiden tree of fifteen years ſtanding; the canker, if any, muſt be carefully pared off the branch, and the ſcion muſt be taken from a ſound healthy tree. Whenever an inciſion is made for budding or grafting, from that moment the canker begins. He would, therefore, recommend to thoſe employed in budding or grafting, as ſoon as the inciſion is made, and the bud or graft inſerted, to rub in with the finger, or a bruſh, ſome of the compoſition before the baſs is tied on: then to cover the baſs all over with the compoſition as thick as it can be laid on with a bruſh, working it well in. If this operation be performed in a proper manner, and in a moiſt ſeaſon, it will anſwer every purpoſe without applying any grafting clay: as he has frequently done it, and found it ſucceed perfectly to his wiſhes. The matting which is wrapped round the bud ſhould not be ſlackened too ſoon; for in that caſe you will find the inciſion opened, which very often occaſions the death of the bud. If, ſays he, nurſerymen and gardeners would give this method a fair trial, and uſe the ſame compoſition as he uſes for curing defects in trees, inſtead of loam and horſe-dung (which binds ſo hard as to prevent the rain and moiſture from penetrating to the graft to moiſten the wood and bark), they would find that the grafts would ſucceed much better. The compoſition, for this purpoſe, ſhould be rather ſofter than grafting clay generally is; and inſtead of applying ſo large a maſs as is generally done of clay, it need not, in moſt caſes, be more than two or three inches in circumference, to effect the purpoſe.

Apples come to full growth in different ſorts ſucceſſively, from July until the end of October: the ſummer kinds continue but a ſhort time, but the autumn and winter apples keep from two or three to ſix or eight months and longer, in different varieties. The ſigns of perfection or full growth of the different ſorts of apples, are by their aſſuming a lively colour, emitting a fragrant odour, frequently falling from the tree, and by quitting their hold eaſily on being handled.

Gathering.—In the gathering of all the ſorts of apples for keeping, dry weather ſhould always be choſen, and when the trees and fruit are alſo perfectly dry: obſerve likewiſe, in gathering apples for the table, and all kinds of apples deſigned for keeping any conſiderable time, that they be pulled one and one by hand. See FRUIT.

The other ſpecies may be increaſed by grafting and budding them upon the common crab-ſtock: they ſhould have ſheltered ſituations, as they are rather tender while young. Theſe trees afford ornament and variety in the clumps and ſhrubbery parts of pleaſure-grounds.

Method of Culture in the Quince Kind.—Theſe trees may be raiſed from the kernels of the fruit ſown in autumn; but there is no depending on having the ſame ſort of good fruit from ſeedlings, nor will they ſoon become bearers. But the ſeveral varieties may be continued the ſame by cuttings and layers; alſo by ſuckers from ſuch trees as grow upon their own roots, and likewiſe be increaſed by grafting and budding upon their own pear-ſtocks, raiſed from the kernels in the ſame manner as for apples.

The raiſing by cuttings, layers, and ſuckers, is performed in autumn, winter, or ſpring, chooſing young wood for the cuttings and layers, which ſhould be planted and laid in the common method, when they will be rooted by the following autumn, then planted out into nurſery rows two feet aſunder; plant the ſuckers alſo at the ſame diſtance, and then train the whole for the purpoſes intended: if for ſtandards, run them up with a ſtem to any deſired height, from three to five or ſix feet, then encourage them to branch out at top, to form a head; and thoſe deſigned as dwarfs muſt be headed near the ground, and trained accordingly for eſpaliers, or dwarf ſtandards, as directed under thoſe articles: the grafting or budding is effected on quince or pear-ſtocks, and trained as above. When they have formed tolerable heads, they ſhould be planted out finally.

Mr. Forſyth adviſes that the layers or cuttings ſhould be planted in a ſhady place, in rows at about a foot diſtant from each other, and about three inches from plant to plant in the rows; mulching them with rotten leaves, or rotten dung, which will keep the ground about them moiſt; and watering them frequently in hot weather. About Michaelmas thoſe that are well rooted may be planted out, and thoſe that are not ſhould remain another year. They may alſo be propagated by budding or grafting; and theſe trees will bear ſooner, and be more fruitful than thoſe raiſed by any other method.

He obſerves, that the quince-tree may be pruned much in the ſame way as an apple-tree, taking care to cut out all the old diſeaſed and dead wood, and the croſs branches in the middle of the tree, which are apt to injure each other by friction. In general you will find old trees much hurt by injudicious pruning: in that caſe they ſhould be headed down, cutting out all the cankery parts, and alſo all the diſeaſed and dead wood where the tree is hollow, or where large branches have been cut or broken off, applying the compoſition as for apple-trees: and as quince-trees are very apt to have rough bark, and to be bark-bound, in theſe caſes it will be neceſſary to ſhave off the rough bark with a draw-knife, and to ſcarify them when bark-bound, bruſhing them over with the compoſition. It is alſo adviſed to plant quince-trees at a proper diſtance from apples and pears, as bees and the wind may mix the farina, and occaſion the apples or pears to degenerate.

Standard quinces, deſigned as fruit-trees, may be ſtationed in the garden or orchard, and ſome by the ſides of any water, pond, watery-ditch, &c. as they delight in moiſture, ſuffering the whole to take their own natural growth: and as eſpaliers, they may be arranged in aſſemblage with other moderate growing trees, ſuch as apples and pears on paradiſe and quince-ſtocks, cherries, &c. being trained as directed for apples and pears in eſpaliers. They may alſo be planted in ſhrubberies, either as full or low ſtandards, and permitted to take their own way of growth. See ORCHARD.

PYSTERA, in *Ancient Geography*, an iſland ſituated on the coaſt of Aſia Minor, over-againſt Smyrna. Pliny.

PYTHAGORAS, in *Biography*. See PYTHAGOREANS.

Poſterity has been very liberal to this philoſopher, in beſtowing upon him all ſuch inventions as others had neglected to claim, particularly in muſic; for there is ſcarcely any part of it, as a ſcience, with which he has not been inveſted by his generous followers in biography.

Muſical ratios have been aſſigned to him, with the method of determining the gravity or acuteneſs of ſounds by the greater or leſs degree of velocity in the vibrations of ſtrings; the

the addition of an eighth to the lyre (Pliny, lib. ii. cap. 2.); the harmony of the ſpheres (Plato); and the Greek muſical notation (Boethius). His right, indeed, to ſome of theſe diſcoveries has been diſputed by ſeveral authors, who have given them to others with as little reaſon, perhaps, as they had been before beſtowed upon him.

But there is one diſcovery, relative to muſic, that has, at all times, been unanimouſly aſſigned to him, which, however, appears to us extremely doubtful, not only whether it was made by him, but whether, in the manner it is related, it was ever made by any one.

We are told by Nicomachus, Gaudentius, Jamblichus, Macrobius, and all their commentators, "that Pythagoras, one day meditating on the want of ſome rule to guide the ear, analogous to what had been uſed to help the other ſenſes, chanced to paſs by a blackſmith's ſhop, and obſerving that the hammers, which were four in number, ſounded very harmonioufly, he had them weighed, and found them to be in the proportion of 6, 8, 9, and 12. Upon this he ſuſpended four ſtrings, of equal length and thickneſs, &c. faſtened weights, in the above-mentioned proportions, to each of them reſpectively, and found that they gave the ſame ſounds that the hammers had done; *viz.* the fourth, fifth, and octave to the graveſt tone; which laſt interval did not make part of the muſical ſyſtem before; for the Greeks had gone no farther than the heptachord, or ſeven ſtrings, till that time." Principles and Power of Harmony, p. 8.

This is the ſubſtance of the account, as it has been lately abridged by Mr. Stillingfleet, who points out many incredible circumſtances with reſpect to the ſtory in general, and denies that the weights 6, 8, 9, 12, would give the intervals pretended; but ſeems not to have ſeen the leaſt difficulty in the fact, relative to *different hammers producing different ſounds upon the ſame anvil.* The frontiſpiece to M. Marpurg's Hiſtory of Muſic, repreſents the Samian ſage in the act of *weighing* the *hammers.*

But though both hammers and anvil have been ſwallowed by ancients and moderns, and have paſſed through them from one to another, with an oſtrich-like digeſtion, upon examination and experiment it appears, that hammers of different ſize and weight will no more produce *different tones* upon the *ſame anvil,* than bows or clappers of different ſizes, will from the *ſame ſtring* or *bell.*

Indeed, both the hammers and anvils of antiquity muſt have been of a conſtruction very different from thoſe of our *degenerate days,* if they produced any tones that were ſtrictly *muſical.* Of the millions of well-organized mortals, who have paſſed by blackſmiths' ſhops, ſince the time of Pythagoras, we believe no one was ever detained by a *ſingle note,* much leſs by an harmonious *concord,* from thoſe Vulcanian inſtruments. A different kind of noiſe, indeed, will be produced by hammers of different weights and ſizes; but it ſeems not to be in the power of the moſt ſubtle ear to diſcover the leaſt imaginable difference with reſpect to gravity or acuteneſs. But though *different noiſes* may be produced from different bodies, in proportion to their ſize and ſolidity, and every room, chair, and table, in a houſe, has a particular tone, yet theſe noiſes can never be aſcertained like muſical tones, which depend upon reiterated and regular vibrations of the aliquot parts of a ſtring, or other elaſtic body; and in wind inſtruments, upon the undulations of the air conveyed into a tube. Noiſe may, indeed, be *forced* from a muſical ſtring, or inſtrument, by violence; but noiſe proceeding from bodies non-elaſtic, or immuſical, can never be *ſoftened* into ſound. M. Rouſſeau (Dict. de Muſ. art. *Bruit*) has ingeniouſly imagined that noiſe is of the ſame nature as ſound, with this difference, that to produce ſound, the *one* tone, with its conſonant harmonics only, ſhould be heard; ſuch as the 8th, 12th, 15th, and 17th; whereas noiſe is produced by a jarring multitude of different tones, or even by one tone, when its vibrations are ſo violent as to render audible a conſiderable number of diſſonant tones, of which the vibrations ſeldom or never coincide; ſuch as the 7th, 9th, 11th, &c.

The long belief of this ſtory proves that philoſophers themſelves have ſometimes taken facts upon truſt, without verifying them by experiment. And as the tone of the hammers was aſſerted without proof, ſo was the effect of their different weights faſtened to ſtrings: this Galileo diſcovered. The numbers 6, 8, 9, 12, applied to different lengths of ſtrings, would, indeed, give the intervals mentioned. But it is proved, that to produce thoſe intervals by the *tenſion* of different weights, the weights muſt be the ſquares of thoſe numbers; that is, 36, 64, 81, 144. It is aſtoniſhing how the blunder had been echoed from author to author, without experiment, till the time of Galileo. And Bontempi, in trying the power of weights upon ſtrings in the Pythagoric proportions of 6, 8, 9, 12, found, that inſtead of giving the 4th, 5th, and 8th of the graveſt tone, they produced only the minor 3d, major 3d, and tritonus; ſo that the whole account falls to the ground. But though modern incredulity and experiment have robbed Pythagoras of the glory of diſcovering muſical ratios by *accident,* he has been allowed the ſuperior merit of arriving at them by meditation and deſign. At leaſt the invention of the harmonical canon, or monochord, has been aſcribed to him both by ancient and modern writers. (See MONOCHORD.) See Ariſtid. Quint. p. 116. Prin. and Power of Harm. Hiſt. des Mathem. par. Montucla. Euler, Tentamen novæ Theor. Muſ. and all the writers upon harmonics and temperament.

We ſhall enter no deeper into this ſubject here, than is abſolutely neceſſary to explain the nature of the diſcovery attributed to Pythagoras, to which muſic is indebted for the honourable appellation of *ſcience.*

Pythagoras ſuppoſed the air to be the *vehicle* of ſound, and the agitation of that element occaſioned by a ſimilar agitation in the parts of the ſounding body, to be the *cauſe* of it. The vibrations of a ſtring, or any other ſonorous body, being communicated to the air, affected the auditory nerves with the ſenſation of ſound; and this ſound, according to him, was acute or grave, in proportion as the vibrations were quick or ſlow. It was alſo known, by experiment, that of two ſtrings equal in every thing but length, the ſhorter made the quickeſt vibrations, and gave the acuter ſound; in other words, that the number of vibrations made in the ſame time by two ſtrings of different lengths, were inverſely as thoſe lengths; that is, the greater the length, the ſmaller the number of vibrations in any given time. By theſe diſcoveries it was that ſound, conſidered in the vibrations that cauſe it, and the dimenſions of the vibrating or ſonorous body, was reduced to quantity, and as ſuch, became ſubject to calculation, and expreſſible by numbers. Thus, for inſtance, the two ſounds that form an octave are expreſſed by the numbers 1 and 2; which repreſent either the number of vibrations in a given time, or the length of the ſtrings; and mean nothing more myſterious than that the acuter ſound vibrates twice, while the graver vibrates once; or, that the ſtring producing the lower ſound is twice the length of that which gives the upper. If we conſider the vibrations, the higher ſound is as 2, the lower as 1: the reverſe, if we conſider only the lengths. In the ſame manner, and in the ſame ſenſe, the 5th is expreſſed by the ratio of 2 to 3, and the 4th by that of 3 to 4.

Such

Such was the ancient philoſophy of ſounds, of which Pythagoras is recorded as the firſt teacher. But how much of this theory was founded on experiment and demonſtration, and how much of it upon hypotheſis; how much of it was known, and how much taken for granted, cannot certainly be determined. The ſtory juſt now diſcuſſed is too much embarraſſed with abſurdities and impoſſibilities to guide us to any probable conjecture, as to the method by which Pythagoras *actually* arrived at his concluſions.

The diſcovery, as far as it relates to the length of ſtrings, was eaſily made, becauſe it depended upon an obvious experiment. It was, likewiſe, eaſily perceived, that a ſhort ſtring vibrated with more velocity than a long one; but between the certainty of this general fact, and the certainty that the vibrations were in a ratio exactly the inverſe of the lengths, there is a conſiderable gulph. (See Smith's Harmonics, ſect i. art. 7, and note f.) We have no account of the bridge upon which Pythagoras got ſafely over. Experiment, here, is out of the queſtion; for the ſloweſt vibrations that produce muſical ſound, are far too quick to be counted or diſtinguiſhed. The inference, however, was natural, though it does not appear that the ancients were able to ſupport it by ſtrict and ſcientific proof.

Indeed it was ſo late as the beginning of the preſent century, (1714. See Phil. Tranſ. and Methodus incrementorum directa et inverſa, by Dr. Brook Taylor,) before this ancient theory of ſound was fully confirmed, and the laws of vibrations, and the whole doctrine of muſical ſtrings, eſtabliſhed upon the ſolid baſis of mathematical demonſtration.

The ſecond muſical improvement attributed to Pythagoras, was the addition of an eighth ſtring to the lyre, which, before his time, had only ſeven, and was thence called a heptachord. It is ſuppoſed by ſeveral ancient writers, that the ſcale of this inſtrument, which was that of Terpander, conſiſted of two conjoint tetrachords, E F G A B ♭ C D; and that Pythagoras, by adding an eighth ſound, at the top, and altering the tuning of the fifth, formed this ſcale: E F G A, B C D e, or a ſimilar ſcale, conſiſting of two disjunct tetrachords.

How this ſcale was generated by the triple progreſſion, or ſeries of perfect 5ths, the abbé Rouſſier has lately very well diſcuſſed, in his "Memoire ſur la Muſique des Anciens." We ſhall endeavour to explain what is meant by the triple progreſſion in muſic, which is the baſis of this ingenious hypotheſis; referring the reader to the Memoire itſelf for his proofs, as inſerting them here would require too much time and ſpace for a work of this nature.

Let any ſound be repreſentnd by unity, or the number 1; and as the 3d part of a ſtring has been found to produce the 12th, or octave of the 5th above the whole ſtring, a ſeries of 5ths may be repreſented by a triple geometric progreſſion of numbers, continually multiplied by 3, as 1 3 9 27 81 243 729; and theſe terms may be equally ſuppoſed to repreſent 12ths, or 5ths, either aſcending or deſcending. For whether we divide by 3, or multiply by 3, the terms will be in the proportion of a 12th, or octave to the 5th, either way. The abbé Rouſſier, imagining that the ancients ſung their ſcale backwards, as we ſhould call it, by deſcending, annexes to his numbers the ſounds following:

Term	I	II	III	IV	V	VI	VII
	1	3	9	27	81	243	729
	B	E	A	D	G	C	F

out of which ſeries of 5ths, by arranging the ſounds in diatonic order, may be formed the heptachord, or 7th, B C D E F G A; and to theſe, adding the duple of the higheſt ſound, in the proportion of 2 to 1, the abbé ſuppoſes that Pythagoras acquired the octave, or proſlambanomenos. This is throwing a mite into the charity-box of poor Pythagoras, without, however, telling us in what reign the obolum was coined; for we have met with no ancient author who beſtows the invention of proſlambanomenos upon this philoſopher. The abbé does not let him or his followers ſtop here, but ſuppoſes an 8th term, 2187, added to the progreſſion given above, by which a B ♭ was obtained, which furniſhed the minor ſemitone below B ♮. The ſyſtem of Pythagoras, according to the abbé, was bounded by this 8th term, and the principle upon which it was built being loſt, the Greeks penetrated no farther into the regions of modulation, where they might have enriched their muſic, but contented themſelves, in after-times, with tranſpoſitions of this ſeries of ſound.

The abbé Rouſſier imagines, however, that though Pythagoras went no farther than the eighth term in triple progreſſion, yet the Egyptians, in very high antiquity, extended the ſeries to twelve terms, which would give every poſſible mode and genus perfect. A curious circumſtance is obſerved by the ſame author, p. 28, § 47, with reſpect to the muſical ſyſtem of the Chineſe, which well deſerves mention here. "In collecting," ſays he, "what has already been advanced concerning the original formation of the Chineſe ſyſtem, it appears to begin preciſely where the Greek left off, that is, at the VIIIth term of the triple progreſſion, which is purſued as far as the XIIth term, by which ſeries, arranged diatonically, the Chineſe acquire their ſcale, e ♭, D ♭, B ♭, A ♭, G ♭, E ♭, in deſcending: or, as Rameau expreſſes the ſame intervals, in ſharps, aſcending, G♯, A♯, C♯, D♯, E♯, g♯."—It is obſervable that both theſe ſcales, which are wholly without ſemitones, are Scottiſh, and correſpond with the natural ſcale of the old ſimple enharmonic, given p. 34. M. Jamard, a late French writer on muſic, puſhing calculation ſtill further than either the Egyptians or Chineſe, has obtained, by purſuing the harmonic ſeries, 1, 2, 3, 4, &c. &c. not only the enharmonic dieſis, but even the minute intervals in the warbling of birds; it is wonderful he did not apply his ratios to human ſpeech.

After muſical ratios were diſcovered and reduced to numbers, they were made by Pythagoras and his followers, the type of order and juſt proportion in all things: hence virtue, friendſhip, good government, celeſtial motion, the human ſoul, and God himſelf, were harmony.

This diſcovery gave birth to various ſpecies of muſic, far more ſtrange and inconceivable than chromatic and enharmonic: ſuch as divine muſic, mundane muſic, elementary muſic, and many other diviſions and ſubdiviſions, upon which Zarlino, Kircher, and almoſt all the old writers, never fail to expatiate with wonderful complacence. It is, perhaps, equally to the credit and advantage of muſic and philoſophy, that they have long deſcended from theſe heights, and taken their proper and ſeparate ſtations upon *earth*: that we no longer admit of muſic that cannot be *heard*, or of philoſophy that cannot be *underſtood*.

Ariſtides Quintilianus aſſures us, that muſic comprehends arithmetic, geometry, phyſics, and metaphyſics, and teaches every thing, from *ſolfaing* the ſcale, to the nature and conſtruction of the ſoul of man and the ſoul of the univerſe. To confirm this, he quotes, as a *divine ſaying*, a moſt curious account of the *end* and *buſineſs* of muſic, from one maſter Panacmus, which informs us that the province of muſic is not only to arrange muſical ſounds, and to regulate the voice, but to unite and harmonize every thing in nature. This writer, p. 102, in ſolving the queſtion, whence it is that the ſoul is ſo eaſily affected by inſtrumental muſic, acquaints us, in the Pythagorean way, how the ſoul, friſking about, and

playing all kinds of tricks in the purer regions of ſpace, approaches by degrees to our groſs atmoſphere; gets a taſte for matter and ſolidity, and at length acquires a warm and comfortable body to cover her nakedneſs. Here ſhe picks up nerves and arteries; there membranes; here ſpirit or breath; and all in a moſt extraordinary manner; eſpecially the arteries and nerves: for what ſhould they be made of, but the *circles* and *lines* of the ſpheres, in which the ſoul gets entangled in her paſſage, like a fly in a ſpider's web. Thus, continues he, the body becomes ſimilar in its texture to inſtruments of the wind and ſtringed kind. The nerves and arteries are ſtrings, and at the ſame time they are pipes filled with wind. "What wonder, then," ſays Ariſtides Quintilianus, "if the ſoul, being thus intimately connected with a body ſimilar in conſtruction to thoſe inſtruments, ſhould ſympathize with their motions."

Maſter Thomas Mace, author of a moſt delectable book, called "Muſick's Monument," would have been an excellent Pythagorean; for he maintains that the myſtery of the Trinity is perſpicuouſly made plain by the connection of the three harmonical concords, 1, 3, 5; that muſic and divinity are nearly allied; and that the contemplation of concord and diſcord, of the nature of the octave and uniſon, will ſo ſtrengthen a man's faith, "that he ſhall never after degenerate into that *groſs ſub-beaſtical ſin* of atheiſm." P. 268.

Pythagoras is ſaid, by the writers of his life, to have regarded muſic as ſomething celeſtial and divine, and to have had ſuch an opinion of its power over the human affections, that, according to the Egyptian ſyſtem, he ordered his diſciples to be waked every morning, and lulled to ſleep every night, by ſweet ſounds. He likewiſe conſidered it as greatly conducive to health, and made uſe of it in diſorders of the body, as well as in thoſe of the mind. His biographers and ſecretaries even pretend to tell us what kind of muſic he applied upon theſe occaſions. Grave and ſolemn, we may be certain; and vocal, ſay they, was preferred to inſtrumental, and the lyre to the flute, not only for its decency and gravity, but becauſe inſtruction could be conveyed to the mind, by means of articulation in ſinging, at the ſame time as the ear was delighted by ſweet ſounds. This was ſaid to have been the opinion of Minerva. In very high antiquity mankind gave human wiſdom to their gods, and afterwards took it from them, to beſtow it on mortals.

In peruſing the liſt of illuſtrious men, who have ſprung from the ſchool of Pythagoras, it appears that the love and cultivation of muſic was ſo much a part of their diſcipline, that almoſt every one of them left a treatiſe behind him upon the ſubject.

PYTHAGORAS'S *Table*. See TABLE.

PYTHAGOREA, in *Botany*, received that appellation from Loureiro, in memory of the famous Pythagoras, who is ſaid to have written a book on the qualities of plants.—Loureir. Cochinch. 243. Claſs and order, *Octandria Tetragynia*. Nat. Ord. . . . . .

Gen. Ch. *Cal.* Perianth inferior, bell-ſhaped, of ſeven or eight linear, hairy, coloured leaves. *Cor.* ſuperior, bell-ſhaped, of ſeven or eight lanceolate, concave, hairy petals, the length of the calyx. *Stam.* Filaments eight, awl-ſhaped, longer than the corolla; anthers roundiſh, two-lobed. *Piſt.* Germen between the calyx and corolla, nearly ovate, hairy; ſtyles four, awl-ſhaped, reflexed, ſhorter than the ſtamens; ſtigmas acute. *Peric.* Capſule ovate, of four cells. *Seeds* numerous, roundiſh.

Eſſ. Ch. Calyx of ſeven or eight leaves, inferior. Corolla of ſeven or eight petals, ſuperior. Capſule of four cells, with many ſeeds.

1. P. *cochinchinenſis*.—Native of Cochinchina, where it is called *Xuong cá tiá nhơ lá*. A ſmall *tree*, with numerous branches. *Leaves* nearly ſeſſile, ovato-lanceolate, ſerrated, ſmooth; their longitudinal ribs red at the extremity. *Cluſters* axillary, long, nearly ſimple, with ſhort partial ſtalks. *Flowers* white.

Such is Loureiro's account, but we have no knowledge of the plant he deſcribes, nor can we offer any conjecture reſpecting its natural affinity. We have no faith in the exiſtence of a germen ſuperior to the calyx and inferior to the corolla, the only inſtance of the kind which Linnæus ever imagined, in *Sanguiſorba*, proving not well founded.

PYTHAGOREAN, or PYTHAGORIC *Syſtem*, among the *Ancients*, was the ſame with the Copernican ſyſtem among the moderns. See SYSTEM.

It was thus called, as having been maintained and cultivated by Pythagoras, and his followers; not that it was invented by him, for it was much older.

PYTHAGOREANS, a ſect of ancient philoſophers, who adhered to the doctrine of Pythagoras.

Pythagoras, the founder of this ſect, was of Samos, the ſon of a lapidary, and a pupil of Pherecydes, and flouriſhed (ſays Bayle) about five hundred years before Chriſt, in the time of Tarquin, the laſt king of Rome, and not in Numa's time, as many authors have ſuppoſed. See Cicero Tuſcul. Queſt. lib. iv. cap. 1.

The time of his birth, however, has been much diſputed. Dr. Bentley, in his "Diſſertation on the Epiſtles of Phalaris," relying chiefly on the authority of Eratoſthenes, refers the birth of Pythagoras to the 4th year of the 43d olympiad, B.C. 608. Lloyd, in his "Diſſertation concerning the Chronology of Pythagoras," aſcribes his birth to the 3d year of the 48th olympiad, B.C. 586. Dodwell places it in the 4th year of the 52d olympiad, B.C. 569, reſting in this date chiefly on the authority of Porphyry and Jamblichus. Upon the whole, the opinion of Lloyd ſeems to be the moſt probable, which is, that he was born about the year B.C. 586, and that he died about the 3d year of the 68th olympiad, B.C. 506; ſo that it ſeems pretty certain, that he was not born earlier than the 4th year of the 43d olympiad, B.C. 605, nor later than the 4th year of the 52d, B.C. 569. If we admit only the credible particulars of his childhood and early education, and pay no attention to the tales of Jamblichus and others, who even aſſerted that he was the ſon of God, we ſhall find that he was firſt inſtructed in his own country by Creſphilus, and afterwards by Pherecydes, in the iſland of Scyrus, and that after having paid his laſt tribute of reſpect to his preceptor, he returned to Samos, and purſued his ſtudies under the direction of his firſt maſter. Jamblichus, and other later biographers, mention his journey into Ionia, and his interviews with Thales and Anaximander, but of this journey we have no authentic record, nor is any effect of it diſcernible in his doctrine, which is eſſentially different from that of the Ionic ſchool. His firſt journey from the Grecian iſlands was probably into Egypt, which was celebrated in his time for that kind of wiſdom which beſt ſuited his genius and temper. In his way thither, Jamblichus aſſerts that he viſited Phœnicia, and converſed with the prophets and philoſophers that were the ſucceſſors of Mochus the Phyſiologiſt; which Mochus, Selden, and ſome others, will have to be Moſes.

Nor is it thought at all improbable that Pythagoras might wiſh to acquaint himſelf with the Phœnician philoſophy, of which he muſt, without doubt, have received a general report from his father, and from other merchants who traded to this coaſt. But that he derived his knowledge of numbers from the Phœnicians is not at all probable, becauſe their acquaintance with numbers extended no further than

to the practical ſcience of arithmetic. It has been ſaid, indeed, that Pythagoras travelled, not only into Egypt and Chaldæa, but even into the Indies, to inform his underſtanding with regard to all branches of ſcience and prevalent cuſtoms; and that after returning to his own country, being unable to bear the tyranny of Polycrates, he retired into the eaſtern part of Italy, then called Magna Græcia, and eſtabliſhed his ſect, denominated from this circumſtance the "Italic Sect," or "Italic ſchool." Whatever opinion is entertained of this journey to the Eaſt, to which Le Clerc gives no credit, we muſt altogether reject other ſtories of his viſiting the temple on mount Carmel, and remaining there for ſeveral days, without food, paſſing among the inhabitants for a good dæmon, and obtaining from them religious honours; and of his proceeding into India, and there paſſing through ſeveral ceremonies of the Moſaic law.

Pythagoras, whilſt he was in Egypt, was introduced by the recommendation of Polycrates, tyrant of Samos, to Amaſis, king of Egypt, a diſtinguiſhed patron of literary men, and thus obtained acceſs to the colleges of the prieſts. Having found it difficult to gain this privilege, he performed many ſevere and troubleſome preliminary ceremonies, and even ſubmitted to circumciſion, a preſcribed condition of his admiſſion. He paſſed twenty-two years in Egypt, availing himſelf of all poſſible means of information with regard to the recondite doctrines of the Egyptian prieſts, as well as their aſtronomy and geometry, and Egyptian learning in its moſt unlimited extent.

Many writers of reputation, both Pagan and Chriſtian, who flouriſhed after the commencement of the Chriſtian era, relate, that after Pythagoras had left Egypt, he viſited the Perſian and Chaldæan Magi, and proceeeded ſo far as to have intercourſe with the Indian Gymnoſophiſts. Jamblichus aſſerts, that he was taken captive by the victorious army of Cambyſes, and carried to Babylon, where he acquainted himſelf with the learning and philoſophy of the Eaſt; and that after the expiration of twelve years, when he was in the 60th year of his age, he returned to Samos. The circumſtance of his having viſited the Perſian magi is alſo mentioned by Cicero, Euſebius, Lactantius, and Valerius Maximus, though they take no notice of his captivity. In this journey to the Eaſt, as ſome have maintained, he attended upon the inſtructions of the celebrated Perſian ſage, Zoroaſter; and others, who have placed the life of Zoroaſter in an earlier period than that of Pythagoras, have aſſerted, that he converſed with certain Jewiſh prophets, who were at that time in Babylon, in a ſtate of captivity, and thus became acquainted with the Jewiſh laws and cuſtoms. However, ſeveral objections, particularly of a chronological kind, have been alleged againſt the narrative of Pythagoras's journey to the Eaſt. Chronologiſts unanimouſly agree, that Cambyſes invaded Egypt in the fifth year of his reign, or the third year of the 63d olympiad. According to Jamblichus, Pythagoras, after ſtaying twelve years in Babylon, and viſiting ſeveral other countries, went into Italy in the 62d olympiad. The ſame date is affixed to this journey by Diodorus and Clemens Alexandrinus; whilſt others place it about fourteen years earlier. Hence it appears, that if Pythagoras left the Eaſt before the 62d olympiad, after remaining there twelve years, he could not have been carried thither by Cambyſes in the 63d olympiad. Moreover, the whole narration of Pythagoras's journey into the Eaſt is contradicted by the expreſs authority of Antiphon (quoted by Porphyry), who ſays that Pythagoras, after his reſidence in Egypt, returned into Ionia, and opened a ſchool in his own country; and that, at the age of forty years, finding himſelf haraſſed by the tyranny of Polycrates, he withdrew into Italy; and according to this account, we have no interval for the ſuppoſed eaſtern expedition. The reality of this expedition is teſtified either by certain Alexandrian Platoniſts, who were deſirous of exalting, as much as poſſible, the wiſdom of thoſe ancient philoſophers, whom they conſidered as the oracles of wiſdom, or by certain Jewiſh and Chriſtian writers, who were diſpoſed to credit every tale which tended to give probability to the opinion that the Pythagorean doctrine was derived from the Oriental philoſophers, and ultimately from the Hebrew ſcriptures. In either caſe the authenticity of the relation is liable to juſt ſuſpicion; nor is there any probable argument to prove, that Pythagoras received inſtruction from any prophet of the Hebrew nation, during his ſuppoſed reſidence at Babylon. Brucker concurs with thoſe writers who are diſpoſed to reject this ſtory of Pythagoras's eaſtern journey as a mere fiction, and who concludes that, having never paſſed from Egypt to the Eaſt, he returned thence immediately to Samos. The ſtory of his having viſited the northern Druids is ſo deſtitute of probability and of evidence, as to merit no regard.

After his return from Egypt to his native iſland, he wiſhed to communicate the benefit of his twenty years' reſearches and ſtudies to his fellow-citizens, and with this view he attempted to inſtitute a ſchool for their inſtruction in the elements of ſcience; propoſing to adopt the Egyptian mode of teaching, and to communicate his doctrines under a ſymbolical form: but the Samians were either too ſtupid or too indolent to profit by his inſtructions. Although he was obliged to relinquiſh his deſign, he did not altogether abandon it. In order to engage the attention of his countrymen by ſome other means, he repaired to Delos; and after preſenting an offering of cakes to Apollo, he there received, or pretended to receive, moral dogmas from the prieſteſs, which he afterwards delivered to his diſciples under the character of divine precepts. With the ſame views he alſo viſited the iſland of Crete, ſo celebrated in mythological hiſtory; where he was conducted by the Corybantes, or prieſts of Cybele, into the cave of mount Ida, in which Jupiter is ſaid to have been buried. Here he converſed with Epimenides, an eminent pretender to prophetic powers, and was by him initiated into the moſt ſacred myſteries of Greece. About the ſame time he viſited Sparta and Elis, and was preſent during the celebration of the Olympic games, where he is ſaid to have exhibited a golden thigh to Abaris, in order to convince him that he was Apollo. Beſides other places which he viſited during his ſtay in Greece, he repaired to Phlius, where he firſt aſſumed the appellation of philoſopher. (See PHILOSOPHER.) Having thus added to the ſtores of learning which he had previouſly accumulated, and acquired a kind of authority which was calculated to command reſpect, he returned to Samos, and made a ſecond attempt, more ſucceſsful than his firſt, for eſtabliſhing a ſchool of philoſophy. In a ſemicircular kind of building, which the Samians had uſed as a place of reſort for public buſineſs, he delivered with an aſſumed authority of a ſacred nature, popular precepts of morality; and he alſo provided for himſelf a ſecret cave, into which he retired with his intimate friends and profeſſed diſciples, and here he gave his followers daily inſtructions, accompanied with a conſiderable parade of myſtery, in the more abſtruſe parts of philoſophy. His fame, and the multitude of his followers, increaſed. What he failed to accompliſh by the mere force of learning and ability, he effected by concealing his doctrines under the veil of myſterious ſymbols, and iſſuing forth his precepts as reſponſes from a divine oracle. About the beginning of the 59th olympiad, Pythagoras, deſirous of eſcaping

the tyrannical government exerciſed in his native iſland by Syloſon, the brother of Polycrates, left Samos, and, as we have already hinted, paſſed over into Italy, and attempted to eſtabliſh his ſchool among the colonies of Magna Græcia. It is probable that, in order to obtain credit with the populace, he about this time pretended to poſſeſs a power of performing miracles, and practiſed many arts of impoſture. The firſt place at which he arrived in Italy was Crotona, a city in the bay of Tarentum, the inhabitants of which were very corrupt in their manners. But ſuch were his reputation and influence, that he was treated with great reſpect, and people of all claſſes aſſembled to hear his diſcourſes; inſomuch that the manners of the citizens were ſoon totally changed from great luxury and licentiouſneſs to ſtrict ſobriety and frugality. It is ſaid that 600 (ſome ſay 2000), perſons were prevailed upon to ſubmit to the ſtrict diſcipline which he required, and to throw their effects into a common ſtock for the benefit of the whole fraternity. The influence of his philoſophy extended from Crotona to many other cities of Magna Græcia, and obtained for Pythagoras from his followers a degree of reſpect little ſhort of adoration. If he had contented himſelf with delivering doctrines of philoſophy and precepts of practical wiſdom, he might probably have continued his labours, without moleſtation, to the end of his life. But he manifeſted a ſtrong propenſity towards political innovations; and he employed his influence in urging the people to the ſtrenuous aſſertion of their rights, againſt the encroachments of their tyrannical governors. This courſe of conduct raiſed againſt him a very powerful oppoſition, which he was unable to reſiſt and contend againſt, and which obliged him to retire to Metapontum. Here he found himſelf ſtill ſurrounded with enemies, and was under a neceſſity of ſeeking an aſylum in the temple of the Muſes, where, not being ſupplied by his friends with ſufficient food, he periſhed with hunger. The time of his death is uncertain; but according to the Chronicon of Euſebius, he died in the third year of the 68th olympiad, B. C. 506, after having lived, according to the moſt probable ſtatement of his birth, to the age of 80 years. After his death his followers paid a ſuperſtitious reſpect to his memory. They erected ſtatues in honour of him, converted his houſe at Crotona into a temple of Ceres, the ſtreet in which it ſtood was called the Muſeum, and appealed to him as a divinity, ſwearing by his name.

It appears, from the hiſtory of this philoſopher, that with all his talents and learning, he owed much of his celebrity and authority to impoſture. His whole manner of life confirms this opinion. Clothed in a long white robe, with a flowing beard, and, as ſome ſay, with a golden crown on his head, he preſerved among the people, and in the preſence of his diſciples, a commanding gravity and majeſty of aſpect. He recurred to muſic for promoting the tranquillity of his mind, frequently ſinging, for this purpoſe, hymns of Thales, Heſiod, and Homer. He had ſuch an entire command over himſelf, that he was never ſeen to expreſs, in his countenance, grief, joy, or anger. He refrained from animal food, and confined himſelf to a frugal vegetable diet, excluding from his ſimple bill of fare, for myſtical reaſons, pulſe or beans. By this artificial demeanour, Pythagoras appeared among the vulgar as a being of an order ſuperior to the common condition of humanity, and perſuaded them that he had received his doctrine from heaven. Pythagoras married Theano of Crotona, or, as ſome ſay, of Crete, by whom he had two ſons, Telauges and Mneſarchus, who, after his death, took the charge of his ſchool. Whether this philoſopher left behind him any writings has been a ſubject of diſpute. Many works have been enumerated under his name by Laertius, Jamblichus, and Pliny; but it is the declared opinion of Plutarch, Joſephus, Lucian, and others, that there were no genuine works of Pythagoras extant; and it appears highly probable, from the pains which he took to confine his doctrine to his own ſchool during his life, that he never committed his philoſophical ſyſtem to writing, and that the pieces to which his name was affixed at an early period, were written by ſome of his followers, upon the principles imbibed in his ſchool. The famous golden verſes attributed to Pythagoras, and illuſtrated with a commentary by Hierocles, were not written by our philoſopher, but are to be aſcribed to Epicharmus, or Empedocles. They may, however, be conſidered as a brief ſummary of his popular doctrines.

His "Method of inſtruction," formed upon the Egyptian model, was "exoteric," and "eſoteric," that is, public and private. Thoſe auditors, who attended his public lectures, did not properly belong to his ſchool; but followed their uſual mode of living. His ſelect diſciples, called his companions and friends, were ſuch as ſubmitted to a peculiar plan of diſcipline, and were admitted, by a long courſe of inſtruction, into all the myſteries of his *eſoteric* doctrine.

Previouſly to the admiſſion of any perſon into this fraternity, Pythagoras examined his features and external appearance; inquired how he had been accuſtomed to behave towards his parents and friends; marked his manner of laughing, converſing, and keeping ſilence; and obſerved what paſſions he was moſt inclined to indulge; with what kind of company he choſe to aſſociate; how he paſſed his leiſure moments; and what incidents appeared to excite in him the ſtrongeſt emotions of joy or ſorrow. Nor after this examination was any one admitted into his ſociety, till he was fully perſuaded of the docility of his diſpoſition, the gentleneſs of his manners, his power of retaining in ſilence what he was taught, and, in fine, his capacity of becoming a true philoſopher. After the firſt probationary admiſſion, the fortitude and ſelf-command of the candidate were put to the trial by a long courſe of ſevere abſtinence and rigorous exerciſe. The courſe of abſtinence and ſelf-denial comprehended food and drink, and clothing, all which were of the moſt plain and ſimple kind: and the exerciſes preſcribed were ſuch as could not be performed without pain and fatigue. To teach them humility and induſtry, he expoſed them, for three years, to a continued courſe of contradiction, ridicule, and contempt, among their fellows. In order to reſtrain the powerful paſſion of avarice, he required his diſciples to ſubmit to voluntary poverty; he deprived them of all command over their own property, by caſting the poſſeſſions of each individual into a common ſtock, to be diſtributed by proper officers, as occaſion required. After this ſequeſtration of their goods, they lived together on the footing of perfect equality, and ſat down together daily at a common table. If any one afterwards repented of the connection, he was at liberty to depart, and might reclaim, from the general fund, his whole contribution. That his diſciples might acquire a habit of entire docility, Pythagoras enjoined upon them, from their firſt admiſſion, a long term of ſilence, called ἐχεμυθίαν. This initiatory ſilence, which probably conſiſted in refraining from ſpeech, not only during the hours of inſtruction, but through the whole term of initiation, continued from two to five years, according to the propenſity diſcovered by the pupil towards conceit and loquacity. With regard to himſelf, this was a judicious expedient, as it checked impertinent curioſity, and prevented every inconvenience of contradiction. Accordingly his diſciples ſilenced all doubts and refuted all ob-

jections, by appealing to his authority. Αυτος εφα, *ipse dixit*, decided every diſpute. Moreover, during the years of initiation, the diſciples were prohibited from ſeeing their maſter, or hearing his lectures, except from behind a curtain, or receiving inſtruction from ſome inferior preceptor.

To the members of the eſoteric ſchool (who were called γνησιοι ὁμιλεῖαι, genuine diſciples) belonged the peculiar privilege of receiving a full explanation of the whole doctrine of Pythagoras, which was delivered to others in brief precepts and dogmas, under the concealment of ſymbols. Diſciples of this claſs were permitted to take minutes of their maſter's lectures, in writing, as well as to propoſe queſtions, and offer remarks, upon every ſubject of diſcourſe. Theſe were particularly diſtinguiſhed by the appellation of the "Pythagoreans;" they were alſo called "Mathematicians," from the ſtudies upon which they entered immediately after their initiation. After having made a ſufficient progreſs in geometrical ſcience, they proceeded to the ſtudy of nature, the inveſtigation of primary principles, and the knowledge of God. Thoſe who purſued theſe ſublime ſpeculations were called "Theoriſts," and thoſe who devoted themſelves more particularly to theology, were ſtyled σεβαστικοι, religious. Others, according to their abilities and inclinations, were engaged in the ſtudy of morals, economics, and policy; and were afterwards employed in managing the affairs of the fraternity, or ſent into the cities of Greece, to inſtruct them in the principles of government, or aſſiſt them in the inſtitution of laws.

The brethren of the Pythagorean college at Crotona, called κοινοβιον, *coenobium*, about 600 in number, lived together as in one family, with their wives and children; and the whole buſineſs of the ſociety was conducted with the moſt perfect regularity. Every day commenced with deliberation upon the manner in which it ſhould be ſpent; and concluded with a retroſpect of the events that had occurred, and of the buſineſs that had been tranſacted. They roſe before the ſun, that they might pay him homage; after which they repeated ſelect verſes from Homer and other poets, and made uſe of muſic, both vocal and inſtrumental, to enliven their ſpirits and fit them for the buſineſs of the day. They then employed ſeveral hours in the ſtudy of ſcience. Theſe were ſucceeded by an interval of leiſure, which was commonly ſpent in a ſolitary walk for the purpoſe of contemplation. The next portion of the day was allotted to converſation. The hour immediately before dinner was filled up with various kinds of athletic exerciſes. Their dinner conſiſted chiefly of bread, honey, and water; for after they were perfectly initiated, they wholly denied themſelves the uſe of wine. The remainder of the day was devoted to civil and domeſtic affairs, converſation, bathing, and religious ceremonies.

The "exoteric" diſciples of Pythagoras were taught, after the Egyptian manner, by images and ſymbols, obſcure and almoſt unintelligible to thoſe who were not initiated into the myſteries of the ſchool; and thoſe who were admitted to this privilege were under the ſtricteſt obligation of ſilence with regard to the recondite doctrines of their maſter. The wiſdom of Pythagoras, that it might not paſs into the ears of the vulgar, was committed chiefly to memory; and when they found it neceſſary to make uſe of writing, they took care not to ſuffer their minutes to paſs beyond the limits of the ſchool.

Clemens obſerves, that the two orders above deſcribed correſponded very exactly to thoſe among the Hebrews; for in the ſchools of the prophets there were two claſſes, *viz.* the ſons of the prophets, who were the ſcholars; and the doctors or maſters, who were alſo called *perfecti*: and among the Levites, the novices or tyros, who had their quinquennial exerciſes, by way of preparation. Laſtly, even among the proſelytes there were two orders; *exoterici*, or proſelytes of the gate; and *intrinſeci* or *perfecti*, proſelytes of the covenant. He adds, it is highly probable, that Pythagoras himſelf had been a proſelyte of the gate, if not of the covenant.

Gale endeavours to prove, that Pythagoras borrowed his philoſophy from that of the Jews; to this end producing the authorities of many of the fathers, and ancient authors; and even pointing out the tracks and footſteps of Moſes in ſeveral parts of Pythagoras's doctrine.

After the diſſolution of the aſſembly of Pythagoras's diſciples by the faction of Cylo, a man of wealth and diſtinction at Crotona, it was thought neceſſary by Lyſis and Archippus, in order to preſerve the Pythagorean doctrine from oblivion, to reduce it to a ſyſtematic ſummary; at the ſame time, however, ſtrongly enjoining their children to preſerve theſe memoirs ſecret, and to tranſmit them in confidence to their poſterity. From this time books began to multiply among the followers of Pythagoras, till at length, in the time of Plato, Philolaus expoſed the Pythagorean records to ſale, and Archytas of Tarentum gave Plato a copy of his commentaries upon the aphoriſms and precepts of his maſter. Of the imperfect records of the Pythagorean philoſophy left by Lyſis, Archytas, and others, nothing has eſcaped the wreck of time, except perhaps ſundry fragments collected by the diligence of Stobæus, concerning the authenticity of which there are ſome grounds for ſuſpicion; and which, if admitted as genuine, will only exhibit an imperfect view of the moral and political doctrine of Pythagoras under the diſguiſe of ſymbolical and enigmatical language. The ſtrict injunction of ſecrecy, which was given by oath to the initiated Pythagoreans, has effectually prevented any original records of their doctrine concerning Nature and God from paſſing down to poſterity. On this head we are to rely entirely for information, and indeed concerning the whole doctrine of Pythagoras, upon Plato and his followers. Plato himſelf, while he enriched his ſyſtem with ſtores from the magazine of Pythagoras, accommodated the Pythagorean doctrines, as he alſo did thoſe of his maſter Socrates, to his own ſyſtem, and thus gave an imperfect, and, we may ſuppoſe, in many particulars, a falſe repreſentation of the doctrines of the Samian philoſopher. It was farther corrupted by the followers of Plato, even in the old academy, and afterwards in the Alexandrian ſchool. To which we may add, that the doctrine of Pythagoras itſelf, probably in its original ſtate, and certainly in every form under which it has been tranſmitted to us, was obſerved, not only by ſymbolical, but by mathematical language, which is rather adapted to perplex than to illuſtrate metaphyſical conceptions. In this fault Pythagoras was afterwards imitated by Plato, Ariſtotle, and others.

We extract from Brucker the following faint delineation of the Pythagorean philoſophy: The end of philoſophy is to free the mind from thoſe incumbrances, which hinder its progreſs towards perfection, and to raiſe it to the contemplation of immutable truth, and the knowledge of divine and ſpiritual objects. This effect muſt be produced by eaſy ſteps, leſt the mind, hitherto converſant only with ſenſible things, ſhould revolt at the change. The firſt ſtep towards wiſdom is the ſtudy of mathematics, a ſcience which contemplates objects that lie in the middle way between corporeal and incorporeal beings, and as it were on the confines of both, and which moſt advantageouſly inures the mind to

contemplation. The whole courſe of mathematical ſcience may be divided into four parts: two reſpecting numbers, and two reſpecting magnitude. Number may be conſidered either abſtractedly in itſelf, or as applied to ſome object. The former ſcience is arithmetic; of the latter kind is muſic. Magnitude may be conſidered as at reſt, or as in motion; the ſcience which treats of the former is geometry, that which treats of the latter is aſtronomy.

Arithmetic is the nobleſt ſcience; numbers the firſt object of ſtudy, and a perfect acquaintance with numbers the higheſt good. Numbers are either ſcientific or intelligible.

Scientific number is the production of the powers involved in unity, or the progreſſion of multitude from the monad or unity, and its return to the ſame. *Unity* and *one* are to be diſtinguiſhed from each other; the former being an abſtract conception, the latter belonging to things capable of being numbered. Number is not infinite, but is the ſource of that infinite diviſibility into equal parts, which is the property of all bodies.

Intelligible numbers are thoſe which ſubſiſted in the divine mind before all things, from which every thing hath received its form, and which always remain immutably the ſame. It is the model, or archetype, after which the world, in all its parts, is framed. Numbers are the cauſe of eſſence to beings: τῶν ἀριθμῶν αἰτίαν εἶναι τῆς οὐσίας.

The monad, or unity, is that quantity, which, being deprived of all number, remains fixed; whence called monad, from τῷ μένειν. It is the fountain of all number. The duad is imperfect and paſſive, and the cauſe of increaſe and diviſion. The triad, compoſed of the monad and duad, partakes of the nature of both. The tetrad, tetractys, or quaternion number, is the moſt perfect. The decad, which is the ſum of the four former, comprehends all arithmetical and muſical proportions.

According to ſome writers, the monad denotes the active principle in nature, or God; the duad, the paſſive principle, or matter; the triad, the world formed by the union of the two former; and the tetractys, the perfection of nature. Some have underſtood by this myſterious number, the four elements; others, the four faculties of the human mind; others, the four cardinal virtues; and others have been ſo abſurd as to ſuppoſe that Pythagoras made uſe of this number to expreſs the name of God, in reference to the word יהוה, by which that name is expreſſed in the Hebrew language. But every attempt to unfold this myſtery has hitherto been unſucceſsful.

The moſt probable explanation of the Pythagoric doctrine of numbers is, that they were uſed as ſymbolical or emblematical repreſentations of the firſt principles and forms of nature, and particularly of thoſe eternal and immutable eſſences, to which Plato afterwards gave the appellation of ideas. Not being able, or not chuſing, to explain in ſimple language the abſtract notions of principles and forms, Pythagoras ſeems to have made uſe of numbers, as geometricians make uſe of diagrams, to aſſiſt the conceptions of ſcholars. More particularly, conceiving ſome analogy between numbers and the intelligent forms which ſubſiſt in the divine mind, he made the former a ſymbol of the latter. As numbers proceed from unity, or the monad, as a ſimple root, whence they branch out into various combinations, and aſſume new properties in their progreſs, ſo he conceived the different forms of nature to recede, at different diſtances, from their common ſource, the pure and ſimple eſſence of deity, and at every degree of diſtance to aſſume certain properties in ſome meaſure analogous to thoſe of number; and hence he concluded, that the origin of things, their emanation from the firſt being, and their ſubſequent progreſſion through various orders, if not capable of a perfectly clear explanation, might, however, be illuſtrated by ſymbols and reſemblances borrowed from numbers.

Next to numbers, muſic had the chief place in the preparatory exerciſes of the Pythagorean ſchool, by means of which the mind was to be raiſed above the dominion of the paſſions, and inured to contemplation. Pythagoras conſidered muſic, not only as an art to be judged of by the ear, but as a ſcience to be reduced to mathematical principles and proportions. We have introduced, under the article PYTHAGORAS, the manner in which he is ſaid to have diſcovered the muſical chords, but ſhall here ſubjoin a more minute account. As Pythagoras was one day reflecting upon the ſubject, happening to paſs by a ſmith's forge, where ſeveral men were ſucceſſively ſtriking with their hammers a piece of heated iron upon an anvil, he remarked, that all the ſounds produced by their ſtrokes were harmonious except one. The ſounds, which he obſerved to be chords, were the octave, the fifth, and the third; but that ſound which he perceived to lie between the third and the fifth he found to be diſcordant. Going into the work-ſhop, he obſerved, that the diverſity of ſounds aroſe, not from the form of the hammers, nor from the force with which they were ſtruck, nor from the poſition of the iron, but merely from the difference of weight in the hammers. Taking, therefore, the exact weight of the ſeveral hammers, he went home, and ſuſpended four ſtrings of the ſame ſubſtance, length, and thickneſs, and twiſted in the ſame degree, and hung a weight at the lower end of each, reſpectively equal to the weight of the hammers: upon ſtriking the ſtrings, he found, that the muſical chords of the ſtrings correſponded with thoſe of the hammers. Hence it is ſaid, that he proceeded to form a muſical ſcale, and to conſtruct ſtringed inſtruments. His ſcale was, after his death, engraved in braſs, and preſerved in the temple of Juno at Samos.

Pythagoras conceived that the celeſtial ſpheres in which the planets move, ſtriking upon the æther through which they paſs, muſt produce a ſound; and that this ſound muſt vary, according to the diverſity of their magnitude, velocity, and relative diſtance. Taking it for granted, that every thing reſpecting the heavenly bodies is adjuſted with perfect regularity, he further imagined, that all the circumſtances neceſſary to render the ſounds produced by their motion harmonious, were fixed in ſuch exact proportions, that the moſt perfect harmony is produced by their revolutions. This fanciful doctrine reſpecting the muſic of the ſpheres gave riſe to the names which Pythagoras applied to muſical tones. The laſt note in the muſical octave he called *hypate*, becauſe he ſuppoſed the ſphere of Saturn, the higheſt planet, to give the deepeſt tone; and the higheſt note he called *neate*, from the ſphere of the moon, which being the loweſt, or neareſt the earth, he imagined, produced the ſhrilleſt ſound. In like manner of the reſt. It was ſaid of Pythagoras by his followers, who heſitated at no aſſertion, however improbable, which might ſeem to exalt their maſter's fame, that he was the only mortal ſo far favoured by the gods as to be permitted to hear the celeſtial muſic of the ſpheres. Pythagoras applied muſic to the cure of diſeaſes both bodily and mental. It was, as we have ſeen, the cuſtom of his ſchool, to compoſe their minds for reſt in the evening, and to prepare themſelves for action in the morning, by ſuitable airs, which they performed upon the lute, or other ſtringed inſtruments. The muſic was, however, always accompanied with verſe, ſo that it may be doubted, whether the effect was to be aſcribed more to the muſician

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or to the poet. It is ſaid of Clinius, a Pythagorean, that whenever he perceived himſelf inclined to anger, ſpleen, or other reſtleſs paſſions, he took up his lute, and that it never failed to reſtore the tranquillity of his mind. Of Pythagoras himſelf it is related, that he checked a young man, who, in the midſt of his revels, was meditating ſome act of Bacchanalian madneſs, by ordering the muſician, who had inflamed his paſſions by Phrygian airs, to change the muſic on a ſudden into the ſlow and ſolemn Doric mood. If the ſtories which are related by the ancients concerning the wonderful effects of their muſic are to be credited, we muſt acknowledge we are ſtrangers to the method by which theſe effects were produced.

Beſides arithmetic and muſic, Pythagoras cultivated geometry, which he had learned in Egypt; but he greatly improved it, by inveſtigating many new theorems, and by digeſting its principles, in an order more perfectly ſyſtematical than had before been done. Several Grecians, about the time of Pythagoras, applied themſelves to mathematical learning, particularly Thales in Ionia. But Pythagoras ſeems to have done more than any other philoſopher of this period towards reducing geometry to a regular ſcience. His definition of a point is, a monad or unity with poſition. He taught that a geometrical point correſponds to unity in arithmetic, a line to two, a ſuperficies to three, a ſolid to four. Of the geometrical theorems aſcribed to Pythagoras, the following are the principal: that the interior angles of every triangle are together equal to two right angles; that the only polygons which will fill up the whole ſpace about a given point, are the equilateral triangle, the ſquare, and the hexagon; the firſt to be taken ſix times, the ſecond four times, and the third three times; and that, in rectangular triangles, the ſquare of the ſide which ſubtends the right angle is equal to the two ſquares of the ſides which contain the right angle. Upon the invention of this latter propoſition (Euclid, l. i. prop. 47.), Plutarch ſays, that Pythagoras offered an ox, others, an hecatomb, to the gods. But this ſtory is thought by Cicero inconſiſtent with the inſtitutions of Pythagoras, which, as he ſuppoſes, did not admit of animal ſacrifices. Pythagoras inferred the ſtature of Hercules from the length of the Olympic courſe, which meaſured ſix hundred of his feet. Obſerving how much ſhorter a courſe ſix hundred times the length of the foot of an ordinary-ſized man was than the Olympic courſe, he inferred, by the law of proportion, the length of Hercules's foot; whence the uſual proportion of the length of the foot to the height of a man enabled him to determine the problem. Pythagoras alſo applied geometrical ideas as ſymbolical expreſſions of bodies, and of natural principles; but nothing certain, or intelligible, is preſerved on this head.

On aſtronomy, the doctrine of Pythagoras, or, however, of the ancient Pythagoreans, was as follows:

The term heaven either denotes the ſphere of the fixed ſtars, or the whole ſpace between the fixed ſtars and the moon, or the whole world, including both the celeſtial ſpheres and the earth. There are ten celeſtial ſpheres, nine of which are viſible to us; namely, that of the fixed ſtars, thoſe of the ſeven planets, and that of the earth; the tenth is the antichthon, or an inviſible ſphere oppoſite to the earth, which is neceſſary to complete the harmony of nature, as the decad is the completion of numerical harmony. And this antichthon may be the cauſe of the greater number of the eclipſes of the ſun than of the moon. Fire holds the middle place in the univerſe; or, in the midſt of the four elements is placed the fiery globe of unity; the earth is not without motion, nor ſituated in the centre of the ſpheres, but is one of thoſe planets which make their revolution about the ſphere of fire. The revolution of Saturn is completed in thirty years, that of Jupiter in twenty, that of Mars in two, that of the Sun, and of Mercury and Venus, in one year. The diſtance of the ſeveral celeſtial ſpheres from the earth correſpond to the proportion of notes in the muſical ſcale. The moon and other planetary globes are habitable. The earth is a globe, which admits of antipodes.

From ſeveral of theſe particulars reſpecting the aſtronomical doctrine of Pythagoras, it has been inferred, that he was poſſeſſed of the true idea of the ſolar ſyſtem, which was revived by Copernicus, and has ſince been fully eſtabliſhed by Newton.

From this preparatory ſtudy the diſciples of the Pythagorean ſchool were conducted to the knowledge of natural, theological, and moral ſcience. Concerning wiſdom, in general, Pythagoras taught, that it is the ſcience which is converſant with thoſe objects, which are in their nature immutable, eternal, and incorruptible, and therefore alone can properly be ſaid to exiſt. The man who applies himſelf to this kind of ſtudy is a philoſopher. The end of philoſophy is, that the human mind may, by ſuch contemplation, be aſſimilated to the divine, and at length be qualified to join the aſſembly of the gods. In the purſuit of wiſdom, the utmoſt care muſt be taken to raiſe the mind above the dominion of the paſſions, and the influence of ſenſible objects, and to diſengage it from all corporeal impreſſions, that it may be inured to converſe with itſelf, and to contemplate things ſpiritual and divine. For this purpoſe the aſſiſtance of God, and of good dæmons, muſt be invoked by prayer. Philoſophy, as it is converſant with ſpeculative truth, or with the rules of human conduct, is either theoretical or practical. Practical philoſophy is only to be ſtudied ſo far as may be neceſſary for the purpoſes of life; theoretical philoſophy is the perfection of wiſdom. Contemplative wiſdom cannot be completely attained, without a total abſtraction from the ordinary affairs of life, and a perfect tranquillity and freedom of mind. Hence the neceſſity of inſtituting a ſociety, ſeparated from the world, for the purpoſe of contemplation and ſtudy.

Active or moral philoſophy, which preſcribes rules and precepts for the conduct of life, according to Ariſtotle, was firſt taught by Pythagoras, and after his death by Socrates. Among the moral maxims and precepts aſcribed to Pythagoras are the following:

Virtue is divided into two branches, private and public. Private virtue reſpects education, ſilence, abſtinence from animal food, fortitude, ſobriety, and prudence. The powers of the mind are reaſon and paſſion; and when the latter is preſerved in ſubjection to the former, virtue is prevalent. Young perſons ſhould be inured to ſubjection, that they may always find it eaſy to ſubmit to the authority of reaſon. Let them be conducted into the beſt courſe of life, and habit will ſoon render it the moſt pleaſant. Silence is better than idle words. A wiſe man will prepare himſelf for every thing which is not in his own power. Do what you judge to be right, whatever the vulgar may think of you; if you deſpiſe their praiſe, deſpiſe alſo their cenſure. It is inconſiſtent with fortitude to relinquiſh the ſtation appointed by the Supreme Lord, before we obtain his permiſſion. Sobriety is the ſtrength of the ſoul, for it preſerves its reaſon unclouded by paſſion. No man ought to be eſteemed free, who has not the perfect command of himſelf. Drunkenneſs is a temporary phrenſy. That which is good and becoming is rather to be purſued, than that which is pleaſant. The deſire of ſuperfluity is fooliſh, becauſe it knows

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no limits. All animal pleaſures ſhould rather be poſtponed, than enjoyed before their time; and ſhould only be enjoyed according to nature, and with ſobriety. Much forethought and diſcretion is neceſſary in the production and education of children. Wiſdom and virtue are our beſt defence; every other guard is weak and unſtable. It requires much wiſdom to give right names to things.

Concerning public virtue, the doctrine of Pythagoras, as it is tranſmitted to the preſent time, reſpects converſation, friendſhip, religious worſhip, reverence to the dead, and legiſlation. Upon theſe heads he is ſaid to have taught thus:

Converſation ſhould be adapted to the characters and condition of the perſons with whom we converſe: that diſcourſe and behaviour, which might be proper among young perſons, may be exceedingly improper between the young and aged. Propriety and ſeaſonableneſs are the firſt things to be regarded in converſation. In all ſociety, a due regard muſt be had to ſubordination. Reſpect is due to a worthy ſtranger, ſometimes in preference even to countrymen or relations. It is better that thoſe who converſe with you ſhould reſpect you, than that they ſhould fear you; for reſpect produces admiration, but fear produces hatred. It is an evident proof of a good education, to be able to endure the want of it in others. Between friends, the utmoſt care ſhould be taken to avoid contention, which can only be done by ſhunning as much as poſſible all occaſions of ſtrife, ſuppreſſing reſentment, and exerciſing mutual forbearance. Reproof and correction are uſeful and becoming from the elder to the younger; eſpecially when they are accompanied, on the part of the reprover, with evident tokens of affection.

Mutual confidence is never for a moment to be interrupted between friends, whether in jeſt or earneſt; for nothing can heal the wounds which are made by deceit. A friend muſt never be forſaken in adverſity, nor for any infirmity in human nature, excepting only invincible obſtinacy and depravity. Before we abandon a friend, we ſhould endeavour, by actions as well as words, to reclaim him. True friendſhip is a kind of union which is immortal.

The deſign and object of all moral precepts is to lead men to the imitation of God. Since the Deity directs all things, every good thing is to be ſought for from him alone; and nothing is to be done which is contrary to his pleaſure. Whilſt we are performing divine rites, piety ſhould dwell in the mind. The gods are to be worſhipped not under ſuch images as repreſent the forms of men, but by ſuch ſymbols as are ſuitable to their nature, by ſimple luſtrations and offerings, and with purity of heart. Gods and heroes are to be worſhipped with different degrees of homage, according to their nature. Oaths are in no caſe to be violated.

The bodies of the dead are not to be burned. Next to gods and dæmons, the higheſt reverence is due to parents and legiſlators; and the laws and cuſtoms of our country are to be religiouſly obſerved.—Thus much concerning the active or moral philoſophy of Pythagoras.

Theoretical philoſophy, which treats of nature and its origin, was the higheſt object of ſtudy of the Pythagorean ſchool, and included all thoſe profound myſteries, which thoſe, who have been ambitious to report what Pythagoras ſaid behind the curtain, have endeavoured to unfold. Upon this ſubject, nothing can be advanced with certainty, eſpecially reſpecting theology, the doctrine of which, Pythagoras, after the manner of the Egyptian prieſts, was peculiarly careful to hide under the veil of ſymbols, probably through fear of diſturbing the popular ſuperſtitions. The ancients have not, however, left us without ſome grounds of conjecture.

With reſpect to God, Pythagoras appears to have taught, that he is the Univerſal Mind, diffuſed through all things, the ſource of all animal life, the proper and intrinſic cauſe of all motion, in ſubſtance ſimilar to light, in nature like truth, the firſt principle of the univerſe, incapable of pain, inviſible, incorruptible, and only to be comprehended by the mind.

Cicero (Nat. Deor. l. 1. c. 12.) aſſerts, that Pythagoras conceived God to be a ſoul pervading all nature, of which every human ſoul is a portion: and this doctrine was perfectly conſonant to the opinions received in the countries which Pythagoras viſited, and where he learned theology. Juſtin Martyr (Orat. ad Gentes) expreſsly ranks Pythagoras among the theiſtical philoſophers. "If any one," ſays he, "wiſhes to be informed more accurately concerning the doctrine of Pythagoras with reſpect to one God, let him hear his opinion, for he ſays, God is one: he is not, as ſome conjecture, exterior to the world, but, in himſelf entire, pervades the univerſal ſphere, ſuperintends all productions, is the ſupport of all nature, eternal, the ſource of all power, the firſt ſimple principle of all things, the origin of celeſtial light, the father of all, the mind and animating principle of the univerſe, the firſt mover of all the ſpheres." From a variety of paſſages that might be cited, we may reaſonably infer, that Pythagoras conceived the Deity to be the informing ſoul of the world, animating it in a manner ſimilar to that in which the human ſoul animates the body.

Subordinate to the Deity, it was taught in the Italic ſchool, that there are three orders of intelligence, gods, dæmons, heroes, who are diſtinguiſhed by their reſpective degrees of excellence and dignity, and by the nature of the homage which is due to them; gods being to be preferred in honour to demi-gods or dæmons, and dæmons to heroes or men. Theſe three orders, in the Pythagorean ſyſtem, were emanations, at different degrees of proximity, from the ſupreme intelligence, the particles of ſubtle ether aſſuming a groſſer clothing the farther they receded from the fountain. The third order, or heroes, were ſuppoſed to be inveſted with a ſubtle material clothing. Hierocles defines a hero to be a rational mind united with a luminous body. If to theſe three ſpecies we add a fourth, the human mind, we have the whole ſcale of divine emanation, as it was conceived by this ſect of philoſophers. All theſe they imagined to proceed from God, as the firſt ſource of intelligence, and to have received from him a pure, ſimple, immutable nature. God, being himſelf one, and the origin of all diverſity, they repreſented him under the notion of monad, and ſubordinate intelligences, as numbers derived and included in unity. Thus the numbers or derived intelligences of Pythagoras agree with the ideas of Plato, except, perhaps, that the latter were of a nature perfectly ſpiritual, but the former were clothed with a ſubtle etherial body.

The region of the air was ſuppoſed by the Pythagoreans to be full of ſpirits, dæmons, or heroes, who cauſe ſickneſs or health to man or beaſt, and communicate, at their pleaſure, by means of dreams, and other inſtruments of divination, the knowledge of future events. That Pythagoras himſelf held this opinion cannot be doubted, if it be true, as his biographers relate, that he profeſſed to cure diſeaſes by incantations. It is probable that he derived it from the Egyptians, among whom it was believed that many diſeaſes were cauſed by demoniacal poſſeſſions.

The material world, according to Pythagoras, was produced by the energy of the divine intelligence. It is an animated ſphere, beyond which is a perfect vacuum. It

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contains ſpheres, which revolve with muſical harmony. The atmoſphere of the earth is a groſs, immutable, and morbid maſs; but the air, or ether, which ſurrounds it is pure, healthful, ſerene, perpetually moving, the region of all divine and immortal natures. The ſun, moon, and ſtars, are inhabited by portions of the divinity, or gods. The ſun is a ſpherical body. Its eclipſes are cauſed by the paſſing of the moon between it and the earth; thoſe of the moon by the intervention of the *antichthon*, before explained. The moon is inhabited by dæmons. Comets are ſtars, which are not always ſeen, but riſe at ſtated periods.

Concerning man, the Pythagoreans taught, that, conſiſting of an elementary nature, and a divine or rational principle, he is a microcoſm, or compendium of the univerſe; that his ſoul is a ſelf-moving principle, compoſed of two parts, the rational, which is a portion of the ſoul of the world, ſeated in the brain, and the irrational, which includes the paſſions, and is ſeated in the heart; that man participates in both theſe with the brutes, which, from the temperament of their body, and their want of the power of ſpeech, are incapable of acting rationally; that the ſenſitive ſoul, θυμος, periſhes, but the rational mind, ζην, is immortal, becauſe the ſource whence it is derived is immortal; that after the rational mind is freed from the chains of the body, it aſſumes an ethereal vehicle, and paſſes into the regions of the dead, where it remains till it is ſent back to this world, to be the inhabitant of ſome other body, brutal or human; and that after ſuffering ſucceſſive purgations, when it is ſufficiently purified, it is received among the gods, and returns to the eternal ſource from which it firſt proceeded.

The doctrine of the Pythagoreans, reſpecting the nature of brute animals, and μετεμψυχωσις, *the tranſmigration of ſouls*, were the foundation of their abſtinence from animal food, and of the excluſion of animal ſacrifices from their religious ceremonies. The latter doctrine is thus beautifully repreſented by Ovid, who introduces Pythagoras as ſaying:

" Morte carent animæ: ſemperque priore relicta
Sede, novis domibus habitant, vivuntque receptæ.
Omnia mutantur; nihil interit; errat et illinc,
Huc venit, hinc illuc, et quoſlibet occupet artus
Spiritus, eque feris humana in corpora tranſit,
Inque feras noſter: nec tempore deperit ullo,
Utque novis fragilis ſignatur cera figuris,
Nec manet ut fuerat, nec formas ſervat eaſdem,
Sed tamen ipſa eadem eſt, animam ſic ſemper eandem,
Eſſe, ſed in varias doceo migrare figuras."

" What then is death, but ancient matter dreſt
In ſome new figure, and a varied veſt:
Thus all things are but alter'd, nothing dies;
And here and there th' unbodied ſpirit flies,
By time, or force, or ſickneſs diſpoſſeſs'd,
And lodges where it lights, in man or beaſt;
Or hunts without, till ready limbs it find,
And actuates thoſe according to their kind;
From tenement to tenement is toſt,
The ſoul is ſtill the ſame, the figure only loſt:
And as the ſoften'd wax new ſeals receives,
This face aſſumes, and that impreſſion leaves;
Now call'd by one, now by another name,
The form is only chang'd, the wax is ſtill the ſame;
So death, thus call'd, can but the form deface,
Th' immortal ſoul flies out in empty ſpace,
To ſeek her fortune in ſome other place."

DRYDEN.

This doctrine Pythagoras probably learned in Egypt, where it was commonly taught. Nor is there any ſufficient reaſon for underſtanding it, as ſome have done, ſymbolically.

Among the ſymbols of Pythagoras, recited by Jamblichus and others, are the following: Adore the ſound of the whiſpering wind. Stir not the fire with a ſword. Turn aſide from an edged tool. Paſs not over a balance. Setting out on a journey, turn not back, for the furies will return with you. Breed nothing that hath crooked talons. Receive not a ſwallow into your houſe. Look not in a mirror by the light of a candle. At a ſacrifice, pare not your nails. Eat not the heart, or brain. Taſte not that which hath fallen from the table. Break not bread. Sleep not at noon. When it thunders, touch the earth. Pluck not a crown. Roaſt not that which has been boiled. Sail not on the ground. Plant not a palm. Breed a cock, but do not ſacrifice it, for it is ſacred to the ſun and moon. Plant mallows in thy garden, but eat them not. Abſtain from beans.

The precept prohibiting the uſe of beans, is one of the myſteries which the ancient Pythagoreans never diſcloſed, and which modern ingenuity has in vain attempted to diſcover. Its meaning was probably rather dietetic, than phyſical, or moral. But enough of theſe enigmatical trifles. Pythagorean precepts of more value are ſuch as theſe: Diſcourſe not of Pythagorean doctrines without light. Above all things govern your tongue. Engrave not the image of God in a ring. Quit not your ſtation without the command of your general. Remember that the paths of virtue and of vice reſemble the letter Y. To this ſymbol Perſius refers, when he ſays,

" Et tibi quæ Samios diduxit litera ramos,
Surgentem dextro monſtravit limite collem."

" There has the Samian Y's inſtructive make
Pointed the road thy doubtful foot ſhould take;
There warn'd thy raw and yet unpractis'd youth,
To tread the riſing right-hand path of truth."

Brucker's Hiſt. Philoſ. by Enfield, vol. i. b. 2. c. 12.

After the death of Pythagoras, the care and education of his children, and the charge of his ſchool, devolved upon Ariſtæus of Crotonia, who, having taught the doctrine of Pythagoras 39 years, was ſucceeded by Mneſarchus, the ſon of Pythagoras. Pythagorean ſchools were afterwards conducted in Heraclia by Clinias and Philolaus; at Metapontum by Theorides and Eurytus; and at Tarentum by Archytas, who is ſaid to have been the eighth in ſucceſſion from Pythagoras. The firſt perſon who divulged the Pythagorean doctrine was Philolaus; ſee his article.

PYTHAGORIC ABACUS. See ABACUS and TABLE.

PYTHAGORIC *Sect*, or *Italic School*. See PYTHAGOREANS.

PYTHAGORIC *Tetractys*. See TETRACTYS.

PYTHAGORIC *Theorem*, or *Propoſition*, is the 47th of the firſt book of Euclid. See TRIANGLE and HYPOTHENUSE.

PYTHEAS, in *Biography*, an ancient mathematician, aſtronomer, and geographer, was a native of the Greek colony of Marſeilles, in Gaul, and flouriſhed in the time of Ariſtotle and Alexander the Great. He contributed to the improvement of ſcience by accounts which he wrote of his travels and voyages, and other works. To him is attributed a book, entitled γης περιοδος, or the circuit of the earth; and in the abridgement of Artemidorus the Epheſian, he is placed in the number of thoſe who have written a

" Periplus

"Periplus of the World;" and he is ſuppoſed to have written a treatiſe "De Oceano:" none of theſe pieces have reached modern times, though ſome of them were extant in the fourth century. From fragments collected out of Strabo, it appears that Pytheas introduced into them, as the teſtimony of others, a number of marvellous and incredible circumſtances, which drew on him the cenſure of that author and Polybius. The laſt named author maintained it to be utterly impoſſible for a private perſon, who was even in want, to have travelled ſo far as he pretended to have done by ſea and land. He, however, probably viſited all the countries of Europe that are ſituated upon the ocean, diſcovered the iſland of Thule, or Iceland, and penetrated a conſiderable diſtance into the Baltic. This fact has been proved by Gaſſendi, who ſhews, that Pytheas was well acquainted with the northern countries, and accurately marked the diſtinction of climates, by the difference which he obſerved in the length of the days and nights in different latitudes. He alſo attempts to prove that Eratoſthenes and Hipparchus improved their geographical works by availing themſelves of the labours of Pytheas, without due acknowledgments of their obligations. There is no doubt that Pytheas was a ſkilful obſerver of the heavens, for he taught that there is no ſtar in the preciſe ſituation of the pole, and he rendered himſelf famous among aſtronomers, by being the firſt calculator of the meridian altitude of the ſun at the ſummer ſolſtice at Marſeilles. This fact he aſcertained by erecting a gnomon of a given height, and finding the proportion between that height and the length of the meridian ſhadow. The reſult was found to correſpond exactly with that of an obſervation made by Gaſſendi, at the ſame place, in the year 1636. To obviate ſuch objections as that advanced by Polybius againſt the reality of Pytheas' voyages, it has been ſaid, that he probably was furniſhed with the means of proſecuting them at the public expence. For as the republic of Marſeilles was then powerful at ſea, largely engaged in commercial purſuits, and ſent Euthymenes to make ſuch diſcoveries in the ſouthern parts of the world, as might lead to the extenſion of its trade, it ſeems very probable, that Pytheas was diſpatched on the public account into the northern regions for the ſame purpoſes.

PYTHEUM, in *Ancient Geography*, a town of Macedonia, in the country of the Pelaſgioites. Ptolemy places it between Azorium and Gonnus.

PYTHIA, or PYTHIAN, in *Antiquity*, the prieſteſs of Apollo, by whom he delivered oracles. See DELPHOS.

She was thus called from the god himſelf, who was entitled *Apollo Pythius*, from his ſlaying the ſerpent Python; or, as others will have it, απο τε πυθεσθαι, becauſe Apollo, the ſun, is the cauſe of rottenneſs; or becauſe the carcaſe of Python was left there to putrefy; or, according to others, from πυνθανομαι, *I enquire*, becauſe people went to hear and conſult his oracles.

This prieſteſs was to be a pure virgin. She ſat on the covercle, or lid, of a brazen veſſel, mounted on a tripod; before ſhe aſcended which, after faſting three days, ſhe uſed to waſh her whole body, and eſpecially her hair, in Caſtalio, a fountain at the foot of Parnaſſus, where the poets, men inſpired by the ſame deity, uſed to waſh, and drink; and thence, after ſhaking the laurel-tree that grew by it, and ſometimes eating the leaves, which were ſuppoſed to conduce to inſpiration, and were ſucceeded by a violent enthuſiaſm, ſhe delivered her oracles, or rather explained thoſe of the god; *i. e.* ſhe rehearſed a few ambiguous and obſcure verſes, which were taken for oracles. The oracle being pronounced, ſhe was taken down from the tripod and conducted back to her cell, where ſhe continued for ſeveral days, to recover herſelf from the violent agitation and conflict. Lucan informs us, that ſpeedy death was frequently the conſequence of her enthuſiaſm. See ORACLE.

Diodorus Siculus (lib. xvi.) informs us, that theſe prieſteſſes were at firſt virgins, but that after one of them was deflowered by Echecrates, a Theſſalian, choice was made of women above fifty years of age; that ſo they might either be ſecured from the attempts of luſt, or if they ſhould at any time be forced to the violation of their chaſtity, having paſſed the time of child-bearing, they might remain undiſcovered, and not bring the oracles or religion into contempt; nevertheleſs they wore the habit of virgins, thereby to ſignify their purity and virginal modeſty.

All the Pythiæ did not ſeem to have had the ſame talent at poetry, or to have memory enough to retain their leſſon.

Plutarch and Strabo make mention of poets, who were kept in pay, as interpreters of Jupiter, &c.

PYTHIA, or PYTHIAN *Games*, were ſolemn games inſtituted in honour of Apollo, and in memory of his killing the ſerpent Python with his arrows.

The Pythia were celebrated in Macedonia, in a place called *Pythium*. They were next in fame after the Olympic games, but were more ancient than they; for it is pretended they were inſtituted immediately after the defeat of the ſerpent. The Pythia were alſo celebrated at Delphi; and they were theſe that were the moſt renowned. Their firſt founder, and the preciſe time of their inſtitution, are not known.

The Pythian games, according to Pauſanias, were firſt inſtituted by Jaſon or Diomedes, king of Etolia, and reſtored by Eurylochus of Theſſaly, in the third year of the 48th olympiad, or the year of the world 3364, and 584 years before the birth of Chriſt; from which time the Greeks reckoned ſometimes by Pythiades, as they had been accuſtomed to do by Olympiads. They were at firſt celebrated every eight years, but afterwards every four years, in the third year of each olympiad; ſo that the pythiade, which was a term of four years, ſerved as an epocha for the inhabitants of Delphi. At firſt they conſiſted of poetical and muſical conteſts, but in proceſs of time they conſiſted of the other exerciſes of the pancratium, which were performed in the Olympic games. The victors were crowned with branches of laurel; though, at the firſt inſtitution, the crown was of beech-leaves. The Romans are ſaid to have adopted theſe games in the year U.C. 642, and to have given them the name of Apollinares ludi.

A part of Pindar's poems was compoſed in praiſe of the victors in the Pythian games. See GAMES.

The critics are divided on the ſubject of the ſerpent Python. The poets ſay, that Juno made uſe of it to perſecute Latona, and prevent her bringing into the world Apollo and Diana, whom ſhe had conceived of Jupiter; and that it was for this reaſon that Apollo afterwards killed it.

Strabo ſays, it was no other than a famous villain, one Draco, that Apollo freed the world from. Dickinſon, in his "Delphi Phœnicizantes," maintains the Python of the Greeks to be the Typhon of the Phœnicians; and the Typhon of the Phœnicians to be the Og of Scripture; and Apollo, who ſlew it, he will have to be Joſhua. See TYPHON.

PYTHON, in *Ancient Geography*, a name anciently given to the city of Delphi.

PYTHOPOLIS, a town of Aſia Minor, in Bithynia, on the river Soloonte, according to Plutarch, founded by Theſeus.

Theſeus.—Alſo, a town of Aſia Minor, in Caria; afterwards called Niſſa.—Alſo, a town of Aſiatic Myſia.

PYULCON, from πυον, *pus*, and ἑλκω, *to draw*, an old ſurgical inſtrument anciently employed for drawing the matter out of ſinuſes.

PYURIA, in *Medicine*, from πυον, *pus*, and ουρον, *urine*, a term uſed by Sauvages and others to denote all purulent and mucous diſcharges from the bladder. See CATARRHUS *Veſicæ*.

PYXIDANTHERA, in *Botany*, from πυξις, *a box*, and ανθηρα, *an anther*, becauſe, according to Michaux, each cell of the anthers opens by a ſort of lid; ſee DIAPENSIA, to which genus the plant in queſtion is referred by Mr. Purſh, in his *Fl. Amer. Sept.* v. 1. 148, under the name of *D. cuneifolia*, after Mr. Saliſbury.

PYXIS NAUTICA, in *Navigation*, the ſeaman's compaſs.

The word πυξις literally ſignifies *a box*.

PYXIS, among *Anatomiſts*, is alſo uſed for the cavity of the hip-bone. See ACETABULUM.

PYXIS, a ſmall metal caſe for containing the conſecrated ſpecies in the Catholic church. Anciently it was made in the form of a dove and ſuſpended over the altar.

PYXUS, in *Ancient Geography*, a ſmall river of Italy, in Lucania; which took its riſe northward towards Sontia, and running ſouthward diſcharged itſelf into a gulf of the ſame name, E. of Pyxus, or Pyxuntum.

PYXUS, or PYXUNTUM, *Poli-Caſtro*, a town of Italy, belonging to Lucania, ſituated at the bottom of a ſmall gulf, E. of a ſmall river of the ſame name. It was founded by Mirathus, prince of Zanele and Rhegium, in the year 471 B.C. It became a Roman colony in the year 194 before the ſame era.

PYXUS *Promontorium*, a ſmall cape of Italy, E. of a peninſula of Laconia, which had on the W. the promontory Palinurum. This promontory is found at the entrance of a ſmall gulf of the ſame name.

PZINENIN, in *Geography*, a town of Bohemia, in the circle of Boleſlau; 12 miles E. of Jung-Buntzel.

Q.

Q, A conſonant, borrowed from the Latin or French, for which the Saxons generally uſed cp, *cw*; and the ſixteenth letter of the alphabet.

The name of this letter is *cue*, from *queue*, Fr. *tail*; its form being that of an O with a tail.

The Q has this peculiar to it, that it is always followed by an U, and is therefore reckoned among the mutes.

The Q is formed from the Hebrew, ק, *koph*; which moſt other languages have borrowed; though ſome of them have rejected it again, particularly the Greeks, who now only retain it as a numeral character, called κοππα επισημον.

In effect, there is that reſemblance between the Q and the C, in ſome languages, and the K in others, that many grammarians, in imitation of the Greeks, baniſh the Q as a ſuperfluous letter. Papias even affirms, that all the Latin words now wrote with a Q, were written among the ancient Romans with a C; but we want better authorities for this. For, though that may hold in many caſes, inſomuch that ſome write indifferently *quur*, or *cur*; *cum*, or *quum*; *quotidie*, or *cotidie*, &c. yet it does not thence follow, that they ever wrote *cis*, *cæ*, *cid*, for *quis*, *quæ*, *quid*. What inſcriptions authorize ſuch a reading?

Far from this, the ancients ſometimes ſubſtituted Q for C; and wrote *quojus*, *quoi*; for *cujus*, *cui*, &c.

Varro, however, and ſome other grammarians, as we are told by Cenſorinus, &c. would never uſe the Q. The truth is, its uſe or diſuſe ſeems to have been ſo little ſettled, and agreed on, that the poets uſed the Q or C indifferently, as beſt ſuited their meaſures; it being a rule, that the Q joined the two following vowels into one ſyllable; and that the C imported them to be divided.

Hence it is, that Lucretius uſes *cuiret* for three ſyllables, in lieu of *quiret*; *acua*, for *aqua*; and that Plautus uſes *relicuum*, for *reliquum*; as in *quod dedi, datum non vellem relicuum non*; where the *cuum* muſt be two ſyllables, otherwiſe the trochiac verſe will be lame of a foot.

In the French, the ſound of the Q and K are ſo near akin, that ſome of their niceſt authors think the former might be ſpared. Ramus adds, that, till the eſtabliſhment of royal profeſſors in the univerſity of Paris, under Francis I. they always uſed Q in the Latin the ſame as in the French; pronouncing *kis*, *kalis*, *kantus*, &c. for *quis*, *qualis*, *quantus*. See K.

Some very learned men make Q a double letter, as well as K and X. According to them, Q is evidently a C and U joined together. It is not enough that the ſound is the ſame, but they ſee the traces of the C U in the figure of the Q; the V being only laid obliquely, ſo as to come within the cavity of the C; as C ⊲.

To confirm this, they ſay the ancients wrote *qi*, *qæ*, *qid*. Though Joſ. Scaliger, Littleton, &c. think this is no proof of the point; for in Gruter's inſcriptions we find not only the Q, but alſo the C, put for Q U; as *Cintus*, *Quintus*; *ficis* for *ſiquis*, &c. Yet nobody ever imagined the C a double letter.

Q, among the *Ancients*, was a numeral letter, ſignifying 500; as in the verſe,

"Q velut A cum D quingentos vult numerare."

A daſh over it, as $\overline{Q}$, denoted it to ſignify five hundred thouſand.

Q is alſo uſed as an abbreviature in ſeveral arts. *Q. pl.* in phyſicians' bills, ſtands for *quantum placet*, or *quantum vis*, as much as you pleaſe of a thing; *q. ſ.* for *quantum ſufficit*, or as much as is neceſſary.

Q, in the proper names of the Romans, ſignifies Quintus, or Quintius. Upon the French coins this letter denotes that they were ſtruck at Perpignan.

Q ſeems the initial of no word in *Muſic*, except in old madrigals, where it frequently is placed at the top of the page for *quinta pars*, the fifth part, in a polyphonic compoſition.

Q. D. is frequently uſed, among *Grammarians*, &c. for *quaſi dictum*, as if it were ſaid, &c. or as who ſhould ſay.

Q. E. D. among *Mathematicians*, ſignifies *quod erat demonſtrandum*, which was to be demonſtrated.

Q. E. F. *quod erat faciendum*, which was to be done.

QUAB, in *Ichthyology*, the name of a Ruſſian fiſh, which ſome report to be at firſt a tadpole, then a frog, and at laſt a fiſh. Dr. Mounſey, who made many enquiries concerning theſe pretended changes, apprehends that they are all fabulous. He had an opportunity of ſeeing the fiſh itſelf, and found that they ſpawned like other fiſhes, and grew in ſize, without any appearances to juſtify the report. He adds, that they delight in very clear water, in rivers with ſandy or ſtony bottoms, and are never found in ſtanding lakes, or in rivers paſſing through marſhy or moſſy grounds, where frogs chooſe moſt to be. Phil. Tranſ. vol. xlv. p. 175.

QUABES, in *Geography*, a people of Africa, in the interior country between Rio Seſtos and Sierra Leona, inhabiting the ſouthern banks of the river Seſtos. They had been formerly conquered by Flanſire, king of Folgia; but having thrown off their ſubjection, they have ſince remained a free people, though under the protection of the emperor of Monou, or Manou; which empire is called by Engliſh geographers, and alſo by M. d'Anville, Mendi Manow.

QUACHA, or QUAGGA, in *Zoology*. See EQUUS.

QUACHILTO, in *Ornithology*, the name of a very beautiful Braſilian bird, of the moor-hen kind, called alſo *yacacintli*, and *porphyrio Americanus*. It is the FULICA *Purpurea*, (which ſee); and is of a fine blackiſh purple colour, variegated with white; its beak is white while young, but becomes red as it grows older, and has a naked ſpace at its baſis, reſembling, in ſome ſort, the coot; its legs are of a yellowiſh-green; it lives about the waters and feeds on fiſh, yet is a very well-taſted bird. It imitates the crowing of a common cock, and makes its muſic early in the morning. Marggrave's Hiſt. Braſil.

QUACHY, in *Zoology*, a name given to the *Coati*, or VIVERRA *Naſua*; which ſee.

QUACK, in *Medicine*. See EMPIRIC.

QUACKENBRUCK, in *Geography*, a town of Weſtphalia, in the biſhopric of Oſnabruck, ſituated on the river Haſe, which runs through it in ſeven ſtreams, that unite in two below the town; 20 miles N. of Oſnabruck. N. lat. 52° 42′. E. long. 8° 3′.

QUADIANS, QUADI, in *Ancient Geography*, a people of Germany, whoſe territories extended from the Danube to Moravia, and the northern part of Auſtria. They are comprehended by ſome writers under the ancient name of Suevi, part of whom forced their way into Spain, and formed a kingdom there. Their country is at preſent known by the name of Moravia; for it extended from the mountains of Bohemia to the river Marus, now the March, and conſequently compriſed that province. Ptolemy mentions the following cities in the country of the Quadians; *viz.* Eburodunum, Eburum, Medoſlanium, and Celemantia, now, according to Cluverius, Brin, Olmutz, Znaim, and Kalminz. The Quadians were a warlike people, had kings of their own, and agreed in cuſtoms, manners, and religion, with the other German nations. They, without doubt, joined their countrymen againſt Lollius, Germanicus, Caius, and Galba, who attempted to reduce Germany, and to ſubdue the ſeveral nations which inhabited that extenſive country. The emperor Domitian marched againſt them, but was defeated by the Marcomans, and put to flight. The Quadians ſubmitted to the emperor Titus Antoninus, and it appears by his coins, ſuppoſed to have been ſtruck about the year 139, that they acknowledged, as ſovereign, a king appointed by that prince. They joined the Marcomans, in the famous war made by that people on the empire under the reign of Marcus Aurelius; but being reduced to great diſtreſs they ſent ambaſſadors to ſue for peace, and with them they reſtored all the Roman deſerters, and about 13,000 priſoners, whom they had taken during the war. They thus obtained peace, upon condition, that they ſhould not traffic, for the future, within the Roman dominions, nor ſettle within ſix miles of the Danube; but, diſliking theſe conditions, they again joined the Marcomans, and renewed the war. In the proſecution of this conteſt, which was long and ſanguinary, they were totally defeated; their king Ariogeſes was taken priſoner; but the emperor ſpared his life, confining him to the city of Alexandria, the metropolis of Egypt. The Quadians, however, ſeem to have continued in arms till the reign of Commodus, who granted them peace upon the following terms: that they ſhould keep at the diſtance of five miles from the Danube;—that they ſhould ſurrender their arms, and ſupply the Romans with a certain number of troops when required;—that they ſhould aſſemble but once a month in one place, and in the preſence of a Roman centurion;—and that they ſhould not make war upon the neighbouring nations without the conſent of the people of Rome. In the year 214, the king of the Quadians was Gaiobomar, who was aſſaſſinated by order of Caracalla. In the 4th year of the reign of the emperor Valerian, the Quadians joined the Sarmatians, and invading Illyricum, ravaged that province; but they were defeated by Probus, then tribune of a legion, and afterwards emperor. In the year 260, the 7th of the emperor Gallienus, they made a ſudden irruption into Pannonia, but they were expelled, without their booty, by Regillianus. Upon the death of Probus, who had kept the barbarians in awe, A.D. 283, the Quadians, in conjunction with the Sarmatians, broke into Illyricum and Thrace, and having ravaged thoſe provinces, and advancing towards Italy, they were met by Carus, the ſucceſſor of Probus, on the borders of Illyricum, and totally defeated; 16,000 being killed on the ſpot, and 20,000 being taken priſoners. In the 19th year of the emperor Conſtantius, the Quadians made an irruption into Pannonia and Mœſia; and having pillaged both provinces, returned home with an immenſe booty. They returned again in two years, and laid waſte Valeria. Conſtantius was provoked by theſe invaſions, and leaving Milan, advanced to the confines of the Quadians, and conferred with their chiefs, who excuſed paſt hoſtilities, and promiſed, for the future, to live in peace and amity with the emperor. They ſoon, however, forgot their promiſe; and in the following year joined the Sarmatians, and laid waſte a great part of Pannonia and Mœſia: but at the approach of Conſtantius, they repaſſed the Danube, and returned home. The emperor determining to puniſh them for their treachery, paſſed the Danube on a bridge of boats, and began to deſtroy their country. The Quadians, unable to reſiſt, ſued for peace, and obtained it, upon delivering up hoſtages, and ſetting at liberty all the priſoners they had taken. In the year 374, their king Gabinius being treacherouſly murdered by Marcellianus, duke of Valeria, they croſſed the Danube in the utmoſt rage, and falling upon the reapers, in harveſt time, killed the greateſt number of them, laid waſte the country, and took many captives. They afterwards followed Equitius, general of the troops in Illyricum, who had been

acceſſory to the murder of their king, into Valeria, and committed dreadful devaſtations in the countries through which they paſſed. In their way they met with two legions, the Pannonian and Mœſian, who had been ſent to oppoſe them, and taking advantage of a conteſt which ſubſiſted among them about precedency, they cut them both in pieces. In this irruption the Quadians had been joined by the Sarmatians; but the latter were defeated with great ſlaughter by Theodoſius, then duke of Mœſia, and afterwards emperor. Againſt the Quadians Valentinian I. marched in perſon; and having made great preparations for his propoſed expedition into their country, he took the field; paſſed the Danube at Acinium, now Gran, or Buda, in Lower Hungary, entered the enemy's country, and deſtroyed it with fire and ſword. At length, the Quadians ſued for peace; but whilſt the emperor was ſpeaking to the meſſenger with great warmth, and threatening to extirpate their whole nation, he fell to the ground in a fit, and ſoon afterwards expired. Upon his death a treaty was concluded with the Quadians. Their reſtleſs ſpirit and diſpoſition for war manifeſted themſelves again in the year 379, when they invaded Illyricum; but they were driven out, with ſome loſs, by the emperor Gratian. In 407 they entered Gaul with the other barbarians, over-ran its provinces, and committed dreadful ravages. From this time no farther mention is made of the Quadians; ſo that they were either ſubdued, or utterly extirpated by the Goths, who had ſettled in Pannonia and Illyricum. Anc. Un. Hiſt. vol. xvii.

QUADRA, in *Building*, any ſquare border, or frame, encompaſſing a baſſo-relievo, pannel, painting, or other work.

The word is alſo uſed, erroneouſly, for a frame or border, of any other form; as round, oval, or the like.

QUADRA and VANCOUVER'S *Iſland*, in *Geography*, a name given to the iſland of Nootka, in compliment to ſignor Quadra, the Spaniſh commander at Nootka Sound, and captain Vancouver, who expected to obtain poſſeſſion of the ſettlement in the year 1792. See NOOTKA, and NOOTKA *Sound*.

QUADRAGESIMA, a term ſometimes uſed for the time of Lent, becauſe conſiſting of forty days.

Hence ſome monks are ſaid to lead a quadrageſimal life; or to live on quadrageſimal food all the year.

QUADRAGESIMA *Sunday* is the firſt Sunday in Lent; ſo called becauſe it is about the fortieth day before Eaſter.

On the ſame account, the three preceding Sundays are called Quinquageſima, Sexageſima, and Septuageſima.

QUADRAGESIMALS, QUADRAGESIMALIA, denote Mid-lent contributions, or offerings.

It was an ancient cuſtom for people to viſit their mother-church on Mid-lent Sunday, and to make their offerings at the high altar; and the like was done in Whitſun-week. But as theſe latter oblations, &c. were ſometimes commuted for by a payment of pentecoſtals, or Whitſun-farthings; ſo were the former alſo changed into a cuſtomary payment, quadrageſimals, denarii quadrageſimales; and ſometimes Letare, Jeruſalem, from a hymn ſo called, ſung on that day, beginning "Jeruſalem, mater omnium," &c.

QUADRANGLE, in *Geometry*, a quadrangular, or quadrilateral figure; or a figure which has four ſides, or four angles.

To the claſs of quadrangles, or quadrangular figures, belong the ſquare, parallelogram, trapezium, rhombus, and rhomboides.

A ſquare, &c. is a regular quadrangle; a trapezium, an irregular one.

Quadrangular figures are not proper for fortification; the flanks, and flanked angles, being too ſmall.

QUADRANGULARIS PISCIS, the *Square-fiſh*, in *Ichthyology*, the name of a fiſh, which, in its moſt uſual ſize, is about fifteen inches long, four inches high in the middle, and three inches and a half over; the forehead is ſquare, a little hollow, and, by the eminence of the eye-brows, two inches and a half over; the noſe blunt, and not very ſteep, with two holes in the place of noſtrils, and the mouth very ſmall; the back is a little convex toward the tail, and on the ſides a little obtuſely angled; as is alſo the belly, which is plain and flat, and a little riſing toward the tail; it has five fins, two near the gills, two near the tail, and the tail-fin, which is conſiderably long. Part of the head and tail are covered with a ſoft ſkin, the reſt of the body with a kind of cruſt, adorned all over with little round knots, reduced for the moſt part into hexagonal figures, and ſubdivided into equilateral triangles. Grew, Muſ. Reg. Sac. p. 110.

QUADRANS, in *Antiquity*, the fourth part of the *as*, or pound. See AS.

QUADRANS, in our *Cuſtoms*, is the fourth part of a penny, or a farthing.

QUADRANT, QUADRANS, in *Geometry*, an arc of a circle, containing 90 degrees, or one-fourth of the entire periphery.

Sometimes, alſo, the ſpace, or area, included between this arc and two radii, drawn from the centre to each extremity thereof, is called a quadrant, or, more properly, a quadrantal ſpace; as being a quarter of the entire circle.

QUADRANT alſo denotes a mathematical inſtrument, of great uſe in navigation and aſtronomy, for the taking of altitudes, angles, &c.

The quadrant is variouſly contrived, and furniſhed with different apparatus, according to the ſeveral uſes for which it is intended; but they have all this in common, that they conſiſt of a quadrant, or quarter of a circle, whoſe limb is divided into 90 degrees; and that they have a plummet ſuſpended from the centre; and are furniſhed with pinnulæ or ſights, through which to look.

QUADRANT, *the Common*, or *Surveying*, (repreſented *Plate* VI. *Surveying*, *fig.* 13.) is made of braſs, wood, or other matter, uſually twelve or fifteen inches radius. Its circular limb is divided into 90°, and each of thoſe ſubdivided into as many equal parts as the ſpace will allow, either diagonally or otherwiſe. On one edge, or ſemi-diameter, are fixed two immoveable ſights; and in the angle, or centre, is hung a thread, with a plummet. To the centre is likewiſe, ſometimes, fixed a label, or moveable index, bearing two other ſights, like the index of a teleſcope. And, in lieu of the immoveable ſights, there is ſometimes fitted a teleſcope; though this more peculiarly belongs to the aſtronomical quadrant.

On the under ſide, or face, of the inſtrument, are fitted a ball and ſocket; by means of which it may be put in any poſition, for uſe.

Beſides the eſſentials of the quadrant, there is frequently added on the face, near the centre, a kind of compartiment, called the *quadrat*, or *geometrical ſquare*; as in the figure: this, in ſome meaſure, making a diſtinct inſtrument of itſelf. See its deſcription and uſe under the article QUADRAT.

The quadrant is to be uſed in different ſituations, according to the dimenſions to be taken. To obſerve heights and depths, its plane is diſpoſed at right angles to the horizon; but to take horizontal diſtances, the plane is diſpoſed parallel to it.

Heights and diſtances, again, may be taken two ways;

viz. by means of the fixed ſights and plummet, and by the label.

QUADRANT, *Uſe of the Surveying. To take the height or depth of an object with the fixed ſights, and plummet.*—Place the quadrant vertically, and the eye under the ſight next the arc of the quadrant: thus direct the inſtrument to the object, *e. gr.* the top of a tower, till the viſual rays of it ſtrike through the ſights upon the eye.

This done, the portion of the arc intercepted between the thread and the ſemidiameter, on which the ſights are faſtened, ſhews the complement of the object's height above the horizon, or its diſtance from the zenith; and the other portion of the arc intercepted between the thread and the other ſemidiameter, ſhews the height itſelf of the object above the horizon.

The ſame arc likewiſe gives the quantity of the angle made by the viſual ray, and a horizontal line, parallel to the baſe of the tower.

Note, to obſerve depths, the eye muſt be placed over that ſight next the centre of the quadrant.

From the height or depth of the object in degrees thus found, which ſuppoſe 35° 35′; and the diſtance of the foot of the object from the place of obſervation carefully meaſured, which ſuppoſe 47 feet; its height or depth in feet, yards, &c. is eaſily determined by the moſt common caſe in trigonometry.

For we have here, in a triangle, one ſide given, *viz.* the line meaſured, and we have all the angles; for that of the tower is always ſuppoſed a right angle: the other two, therefore, are equal to another right angle; but the angle obſerved is 35° 35′, therefore the other is 54° 25′.

The caſe, then, will be reduced to this: as the ſine of 54° 25′ is to 47 feet, ſo is the ſine of 35° 35′ to a fourth term, *viz.* $33\frac{1}{2}$ feet; to which add the height of the obſerver's eye, ſuppoſe 5 feet; and the ſum, $38\frac{1}{2}$ feet, is the height of the tower required.

QUADRANT, *the farther uſe of the, in taking of altitudes of objects, both acceſſible and inacceſſible,* ſee under the article ALTITUDE.

QUADRANT, *Uſe of the, in taking heights and diſtances by the index and ſights.*—To take, *e. gr.* a height, as that of a tower whoſe baſe is acceſſible; place the plane of the inſtrument at right angles to the plane of the horizon, and one of its edges parallel to it, by means of the plummet, which, in that caſe, will hang down along the other. In this ſituation turn the index, till, through the ſight, you ſee the top of the tower; and the arc of the limb of the quadrant between that ſide thereof parallel to the horizon and the index will be the height of the tower in degrees; whence, and from the diſtance meaſured as before, its height in feet, &c. may be found by calculation, as in the former caſe: or, without calculation, by drawing from the data, on paper, a triangle ſimilar to the great one, whoſe baſe is the diſtance; and its perpendicular, meaſured on the ſcale, is the height of the tower.

QUADRANT, *Uſe of the, in meaſuring horizontal diſtances.*—Though the quadrant be a leſs proper inſtrument for this purpoſe than a theodolite, ſemicircle, or the like, becauſe angles greater than quadrants cannot be taken by it, yet neceſſity ſometimes obliges perſons to have recourſe to it.

The manner of its application is the ſame with that of the ſemicircle; all the difference between the two inſtruments conſiſting in this, that the one is an arc of 180°, and can therefore take an angle of any quantity; and the other is only an arc of 90°, and is therefore confined to angles of that quantity. See, therefore, SEMICIRCLE.

QUADRANT, in *Aſtronomy*, is an inſtrument by which the altitude of a heavenly body is meaſured, and is compoſed of one-quarter, or one-eighth of a circle, accordingly as the meaſurement is made by means of direct viſion, or by the reflected image of the object to be viewed. When a ſuſpended circle was made uſe of with revolving ſights, called an aſtrolabe, the accuracy of an obſervation could never be depended on, partly becauſe the radius was ſmall, and partly becauſe the inſtrument vibrated when ſuſpended by the hand, and was otherwiſe inconvenient to uſe, as well as liable to have its equipoiſe diſturbed by the various poſitions of the index and ſights: therefore, ſuch a portion of the circle was adopted as was competent to meaſure the greateſt poſſible altitude, and an increaſe of radius was thereby obtained, which promiſed to contribute to accuracy, without affecting the portability of the inſtrument. But though the conſtruction was varied by different ingenious men, the quadrant was but little, if at all, conducive to the improvement of nautical or of aſtronomical ſcience, till the application of teleſcopic ſights, and an improved mode of graduating the limb, together with the addition of a vernier ſcale, gave it powers on which the mariner and aſtronomer could confide. Quadrants have been conſtructed of different materials, ſuch as wood, ivory, braſs, &c. and of various dimenſions, agreeably to the uſes for which they were intended, in order to accommodate purchaſers of every denomination; but as it is not our province to notice every plaything that has uſurped the appellation of quadrant, we will confine our account to ſuch inſtruments chiefly as have been of actual ſervice in navigation and aſtronomy. We have, however, already anticipated the hiſtory, we might here have introduced, of the various improvements ſucceſſively made in quadrants, at the beginning of our article CIRCLE; and under the article GRADUATION we have given, at conſiderable length, the different methods of dividing and ſubdividing aſtronomical inſtruments in general; to which articles we beg to refer our readers, who wiſh for information on thoſe points, and which may be read in conjunction with our preſent article.

Our arrangement of quadrants will be moſt ſyſtematic, if we divide them into two claſſes, *viz.* thoſe which meaſure altitudes by direct viſion, and thoſe which determine meaſurements in all directions, vertically, horizontally, and obliquely, by means of reflection. The former claſs have been found uſeful in aſtronomy chiefly, and the latter in navigation, where the motion of a ſhip interferes with the ſteadineſs of any fixed poſition of an inſtrument.

The firſt quadrant, in its rude ſtate, was probably a quarter of the aſtrolabe enlarged, with fixed ſights placed in, or parallel to, the vertical line paſſing through zero; and a fine thread, or wire, ſtretched by a plummet, indicated the altitude on the divided limb, according to the repreſentation in *fig.* 4. of *Plate* I. of *Aſtronomical Inſtruments.* This conſtruction might be uſed in obſervations of the ſun, without injuring the eye of the obſerver, by allowing the ſolar ray to paſs through the firſt ſight-vane, or hole, ſo as to fall on the ſecond, at ſome diſtance from the former, while the thread reſted nearly in contact with the elevated limb; but the want of minute, and at the ſame time accurate ſubdiviſions, and the ſenſible thickneſs of the thread, were impediments to accuracy that did not admit of remedy, until another mode of reading the altitudes was deviſed, and until a method was contrived of rendering the light of the ſun tolerable to the eye of an obſerver. The former of theſe deſiderata was accompliſhed firſt by diagonal ſcales, with a fiducial edge of an index, and afterwards by that admirable contrivance, ſometimes called a Nonius, but more properly denominated a Vernier, from the name of its inventor;

ventor; the latter was effected by ſemi-opaque glaſs, introduced at firſt without, but afterwards, with better effect, with teleſcopic ſights; at the ſame time, enlarging the viſual angles ſubtended by the ſun, and yet diminiſhing the intenſity of his light by a partial tranſmiſſion through the ſmoaked or coloured glaſs.

Davis's Quadrant, or Back-Staff.—In the year 1590, captain John Davis, a native of Sandridge, near Dartmouth, previouſly to his ſailing into the South ſeas under the command of Mr. Cavendiſh, contrived that inſtrument, which is repreſented in *fig.* 2. of *Plate* I. of *Aſtronomical Inſtruments*, and which has been called the *Engliſh quadrant*, or *back-ſtaff*. This inſtrument diſpenſed with the uſe of the plumb-line, and conſequently was better adapted to nautical purpoſes than the old quadrant, or than the fore-ſtaff, that preceded it; but wanted the teleſcopic ſights, which have given ſubſequent inſtruments the advantage over it. It was, however, probably the firſt quadrant in which the horizon was uſed as one of the objects in a back obſervation, and from which the reflecting inſtruments afterwards borrowed an uſeful principle, where altitudes are concerned; though it was in the uſe of the *fore-ſtaff*, (deſcribed under our article CIRCLE,) that the horizon was firſt made one of the extreme limits of an altitude, taken by a forward obſervation. Captain Davis found that pear-tree anſwered very well as the material on which his inſtrument was conſtructed, and an ingenious arrangement of two divided arcs and three vanes conſtituted his plan, according to the following deſcription. The vane at A was called the horizon-vane; the one ſeen at B the ſhade-vane, becauſe its ſhadow fell on the horizon-vane during the inſtant of completing an obſervation; and the third, at C, was denominated the ſight-vane, by reaſon of its being the vane to which the eye was applied in taking an obſervation. The arc of ſmaller radius, D E, contained 60°, and the other, F G, of larger radius, contained only 30°, in continuation of the former, making together the whole quadrant. The arc D E was divided into whole degrees only, on account of the ſmallneſs of its radius; but the arc F G had its degrees ſubdivided by concentric and diagonal lines, as ſeen in the figure. The manner of aſcertaining the altitude of a heavenly body, by the joint uſe of theſe two arcs, is not obvious at firſt ſight of the inſtrument, but may be thus explained. When the altitude of the ſun is taken, the horizon-vane is fitted to the extreme end or centre A of the quadrant, and the ſhade-vane B is put to within about 10° or 15° of the ſuppoſed co-altitude, but to a leſs quantity than the co-altitude, while the ſight-vane remains for adjuſtment on the arc F G. Things being in this ſtate, the back of the obſerver is turned to the ſun, and the quadrant is ſo elevated, that the ſhadow of the upper edge of the ſhade-vane B falls upon the upper edge of the ſlit in the horizon-vane A, when viewed through the ſmall hole in the ſight-vane. If now, in this ſituation, the horizon is ſeen through the ſaid ſlit, the obſervation is exact; but if not, the ſight-vane is moved backwards or forwards on the arc F G, accordingly as the ſky or ſea is ſeen, till the horizon appears in its place, while the ſhadow of the ſhade-vane reſts on the required ſituation in the ſlit of the horizon-vane, and then the obſervation is finiſhed; and the ſum of the two readings on the reſpective arcs, B and C, as read by the fiducial edges of the vanes, is the co-altitude or zenith diſtance of that limb of the ſun, upper or lower, which was obſerved from the correſponding limb of the ſhadow. If a lens, of a focal length equal to the radius of the ſmaller arc, were uſed, the focal luminous point occaſioned thereby would be a better object to meaſure the place of, than a ſhadow with an edge not ſufficiently defined. This inſtrument, it ſhould ſeem, was not capable of taking the altitude of a ſtar or planet, nor of the moon, unleſs her diſc was large enough at the time to project a ſhadow.

Elton's Quadrant.—An index bearing a ſpirit-level, with a vernier-ſcale near the ſight-vane, was added to the quadrant of Davis ſome time afterwards, by one Elton, the uſe of which was to take altitudes *without an horizon;* but the ſimilarity of the two inſtruments renders a more particular deſcription of this addition ſuperfluous. An inſpection of *fig.* 8. *Plate* I. will ſufficiently explain the difference.

Gunter's Quadrant.—Among the numerous and uſeful contrivances of the ingenious profeſſor of aſtronomy in Greſham college, was a portable quadrant, which now claims our attention, and which was contrived in, or a little before, the year 1618. The object of the inventor was not to conſtruct an inſtrument capable of meaſuring altitudes more accurately than that of captain Davis, which we have juſt deſcribed, but to make a quadrant ſo comprehenſive in its uſes, that, like the logarithmic ſcale, which he divided, it might ſhew by inſpection reſults, which had previouſly required long and tedious calculations; and in this point of view it is ſtill to be conſidered. Beſides the quadrantal arc for meaſuring altitudes, this inſtrument has various curves ſtereographically projected on it, ſuch as the equator, the tropics, the ecliptic, and the horizon, on a ſuppoſition that the eye is ſituated in one of the poles, all which are repreſented in *fig.* 3. of *Plate* XXIII. of *Aſtronomical Inſtruments*. The projection, according to Bion, is thus effected; when the quadrantal arc B C has been graduated, from its centre A, with a convenient radius A T, deſcribe the arc T D to repreſent one of the tropics; and let the line A T be taken as the tangent of 56° 46′, or half the ſun's greateſt declination (ſuppoſed here to be 23° 32′), added to the radius or tangent of 45°; then to find the point E in this line for the equinoctial, there will be this proportion, as the tangent of 56° 46′ : 1000 :: radius : 655; and therefore, if $\frac{6}{10}\frac{5}{0}\frac{5}{0}$ parts of the line A T be taken, it will be the proper radius of the arc E F, or equinoctial.

To find the centre of the occult arc E D, which repreſents the ecliptic, let the meridional line A D be ſo divided by the point G, that if A F be taken as radius, A G may be the tangent of 23° 32′, the ſun's greateſt declination; in which caſe A G will be $\frac{4}{10}\frac{3}{0}\frac{4}{0}$ of the line A F, and the occult arc E D deſcribed from the point G will be one-fourth of the ecliptic, which may be divided into ſigns and degrees thus: as radius is to the tangent of any degree's diſtance from the neareſt equinoctial point, ſo is the co-ſine of the ſun's greateſt declination, to the tangent of that degree's right aſcenſion; for example, ſuppoſing the right aſcenſion of the firſt point of ♉ to be 27° 54′, draw a line from A, the centre of the quadrantal arc, to this degree and minute on the ſaid arc, and note where it interſects the occult arc of the ecliptic, and this point will be the beginning of the ſign ♉; and in like manner any other part may be inſerted.

The line E T, or line of declination, may be divided thus; taking A E for the radius of the equinoctial, or tangent of 45°, let the tangents of 46°, 47°, 48°, &c. up to 68° 30′, be ſucceſſively taken and laid down on the line E T, and the points of exceſs above the tangental point of 45° will be the dividing lines of the ſcale for 1°, 2°, 3°, &c. up to 23° 32′, or greateſt declination.

When the ſcale of declination is finiſhed, the quadrantal arc may be taken as the meaſure of right aſcenſions, and then the place of a ſtar or any other heavenly body may be inſerted on the plane of the quadrant thus; let a line be

drawn

drawn from A to the degree and minute of right aſcenſion, counted from B towards C, and the point in this line, where an occult arc, drawn through the declination from the centre A, interſects it, will be the place of the heavenly body in queſtion.

The two parallel arcs contained between the tropic T D and the quadrantal arc B C, are the ſcales of days and months, which are divided by the aid of a table of meridian altitudes of the ſun for each day, calculated for the particular latitude, for which the quadrant is conſtructed. It is hardly neceſſary to obſerve, on the conſtruction of ſuch table, that if the latitude and declination be both north, or both ſouth, the declination muſt be added to the co-latitude for the greateſt altitude; but if of contrary denominations, ſubtracted. The degrees and minutes contained in ſuch table are transferred into the ſcale of months by a line extending acroſs it from the centre A to the quadrantal arc, as before.

The centre of the horizon will be in the meridional line A C, and if a point H be taken ſuch, for the co-latitude 38° 28′ for inſtance, that A H may be the correſponding tangent to radius A F, then $\frac{7}{10}\frac{7}{0}\frac{8}{0}$ of that radius will be its diſtance from A, and the occult arc deſcribed from H, with the extent H E, beginning at E in the equinoctial, and ending at the tropic T D, will be the required horizon. This horizontal arc may be divided thus; as radius is to the ſine of the latitude, ſo is the tangent of any number of degrees in the horizon, to the tangent of a correſponding arc in the quadrant; and from a table thus conſtructed any point in the horizon may be put in by interſection of a line drawn from A to the tabular number as read on the quadrantal arc, as in the former caſes.

A third table of the ſun's altitude for inſerting the hour lines may be calculated thus; when the ſun is in the equator, as radius is to the co-ſine of the latitude, ſo is the co-ſine of any hour from the meridian, to the ſine of the ſun's altitude at that hour; but when the ſun has declination, ſay, as the co-ſine of the hour from the meridian is to radius, ſo is the tangent of the latitude, to the tangent of a fourth arc; then if the latitude and declination have like denominations, and the hour fall between noon and ſix o'clock, ſubtract the declination from the ſaid fourth arc, and the remainder will be a fifth arc; but if the latitude and declination have unlike denominations, or the hour be between ſix and midnight, add the declination to the fourth arc, and the ſum will be a fifth arc, which muſt be thus uſed; as the ſine of the fourth arc, is to the ſine of the latitude, ſo is the co-ſine of the fifth arc, to the ſine of the altitude ſought. The determination of ſuch table by this fundamental method is however operoſe, and Margett's horary tables, which give the ſucceſſive altitudes in any given latitude, would greatly ſhorten the labour, by giving the reſults by inſpection, which may at the ſame time be inſerted by transfers from the quadrantal arc, ſimilar to thoſe we have already deſcribed. When the horary points are put in for each ſucceſſive hour, when the ſun is in the equator, at each tropic, and at a few intermediate places, the horary lines may be drawn through the ſaid points, which will give the hour for any given day, when the inſtrument is uſed as hereafter deſcribed.

A fourth table, for putting in the azimuth lines, will require the ſun's altitude to be calculated for each degree of azimuth, when the ſun is at the equator, at each tropic, and at other intermediate places, which may be done thus: when the ſun is in the equator, as radius is to the co-ſine of the azimuth from the meridian, ſo is the tangent of the latitude, to the tangent of the ſun's altitude at the azimuth in the equator: but out of the equator the rule is, as the ſine of the latitude, is to the ſine of the declination, ſo is the co-ſine of the ſun's altitude at the equator at a given azimuth, to the ſine of a fourth arc. When the latitude and declination have the ſame name, in all azimuths from the prime vertical to the meridian, add this fourth arc to the arc of altitude at the equator; but when the azimuth is above 90°, ſubtract the altitude at the equator from this fourth arc; alſo when the latitude and declination have unlike names, ſubtract the ſaid fourth arc from the arc of altitude at the equator, for the altitude at the propoſed azimuth. The points correſponding to the tabular numbers, thus aſcertained, muſt be inſerted by interſection of lines drawn from A, as before, to the quadrantal arc B C, and lines uniting thoſe points will be the lines of azimuth for each hour in every day of the year. But to complete the inſtruments, two ſights or vanes muſt be fixed on the meridional line A C, and a ſmall plumb-line, with an adjuſtable bead, muſt be ſuſpended from the point A of the quadrant.

In addition to the lines already deſcribed, Gunter's quadrant has ſometimes a ſquare under the angular point A, called a *quadrat*, as ſeen in the figure, two ſides of which are divided into ten equal parts each, and theſe again ſubdivided into others, the uſe of which is to meaſure angular diſtances; and ſometimes the large ſquare is ſubdivided into a number of ſmaller ones, for the purpoſe of performing arithmetical proportions by inſpection. See Bion on the Conſtruction and principal Uſes of Mathematical Inſtruments.

It would be tedious to enumerate all the uſes of this quadrant, and to exemplify all the problems that it is capable of performing, or rather of illuſtrating (for great accuracy cannot be expected in the indication of ſo ſmall an inſtrument); but we will ſpecify a few of the moſt uſeful, which may be varied by reverſing the proceſſes, and by altering the data, to a great extent.

PROBLEM I.—*To find the Sun's Right Aſcenſion.*

Stretch the thread from the point A over the ſun's place, as marked in the graduated ecliptic, and the degree cut by it in the quadrantal arc will give the correſponding right aſcenſion.

PROB. II.—*To find the Sun's Declination.*

Stretch the thread as before, and ſlide the bead till it reſts on the ſun's place for the given day, and then turn it to the ſcale of declination, where the correſponding degree will be ſeen under the bead.

PROB. III.—*To find the Sun's Meridian Altitude on any Day.*

Extend the thread over the day of the month given, in its proper ſcale, till it reaches the quadrantal arc, and the ſun's greateſt altitude for that day will be indicated thereby.

PROB. IV.—*To find the Hour of the Day.*

Extend the thread over the day of the month, and, holding it there, ſlide the bead till it lies on the line of twelve o'clock; then elevate the quadrant ſo that the ſolar ray may paſs through the upper ſight-hole exactly upon the ſecond, and allow the plummet to reſt, and then the bead will indicate the hour, before or after noon, as the caſe may be. In a ſimilar manner the ſun's altitude may be meaſured by the thread falling on the quadrantal arc, when the ſolar ray paſſes as above deſcribed.

PROB. V.—*To find the Sun's Amplitude.*

Let the bead be rectified for the given time, and be brought

brought afterwards to the horizon, while the thread remains ſtretched, and it will indicate the riſing or ſetting amplitude, as the caſe may be.

PROB. VI.—*To find the Aſcenſional Difference.*

Rectify the bead as in the laſt problem, and bring it to the horizon, in which ſituation the thread, extended to the quadrantal arc, will ſhew the aſcenſional difference in degrees, which converted into time will ſhew how much the ſun riſes before ſix in ſummer, and after ſix in winter, and conſequently will give the exact length of the given day.

PROB. VII.—*To find the Sun's Azimuth.*

Rectify the bead for the given time, and obſerve the ſun's altitude as explained in prob. 4. Then extend the thread to the complement of that altitude, and the bead will indicate the azimuth correſponding, and *vice verſâ*.

PROB. VIII.—*To find the Hour of the Night by a Star.*

Put the bead on the thread to the diſtance that will indicate the ſtar's declination, and look through the ſight for the ſtar till the plummet reſts on the plane of the quadrant, and in that ſituation the bead will ſhew, in the hour lines, the ſtar's diſtance in time from the meridian of the place; in the next place ſubtract the ſun's right aſcenſion in time from that of the ſtar, as given in ſome catalogue, and to the remainder add the obſerved diſtance from twelve o'clock in ſidereal time, and the ſum will be the hour nearly, or the approximate diſtance of the ſun from noon, which may be corrected by applying the ſun's variation of right aſcenſion ſince the preceding noon, which in every ſix hours will be about a minute.

Sutton's quadrant, and Collins's ſector on a quadrant, are very ſimilar, both in conſtruction and uſe, to the quadrant we have here deſcribed, and the dial on a card, by Ferguſon, is nearly related to it, particularly as it has been lately improved by the Rev. W. Pearſon.

Of Aſtronomical Quadrants.—The quadrants which we have hitherto deſcribed may be conſidered as by no means perfect, but as approximating only to an inſtrument, that is really uſeful in an obſervatory for determining the exact place of a heavenly body; hence the quadrant which we propoſe next to deſcribe, has obtained the name of *aſtronomical*, from its ſuperior pretenſions to accuracy in the meaſurement of altitudes taken above the horizon, and therefore merits our more particular attention.

An aſtronomical quadrant may be either portable or fixed; in the former caſe it is uſually mounted on a tripod, with adjuſting ſcrews in the feet, and has a horizontal motion as well as a vertical one, in order that it may take altitudes in any azimuth, or be made to follow the body obſerved in its apparent path; but in the latter caſe it is fixed againſt a ſteady wall, with its plane in, or very nearly in the meridian, and is therefore denominated a *mural quadrant*.

The firſt aſtronomical quadrant, of which we have any account left us, is that which Ptolemy uſed; it was the fourth part of a circle placed faſt againſt a ſtone pier, or quadrangular log of wood, with zero of the arc in the horizontal line, and a pin of wood projecting from the central point threw a ſhadow on the limb when the ſun ſhone, which ſhadow was uſed by way of index: but it is obvious that much accuracy was not to be expected from ſuch an inſtrument, however well conſtructed or divided. We might mention here the quadrants of Tycho Brahé and Hevelius, but the former has been noticed under our article CIRCLE, and the latter was deſtroyed in the conflagration of the owner's houſe in Dantzic. In more recent times, aſtronomical quadrants have been made on accurate principles, and with great care, eſpecially by Graham, Siſſon, Bird, Ramſden, Cary, and Troughton, ſeveral of whoſe inſtruments we will now deſcribe, as far as any difference in their conſtruction renders diſtinct accounts neceſſary. We will proceed, as we have done on former occaſions, chiefly in the order of time, which, generally ſpeaking, will be found to be alſo in the order of ſucceſſive improvements.

Mural Quadrant by Graham.—Before we proceed to deſcribe the mural quadrant, contrived and made by Graham, and fixed at the weſt ſide of the ſtone pillar in the middle room at the Royal Obſervatory at Greenwich, at the expence of king George I., and for the uſe of that eminent aſtronomer Dr. Halley, it may be proper to mention that Flamſteed, and his aſſiſtant Sharp, had previouſly uſed an arc of a circle fixed againſt a ſtone pier in the meridian, which they had themſelves conſtructed, and which was removed at Flamſteed's death. We muſt, therefore, conſider their inſtrument as having been the prototype of Graham's mural quadrant, or arc, as it has been alſo called ſometimes. In *fig.* 4. of *Plate* XXIII. of *Aſtronomical Inſtruments*, is given a repreſentation of the mural quadrant of Graham's conſtruction, which will equally repreſent that of Bird, conſtructed after the ſame model, and which is the ſame that both Dr. Smith, and Stone, the editor of Bion's work, have given in their reſpective accounts.

The body of this quadrant is compoſed chiefly of bars of iron united together, as ſeen in the figure; ſome, to form the plane of the quadrant, placed flat-ways; and others, to give ſtrength and ſtability, fixed edge-ways. Theſe bars are all of the ſame dimenſions, namely 2.9 inches wide, and 0.175 thick, and are united together by right-angled ſhort bent bars in various places, both at the interſections made by the ſides of the ſmall ſquares, and at other ſituations, ſo that while great firmneſs is obtained, great weight is avoided. The quadrantal arc is compoſed of two bars, one of iron, united to the iron frame, and the other of braſs, on which the diviſions are made, as deſcribed under our article GRADUATION; this braſs bar is pinned faſt to the iron one, and being more ſlender than the iron, accommodates itſelf thereto, and, as time has proved, does not alter the ſhape of the arc, as we have lately been aſſured by Mr. Troughton. The breadth of the limb is 2.2 inches, the braſs limb being more remote than the anterior edge of the iron arc by 1.2 inch, and the ſurface was planed, or rather ſcraped, by a tool fixed to a radial bar, that revolved on a vertical axis of motion, placed in the centre of the arc, and reſting with its ſuperior end in a fixed beam above the plane of the quadrant, when this plane was lying in a horizontal poſition, it being impracticable to put ſo large a body in any ordinary lathe. The original diviſions of Graham were inſerted on two ſeparate arcs, one graduated into 90° and its ſubdiviſions, and the other divided into 96 parts and its ſubdiviſions, as we have before explained in the article juſt referred to; but the diviſions, being laid down by rough dividing, are not now made uſe of, but a quadrantal arc of 96, with its ſubdiviſions, put in by Bird in 1753 between the two arcs of Graham, is that which all obſervations taken by Graham's quadrant are now referred to, and the readings are transformed into degrees, minutes, and ſeconds, by an appropriate table. The readings were at firſt obtained by a double vernier-piece carried by the teleſcope, that revolves round the centre of the arc, one ſide of which vernier-piece read with the arc 90°, and the other with the arc of 96 parts, or grand diviſions; the degree was ſubdivided into 12 parts, or 5′ ſpaces, and 10 parts on its vernier equalled 11 out of the ſaid 12 parts, ſo that

$\frac{1}{120}$ of a degree, or $5'\frac{1}{2}$, was the length of one of the vernier diviſions, and $\frac{1}{11}$ of this, or $30''$, was the ſmalleſt quantity indicated by this vernier; but on the arc of 96 grand diviſions there was, as in Bird's arc, 16 equal parts, or ſubdiviſions, in every grand diviſion, and the vernier for this arc had 17 diviſions on it, occupying the ſpace of 16 ſubdiviſions in the arc, ſo that the length of this vernier was $\frac{17}{16}$ of $\frac{90^\circ}{96} = 59'.83$ nearly, and one diviſion of it $\frac{59'.83}{17} = 3'.52$ nearly.

Hence in the firſt vernier its number 11 is *one leſs* than its equivalent arc contains on the limb of 90°; but in the ſecond, the number 17 is *one more* than its equivalent arc contains in the arc of 96 parts, on which account the reading of one vernier is in the direction from right to left, but that of the other, on the contrary, from left to right; one meets, and the other overtakes the dividing ſtrokes of the divided limb; and for the ſame reaſon, in the common Hadley's quadrant, or rather octant, ſometimes 19 ſubdiviſions, and ſometimes 21 on the limb, act againſt 20 in the vernier, but then the readings are *not* in the *ſame direction*. The telescope is clamped to the arc in any ſituation by the mechaniſm for ſlow motion in the uſual way, which probably was firſt adopted in one of the large quadrants, and its counterpoiſe beyond the centre of the arc, gives it the advantage of remaining in any poſition. It has croſs hairs in the focus of the eye-glaſs. When the lines of the vernier are none of them coincident with any one on the limb of either quadrantal arc, the portions leſs than what the verniers profeſs to indicate were *eſtimated* by the eye, by examining the ſituation of other pairs of dividing lines, to the right and left of thoſe neareſt to a coincidence; and to a want of a micrometrical nut to the ſcrew of ſlow motion may be attributed the remark, that has been made, that the readings thus taken, even with ſo large radii as 96.85 and 95.8 inches, were not to be depended upon to 10″. That the motion of the telescope might be quite eaſy, and that the centre of the quadrant might be relieved of its weight, the following contrivance was introduced; *a b* repreſents an iron axis laid acroſs the top of the wall, having two braſs plates fixed perpendicularly to its ends, with notches cut in them for this axis to turn in, which axis points to the centre of the quadrant at right angles to its plane: to that end of it next to the quadrant, at *a*, an iron arm, *c d*, is fixed, having two braſs plates, *c e*, *d f*, almoſt perpendicular to it; to theſe are rivetted two ſlender ſlips of deal, whoſe remote ends meet at *g*, near the eye-piece of the telescope, and are held together by a braſs cap. Through a ſmall plate fixed to one ſide of a collar, embracing this lower end of the telescope, there paſſes a ſcrew-pin at *g*, parallel to the telescope; which pin, being ſcrewed into the cap at the end of the ſaid ſlips of deal, holds up the telescope againſt the centre-work, while the ſlips are braced by other croſs ſlips of the ſame light wood. The counterpoiſe *i* is ſupported by the rod *b i* at *b*, the retiring end of the axis *a b*; and a pair of braſs rollers *k l*, acting againſt the limb of the inſtrument, give freedom to the motion of the telescope thus counterpoiſed, and complete the conſtruction. The quadrant being thus put together, ſome ſtrong but ſmall plates of braſs are made faſt to its poſterior face, and bent ſo as to fall into as many hold-faſts in the wall, into which they are reſpectively ſcrewed; but the weight of the whole is ſupported chiefly by two pins or bolts inſerted into the holes A and B, made in pieces of metal attached to ſuch angular points of the iron bars, as beſt ſupport the centre of gravity of the whole: the pin A is made faſt into the wall, but allows a motion round it, and the pin B fixes the quadrant after its extreme radii are adjuſted, one horizontal, and the other vertical: this poſition was given by means of a plumb-line of fine ſilver-wire, that at firſt was ſo ſuſpended as to biſect both the centre of the quadrantal arc and the point 90° on the limb, but which was transferred afterwards to an adjuſtable point of ſuſpenſion out of the centre, with a correſponding dot made on the arc of exceſs of the limb. The plane of the quadrant was made vertical, as compared with the plumb-line, by the ſcrews of the hold-faſts; and the telescope was adjuſted parallel to this plane by compariſon with a tranſit telescope viewing together both high and low ſtars in ſucceſſion; but the line of collimation of the telescope could not be fixed properly, as it regarded the true horizontal line of the quadrant paſſing through its zero, without the aid of Graham's ſector. This ſector was, therefore, ſo adjuſted to a ſtar near the zenith, that it meaſured the ſame zenith-diſtance, with its plane turned to the eaſt, as it did when turned to the weſt, and had its error aſcertained in this way, and afterwards an altitude, taken with the quadrant, was made to correſpond with ſuch corrected altitude of a ſtar taken with the rectified ſector in reverſed poſitions, which property the mural quadrant does not poſſeſs. The method of performing this adjuſtment for collimation will be underſtood from our directions hereafter given, when treating of *Ramſden's portable aſtronomical Quadrant*.

Bird's Mural Quadrant.—After the deſcription we have given of Graham's mural quadrant, we ſhall have no occaſion to dwell long on the ſtructure of Bird's, which was made of braſs entirely, after a ſimilar model, but divided in both its arcs, of 90°, and of 96 grand parts, with more ſkill than Graham proved himſelf maſter of in this part of his labours. Smith and Stone deſcribe Graham's quadrant as fixed to the eaſt ſide of the pier at Greenwich, and looking to the ſouth, which was the ſituation for taking meridian altitudes of the greateſt number of ſtars; but ſince the year 1753, it has been placed on the weſt ſide, looking towards the north, and Bird's then took its original place.

This quadrant, which was procured in the time of Dr. Bradley, was firſt placed on the weſt ſide of the pier, in 1750; and the obſervations of himſelf and of Dr. Maſkelyne, taken by it ſince it was placed on the eaſt ſide, have contributed largely to complete the beſt catalogues of the heavenly bodies, which otherwiſe muſt have been very defective. While, however, Mr. Pond, the preſent aſtronomer royal, was engaged in making his well-known table of declinations, with one of Troughton's circles, at Weſtbury, he found reaſon to ſuſpect the accuracy of the total arc of this quadrant, from a compariſon of his own determinations with thoſe previouſly made with Bird's quadrant; and a ſubſequent examination of the arc by Troughton juſtified his ſuſpicion. With an apparatus expreſsly contrived for the occaſion, this celebrated mathematical inſtrument-maker meaſured the total length of the quadrantal arc, and found it too ſmall by 7″, excluſive of another ſimilar error of 2″, occaſioned by the wear of the axis of motion; though, on a rigid trial of the intermediate diviſions, he did not detect more than *one ſecond* of error, or rather of *inequality*, among the neighbouring diviſions in any part of the arc. This trial was made in the preſence of the preſent aſtronomer royal, in the year 1807; and the reſult, while it ſerves to correct paſt obſervations, by the addition of 1″ to every ſucceſſive 10° of altitude, would have tended to correct all future obſervations by a like addition, had not the large tranſit-circle, lately made and fixed in the ſame obſervatory by Troughton,

ſuperſeded

ſuperſeded the uſe of both the quadrants by its ſuperior accuracy. The quadrantal arc of Graham's quadrant has not lately undergone a ſimilar trial; but Troughton thinks it probable that the iron inſtrument has preſerved its figure better than the braſs one, and that conſequently the addition of the braſs arc on the face of the iron one has had no undue influence in altering either its temporary or permanent dimenſions. At firſt, the teleſcope of Bird's quadrant was not braced; but after a trial, it was found to bend a little by a counterpoiſe of 80 pounds, and was afterwards braced by frame-work ſurrounding it, that prevented its yielding. A trial was made by Dr. Bradley of the total arc, in January 1753, after it had remained three years on the weſt ſide of the pillar; and though its weight is eight hundred pounds, the error was found to be not more than *two ſeconds*. He did the ſame again in July, in the year 1759, when it had remained ſix years and a half in its new ſituation, on the eaſt ſide of the pillar, and found the arc exactly 90°. Theſe examinations, having been made in the extremes of cold and heat, ſhew that change of temperature did not affect the total arc; and that, therefore, the 7″ diminution of the arc, detected by Troughton, is occaſioned by a change of figure in the ſpace of 48 years. The difference of the readings of the two arcs has never yet amounted to 4″, which is a ſtanding proof of the accuracy and ſkill of Bird as a divider. Near the eye-piece of the teleſcope is a good micrometer, that not only gives ſlow motion in taking obſervations, but meaſures the number of *ſeconds* that the reading lines of the vernier is ſhort of coincidence in any obſervation: and formerly the quantity indicated by the vernier had theſe ſeconds added, to obtain the whole meaſure; but, by Smeaton's advice, the vernier is now diſregarded, and the addendum, obtained by ſeveral turns of the micrometer-ſcrew alone, is uſed to complete the ſimple reading of the diviſions and ſubdiviſions, or 5′ ſpaces; in other words, the ſcrew, and not the vernier, ſubdivides the laſt 5′ ſpace in the obſerved arc, and gives what is due to the obſervation. The adjuſtments of this inſtrument, which was made of eight feet radius, on purpoſe to take the place of Graham's, are made in all reſpects as they are made in its predeceſſor; and the ſector, which ſerves for adjuſting Graham's line of collimation by ſtars near the zenith, is uſed for the ſame purpoſe in Bird's quadrant. If any of our readers wiſh to ſee the original plan of all the ſeparate parts of Bird's quadrant, and to read his deſcription of them, we beg leave to refer them to his quarto pamphlet, entitled "The Method of conſtructing Mural Quadrants," publiſhed by order of the commiſſioners of the Board of Longitude, in the year 1768. In this pamphlet, however, it is not mentioned that the vernier of the arc of 90° ſubdivides the ſpace of 5′ into ten parts of 30″ each, by having ten diviſions thereon, reading with eleven ſubdiviſions of the limb; but we know that this was the original reading of the vernier.

Jeremiah Siſſon's Mural Arc.—Perhaps it would have been more conſonant to the order of time, if we had ſpoken of the younger Siſſon, who was Bird's contemporary, and at one time his employer, next after Graham; but the hiſtories of the two mural quadrants at Greenwich being connected, demanded that theſe inſtruments ſhould follow each other in immediate ſucceſſion. In the year 1768, Jeremiah Siſſon, the ſon of Jonathan, made the large mural arc at the king's private obſervatory in Richmond gardens, which extends 45°, or more, beyond a quadrant, and conſequently reaches beyond the north pole; which circumſtance gives it the advantage of being put in the meridian, by an obſervation of the pole-ſtar. The diviſions of this arc are into degrees and its ſubdiviſions, but the ſtrokes are not cut very neatly; and the reading, as was the caſe with Bird's quadrant at firſt, is performed partly by a vernier, and partly by a micrometer-ſcrew. We have ſelected this inſtrument, as a ſpecimen of Siſſon's conſtruction, principally on account of a power that it poſſeſſes, which is very important, but which probably was not contemplated, and conſequently not intended by the maker himſelf: the extenſion of the divided limb, to ſeveral degrees beyond the north pole, affords the means of uſing this inſtrument in the manner that Troughton's large mural circle is now uſed, at Greenwich Obſervatory, by the preſent aſtronomer royal; namely, to meaſure the polar diſtances of the ſtars directly from the *true polar point*, without any reference to the latitude of the obſervatory, which method is one of the greateſt modern improvements in making aſtronomical obſervations. It is much to be deſired that this mural arc ſhould be divided again by Troughton, or ſome other ſuperior divider, and that it have microſcopic micrometers applied to it, which may be placed by adjuſtment over any optional part of the diviſions, and at any aſſumed diſtance from each other; for though it would not then, as it does not now, poſſeſs the valuable property of oppoſite readings, and of a motion in altitude to reverſe the oppoſite arcs, by reaſon of its being leſs than a ſemicircle, yet being compactly made, and of large radius, it is capable of receiving diviſions ſuperior to thoſe on the quadrants which we have juſt deſcribed; and as the ſituation and ſtructure of the obſervatory are excellent, the appointment of a regular obſerver to co-operate with the aſtronomer royal would be highly conducive to the intereſts of aſtronomy. We hope that this hint may be taken up in a quarter where the power exiſts of realiſing our wiſhes in this reſpect. Aſtronomical clocks, and various other auxiliary inſtruments, are already in the obſervatory; ſo that the principal expence of inſtruments, as well as of an appropriate and elegant building, is already incurred.

Portable Aſtronomical Quadrant by Ramſden.—It frequently happens that ſuperior artiſts vary the conſtruction of their inſtruments to ſuit the views of the purchaſer, or the ſcale on which they are to be conſtructed. We will ſelect out of the quadrants made by the late ingenious Mr. Ramſden, that which he made for Dr. Shepherd for the obſervatory of Chriſt-college, Cambridge, and which profeſſor Vince has deſcribed at conſiderable length in his "Treatiſe on Practical Aſtronomy." The figure exhibiting this quadrant is the 5th of *Plate* XXIII. of *Aſtronomical Inſtruments*, which requires but little explanation. The tripod on which the quadrant is mounted has ſcrews of adjuſtment to ſet the ſtem, on which the horizontal motion is performed, perpendicular, which is proved to be ſo in all directions when the plumb-line biſects both the ſuperior and inferior dots during the whole revolution round a horizontal circle. The viſible ſtem is a braſs tube, and through it aſcends a ſolid ſteel vertical axis, which fitting cloſely at the ſuperior and inferior ends, has not the leaſt ſhake, and preſerves the poſition once given it ſo long as the feet ſcrews are unmoleſted. The teleſcope is of the achromatic conſtruction, and has the uſual apparatus for ſlow motion, the ſcrew of which is made a micrometer to ſubdivide the ſmall reſiduum of the angle that the vernier alone will not indicate, when the coincidence is not perfect. The teleſcope lies on a bar that carries the counterpoiſe, and in which is the centre of its motion. It has a ſyſtem of wires in the focus of the eye-glaſs, which are adjuſtable by ſcrews, both upwards and ſideways, as well as in a circular direction, ſo that the adjuſtments for collimation, and for zero in the altitude circle, may be effected thereby. The point of ſuſpenſion of the plumb-line is alſo adjuſtable by a proper ſcrew

apparatus. At the top of the vertical tube, or ſtem, is a ſmall horizontal circle with a clamping apparatus for ſlow horizontal motion, by means of which the whole quadrant, with its attached teleſcope, turns gradually round in azimuth. When obſervations are made in or near the zenith, the plumb-line falls in the way of the teleſcope, and is obliged to be removed, on which account the large quadrant made by Ramſden for the duke of Marlborough, and now placed at Blenheim, has the plumb-line ſuſpended at the poſterior face of the inſtrument. This inconvenience is, however, remedied by the addition of a ſpirit-level ſuſpended from an adjuſtable horizontal braſs rod, under the uppermoſt radial bar of the quadrant, and this level not only ſupplies the place of the plumb-line when taken off, but at all times ſerves as a check on its adjuſtment, and, when furniſhed with a graduated ſcale, may very well be made its ſubſtitute. The conſtruction of Ramſden's portable quadrant was probably borrowed from Bird's, as well as his method of dividing the larger inſtruments that exceeded the reach of his dividing engine; but the inſtrument before us has no other horizontal or azimuth circle, except what is uſed plain, for the purpoſe of giving ſlow motion. Neither is there a ſecond horizontal teleſcope fixed permanently in that ſituation by which the teleſcope of obſervation may have its collimation determined, and the zero of its vernier adjuſted.

The vernier of this quadrant reads with two ſets of diviſions, like that of the mural quadrant by Bird, but the radius being ſmall, the ſubdiviſions are made into four parts each; the inner arc is divided into 90°, and the ſubdiviſions into 15′ each, but the outer one into 96 parts, or grand diviſions, and theſe again each into four parts, or ſub-diviſions; and thoſe two arcs operate as a check on each other. The micrometer ſub-divides the 15′ into 3″; but it is neceſſary to convert the reading of the arc of 96 grand diviſions into a correſponding quantity, expreſſed in degrees, minutes, and ſeconds, which may be done by direct proportion, or, which is more feaſible, by a table that we have ſubjoined, calculated for this purpoſe. The readings of the arc of 96 are put down with titles *diviſions*, *ſub-diviſions*, and *vernier*, where 16 (and ſometimes 32) on the vernier are equal to *one* ſub-diviſion, and *four* ſub-diviſions to *one* diviſion; for example, ſuppoſe the reading to be thus, 21 div. 2 ſub. 11 ver. we ſhall have from the table

			°	′	″
Diviſions	21	=	19	41	15.
Sub-diviſions	2	=		28	7.5
Vernier	11/16	=		9	40.1
Total			20	19	2.6

When, however, the coincidence of the vernier is not perfect, the quantity brought up by the micrometer-ſcrew muſt be added as a fractional portion of 52.″8, which is the value of one ſtep of the vernier, when 16 is the number of ſteps, but if 32 are inſerted, then 26″.4 would be the value of one ſtep forwards from zero.

A Table for the Reduction of the Grand Diviſions, Sub-diviſions, and Vernier, of the Arc of 96, into Degrees, Minutes, and Seconds.

Grand Diviſions.									Sub-diviſions.			Vernier.		
	°	′	″		°	′	″		°	′	″		′	″	
1	0	56	15	33	30	56	15	65	60	56	15	1	14	3.7	1	0	26.4	
2	1	52	30	34	31	52	30	66	61	52	30	2	28	7.5	2	0	52.8	1
3	2	48	45	35	32	48	45	67	62	48	45	3	42	11.2	3	1	19.1	
4	3	45	0	36	33	45	0	68	63	45	0				4	1	45.5	2
5	4	41	15	37	34	41	15	69	64	41	15				5	2	11.8	
6	5	37	30	38	35	37	30	70	65	37	30				6	2	38.2	3
7	6	33	45	39	36	33	45	71	66	33	45				7	3	4.6	
8	7	30	0	40	37	30	0	72	67	30	0				8	3	30.9	4
9	8	26	15	41	38	26	15	73	68	26	15				9	3	57.3	
10	9	22	30	42	39	22	30	74	69	22	30				10	4	23.7	5
11	10	18	45	43	40	18	45	75	70	18	45				11	4	50.0	
12	11	15	0	44	41	15	0	76	71	15	0				12	5	16.4	6
13	12	11	15	45	42	11	15	77	72	11	15				13	5	42.8	
14	13	7	30	46	43	7	30	78	73	7	30				14	6	9.1	7
15	14	3	45	47	44	3	45	79	74	3	45				15	6	35.5	
16	15	0	0	48	45	0	0	80	75	0	0				16	7	1.9	8
17	15	56	15	49	45	56	15	81	75	56	15				17	7	28.2	
18	16	52	30	50	46	52	30	82	76	52	30				18	7	54.6	9
19	17	48	45	51	47	48	45	83	77	48	45				19	8	21.0	
20	18	45	0	52	48	45	0	84	78	45	0				20	8	47.3	10
21	19	41	15	53	49	41	15	85	79	41	15				21	9	13.7	
22	20	37	30	54	50	37	30	86	80	37	30				22	9	40.1	11
23	21	33	45	55	51	33	45	87	81	33	45				23	10	6.4	
24	22	30	0	56	52	30	0	88	82	30	0				24	10	32.8	12
25	23	26	15	57	53	26	15	89	83	26	15				25	10	59.2	
26	24	22	30	58	54	22	30	90	84	22	30				26	11	25.5	13
27	25	18	45	59	55	18	45	91	85	18	45				27	11	51.9	
28	26	15	0	60	56	15	0	92	86	15	0				28	12	18.3	14
29	27	11	15	61	57	11	15	93	87	11	15				29	12	44.6	
30	28	7	30	62	58	7	30	94	88	7	30				30	13	11.0	15
31	29	3	45	63	59	3	45	95	89	3	45				31	13	37.4	
32	30	0	0	64	60	0	0	96	90	0	0				32	14	3.7	16

Adjuſtments.—1. *To adjuſt the axis of the pedeſtal vertical.*—This adjuſtment may be performed either by the *plumb-line* or by the *level*, both which methods we will explain in ſucceſſion. We have already ſaid that when the wire of the plumb-line will continue to biſect both the upper and lower dot, while the inſtrument is turned quite round in azimuth, its axis is vertical in all directions, but this could not be effected unleſs the plumb-line paſſing through the two dots were alſo parallel to the axis; this adjuſtment, therefore, is made partly by the ſcrews at the feet of the tripod, and partly by the ſcrew that moves the piece bearing the upper dot in a lateral direction. In the firſt place then turn the quadrant in azimuth till its plane, or, which is the ſame thing, the teleſcope lies parallel to a line joining any two of the three feet, and turn one of theſe two ſcrews till the wire biſects the lower dot, and with the proper ſcrew bring the upper dot to the ſame wire; then reverſe the teleſcope by turning 180° in azimuth, and if both dots are again biſected, the axis is vertical in the direction that the teleſcope has pointed; in the next place turn the teleſcope the ſpace of a quadrant till it points in the ſame direction as the third foot of the tripod, and make the wire biſect the lower dot by the ſcrew of this foot, and it will be found to biſect the upper dot alſo, if the firſt adjuſtment of the dot was properly made, but if not, repeat the operation till both dots are biſected in all the reverſed ſituations of the teleſcope, and then the axis will be vertical in every direction.

In making this adjuſtment by the level alone, the proceſs muſt be thus; firſt, the level muſt be made parallel to the rod on which it hangs, and ſecondly, this rod muſt be put perfectly horizontal, and the level will then be horizontal alſo, with the bubble in the middle. In order to make the level parallel to the rod, place it parallel to a line joining two of the feet ſcrews, and bring the bubble to the middle by one of the feet ſcrews in queſtion; then take off and reverſe the poſition of the level, and if the bubble is found in the middle now, the parallelism is perfect, if not, one half of the error muſt be rectified by the ſame foot-ſcrew, and the other half by the adjuſting ſcrews at the end of the rod, by releaſing one and ſcrewing up the other. A repetition or two of this proceſs will make the bubble ſtand in the middle in both of the reverſed ſituations. In the next place, with the level thus parallel to the rod of ſuſpenſion, turn the quadrant round its axis an entire ſemicircle as nearly as can be eſtimated, and if the bubble will now reſt in the middle, the rod is level, and being at right angles with the axis of the quadrant's motion, proves that this axis is vertical in every direction; but if the bubble is found to run to one end of the tube, bring it one halfway back by the rod's adjuſting ſcrews, releaſing one and fixing the other, as the caſe may be, and the other half by the proper foot-ſcrew. A repetition of this proceſs will ſoon ſettle the bubble in the middle during a whole revolution in azimuth, and then the adjuſtment of the axis is perfect, as well as of the rod and level.

2. The ſecond adjuſtment is that by which the *line of collimation* of the teleſcope is made parallel to the horizontal line that paſſes from the centre of the quadrant to zero on the limb, or quadrantal arc, at the ſame time that zero on the vernier coincides with zero on the limb. This important adjuſtment may be made in ſeveral ways, ſome of which are tedious and otherwiſe objectionable; but we will confine ourſelves to two which apply, one to the vertical, and the other to the horizontal line of the quadrant, which two methods, when duly effected, will not only check each other, but detect the error of the *total arc*, if there is any, at the ſame time; which is an acquiſition of the utmoſt importance. Firſt then, to adjuſt by the vertical line, let the axis of the quadrant be firſt made truly perpendicular in all directions by the adjuſtment we have already deſcribed, and fix on a ſtar within a few degrees of the zenith, when exactly on the meridian, and meaſure its altitude by the croſs-wire in the field of view in the uſual way, and note down the reſult; do the ſame on a ſucceſſive night ſoon after, if poſſible on an evening of ſimilar temperature, with the quadrant turned half round in azimuth, and note again the reſult; if theſe readings prove to be at equal diſtances from the point 90°, one on the quadrantal arc, and the other on the arc of *exceſs* beyond 90°, the horizontal wire is truly placed in the eye-piece, but if not, *half* of the difference of the readings muſt be corrected by the proper ſcrew for raiſing or lowering the ſaid wire. This may be done by directing the teleſcope to a diſtant mark till the croſs-wire biſects it, then by moving the ſcrew of ſlow motion of the vernier the *half quantity* required, and by bringing back (up or down) the croſs-wire thus diſplaced to its original mark again. This operation repeated will place the croſs-wire in ſuch ſituation, that zero on the vernier will be in its proper place with reſpect to the point 90°; or the *half difference* thus aſcertained may remain, without altering the croſs-wire, as an *error of adjuſtment* to be conſtantly applied with the ſign + or −, as the caſe may be, in all ſubſequent obſervations. Again, to adjuſt by the horizontal line paſſing through zero of the quadrantal arc, it will be neceſſary to have a ſecond teleſcope turning on pivots in adjuſtable Ys attached to the back of the quadrant, on the ſame level with the ſaid horizontal line of the quadrant. This teleſcope may be called the *adjuſting* teleſcope, and may be alſo uſed to *watch* a diſtant mark, before and after an altitude is taken, in order to detect any deviation in the poſition of the vertical axis, that may happen during the operation of meaſuring. Let the adjuſting teleſcope biſect a fine diſtant mark with its croſs-wire, and turn the tube of the teleſcope round one halfway on its pivots, as it lies in a horizontal poſition, and if the wire now biſects the ſame mark it is truly fixed, if not, look out for a new mark a little higher or lower, as the caſe may be, and make it cut that in the reverſed poſitions of the croſs-wire, by means of the proper ſcrew for this purpoſe; now this adjuſting teleſcope will be adjuſted for collimation: in the next place, put zero on the vernier to zero on the limb, and direct the teleſcope of obſervation to the ſame diſtant mark, by which the adjuſting teleſcope had its wire adjuſted, and let this mark be biſected by both teleſcopes, the level and plumb-line at the ſame time ſhewing that the vertical axis is perpendicular; now turn the quadrant half round in azimuth, and reverſe the adjuſting teleſcope ſo as to view the ſame diſtant mark again, and if it is found to biſect it as before, the horizontal line of the quadrant is right, and alſo the quadrantal arc without error, ſuppoſing the teleſcope of obſervation to have its adjuſtment for collimation as fixed by the point 90°, above deſcribed; but if this adjuſtment of the point zero on the limb be *firſt made*, half the apparent error muſt be rectified by the ſcrew at the eye-piece, by means of reverſed poſitions and new marks; and then afterwards the adjuſtment by a ſtar near the zenith will detect the error of the whole arc. If, however, no error in the total arc exiſts, then the adjuſtment for collimation may be made either from the horizontal or from the vertical meaſurement, as may be moſt convenient; one of which is more practicable by day, and the other by night. When this delicate and very eſſential adjuſtment is finally ſettled, the object-glaſs of the teleſcope ſhould not be diſturbed, and therefore it would be adviſeable to have its interior ſurface well cleaned previouſly.

It was taken for granted that the croſs-wire was perfectly

horizontal during the time the preceding adjuſtment was made, or, which is the ſame thing, that the parallel vertical wires were perpendicular to the horizon. This is proved in a ſimple manner thus; direct the teleſcope to a fine ſmall diſtant mark, and make the adjuſtment for viſion, if neceſſary; then if one of the vertical wires will continue to biſect the ſaid mark through the whole field of view while the teleſcope is elevated or depreſſed, the wires are right, but if not, they muſt be made ſo by the proper ſcrews for that purpoſe, near the focus of the eye-glaſs. This preparation ought to precede the laſt adjuſtment, and when once made, ſeldom requires altering, except in caſe of accidental injury.

It has alſo been aſſumed in the preceding adjuſtment, that the maker of the inſtrument placed the plane of the quadrant parallel to the axis of its motion, and alſo the line of collimation of the teleſcope parallel to the ſaid plane. The former may be known to be true thus; if, when the plumb-line is adjuſted, at its centre of ſuſpenſion, juſt to eſcape touching the limb, (which ſhould always be the caſe,) the quadrant's motion in azimuth will not alter it in this reſpect, the plane is truly fixed; but if not, the ſcrews, that fix the quadrant to its axis, muſt be reſorted to for the alteration, which is beſt done by the maker. When there is no plumb-line, a ſmall ſpirit-level, fixed at right angles to the plane of the quadrant, will anſwer the ſame purpoſe; for the reſting of the bubble during the quadrant's revolution in azimuth, will be a proof that the plane to which it is at right angles is vertical. With reſpect to the parallel poſition of the teleſcope, as this is guided by the vernier ſliding on the limb, it is the buſineſs of the maker to adjuſt it properly, which he will beſt do by a compariſon with a good tranſit inſtrument of the paſſages of a high and of a low ſtar in each of the two inſtruments; but a *ſmall* deviation of the teleſcope with reſpect to parallelism, though to be avoided if practicable, will not ſenſibly affect the meaſurement of altitudes, which is the ſole buſineſs of this inſtrument. If, however, this deviation is conſiderable, the eye-end of the teleſcope muſt be ſet nearer to or farther from the limb, as the caſe may be, by the maker himſelf. We have been the more minute in deſcribing theſe adjuſtments, not only becauſe they are indiſpenſably neceſſary in making good obſervations, but becauſe they will apply, one or other of them, by means of the plumb-line, or of the ſpirit-level, to all other aſtronomical quadrants that have a motion in azimuth.

We have before us the drawing of a large and beautiful quadrant made by Mr. Cary, for Leopold, the late grand duke of Tuſcany, with two teleſcopes and a graduated azimuth circle, but the deſcription we have given of Ramſden's inſtrument will equally apply to his, except as to the dimenſions.

Portable Aſtronomical Quadrant by Troughton.—Though we have deſcribed Ramſden's portable aſtronomical quadrant with much minuteneſs, and have detailed the moſt uſeful methods of making ſuch adjuſtments as will apply to the other portable quadrants that have a motion in azimuth, yet we ſhould do violence to our own feelings, as well as to the ingenuity of an exiſting artiſt of the firſt eminence, if we withheld from the public eye the great improvements that he has made in this inſtrument ſince the death of Ramſden. *Fig.* 6. of the ſame plate that contains Ramſden's inſtrument, is a reduced perſpective view of the improved aſtronomical quadrant of Troughton, which was made by him and ſent to Bilboa in Spain, about the time that aſtronomical circles began to be conſtructed. It has been aſſerted, under our article CIRCLE, that this inſtrument, as conſtructed by Troughton, (and we may now add, by Thomas Jones, who has learnt his mode of dividing,) is greatly ſuperior to any quadrant that can be made, on account of properties which the circle excluſively poſſeſſes; but ſo far as a quadrant's accuracy can be depended on, Troughton's improved conſtruction is to be preferred to all others. And, indeed, when we conſider that ſimplicity, ſteadineſs of performance, and permanence of the adjuſtments once made in this inſtrument, are properties which it peculiarly poſſeſſes, along with comparative cheapneſs, it is probable that there will always be purchaſers, when ſuch an inſtrument is on ſale, provided the improver will conſent to make ſuch inſtrument with limited powers, when he can have rapid ſale for thoſe which he now conſtructs, with all the advantages that the circle affords.

The radius of this quadrant is three feet, and the body is made double, that is, of two quadrantal frames united into one, by ſmall pillars holding their planes parallel, and enſuring the two properties, not often united in other men's inſtruments, of lightneſs and ſtrength at the ſame time. The tripod, on which the quadrant is ſupported, is a frame of mahogany, braced in different directions, ſo as to reſiſt any ordinary preſſure, when the quadrant is put in motion, or the teleſcope uſed. The three feet-ſcrews are furniſhed with each a Hooke's joint and long handle, ſo that the obſerver may make an adjuſtment with any of theſe ſcrews without ſtooping, and conſequently without withdrawing his attention from the plumb-line apparatus, or ſpirit-level, that indicate the quantity of adjuſtment that may be neceſſary from any individual ſcrew. About the middle of this pedeſtal, or frame-work of the tripod, is a three-armed horizontal bracing piece, on which the ſtem of the quadrant reſts; and this ſtem is kept vertical by a ſocket of braſs made faſt to the centre of the table, that ſurmounts the pedeſtal, in which ſocket the vertical axis turns both ſteadily and freely, while it reſts on the three-armed bracing piece below. The azimuth or horizontal circle is centered on this axis, but ſo as to admit of a motion round it of about two degrees, for the purpoſe of putting the zero of the quadrant right when the teleſcope is in the plane of the meridian. This ſmall motion is produced by the tangent ſcrew ſeen in front, and the other tangent ſcrew regulates the ſlow motion of the teleſcope and vernier, by taking hold of the ſolid vernier plate, that reads at oppoſite points, and that may be clamped, when in uſe, to the azimuth circle, which is alſo a ſolid circular plate of braſs, ſubdivided into 10′ ſpaces, and reading by the verniers alone to 10″.

The vernier or index-plate is of conſiderable depth, and hollow, terminating with a chamfered edge below, and contains in it a triangular frame not ſeen, ſoldered to it, and oppoſed, for the ſake of ſtrength, by another ſimilar frame ſeen above its plane. From the frame within the hollow index-plate ariſe three ſmall pillars, which ſupport the upper triangular frame at the three corners, and paſſing through it receive ſo many milled nuts on their tapped ends, by which means the whole are compactly united. Theſe milled nuts are uſeful for adjuſting the plane of the quadrant parallel to the vertical axis of the quadrant's motion in azimuth; and it is here where the quadrant is to be ſeparated from the ſtand for cloſe package. Upon the upper triangular frame is ſoldered faſt a ſhort but ſtrong conical tube, that ſupports the long column that terminates with a ſupplementary cone. From nearly the lower extremity of this long column a couple of braces aſcend about twenty inches to the upper part of the body of the quadrant, and, by being made faſt to it, complete the ſteadineſs of the ſtructure in an admirable manner. The teleſcope, which is about forty-two inches long, and achromatic, as well as furniſhed with an adjuſtable ſyſtem of Spider's threads, tapers from the object-glaſs down-

downwards, to prevent any inclination to bending by its weight, and has an axis of motion of four inches and a half long, that paſſes through the thick pillar, that connects the two quadrantal portions of the double frame at the exact centre of motion, and of the divided arc. The counterpoiſe is applied at the redundant end of the teleſcope, and the vernier borne by its end, near the eye-piece, divides the 5′ ſpaces of the vertical arc into 5″, while a micrometrical microſcope, attached to the metal of the teleſcope, ſubdivides this laſt quantity into *ſingle ſeconds*. A nicely ground ſpirit-level hangs on the horizontal bar, with its proper adjuſtment apparatus, which alone will aſcertain the poſition of the quadrant to a *ſecond;* but, as if this were not ſufficient, a plumb-line is made to deſcend, free from duſt, or agitation by the wind, from an adjuſtable point of ſuſpenſion through the hollow column, where there is little or no diſturbance from a motion in azimuth, and enſures the poſition ſtill more certainly. The water veſſel in which the plummet is immerſed, to prevent vibration, is contained in the hollow ſhort cone before deſcribed, as containing a triangular frame within it, and the ſituation of the wire is examined in two directions, at right angles to each other, by microſcopes looking acroſs the bore of the column, at a convenient height for the obſerver to ſee without a change of poſition of his body, when he has been juſt obſerving at the teleſcope. The mark uſed for each wire to biſect is a luminous diſc, known by the name of *Ramſden's ghoſt*, from its being only the *image* of a luminous point without ſubſtance, occaſioned by a contracted aperture of a tube, fixed at the remote ſide of the column into which light enters, and by which it is directed without parallax. Beſides theſe appendages, there is a ſecondary or adjuſting teleſcope, ſuch as the elder Siſſon made for his ſpirit-level, and ſuch as we have already deſcribed, as furniſhing the means of adjuſting the horizontal line of a quadrant that moves in azimuth, and of aſcertaining the error of the whole quadrantal arc, by compariſon with the adjuſtment by a ſtar near the zenith. (See *Portable Aſtronomical Quadrant by Ramſden*, before deſcribed.) Laſtly, the radial bars that bear the quadrantal arc, taper downwards from the centre, thereby giving ſtrength to the part moſt liable to alter its figure by weight, as it is ſuppoſed Bird's mural quadrant has done in a ſmall degree for want of ſuch precaution. This quadrant has an arc of exceſs at each end, and is capable of all the adjuſtments we have above deſcribed in an exquiſite degree.

Of Nautical Quadrants, meaſuring by Reflection.

Sir Iſaac Newton's reflecting Quadrant.—A manuſcript account of a quadrant, meaſuring altitudes and diſtances by reflection, of the hand-writing of ſir Iſaac Newton, was found among the papers of Dr. Halley after his death, which quadrant, according to Stone, was actually made in the year 1672, when Dr. Halley was preparing to go to the South ſeas, to make an addition to his catalogue of fixed ſtars; but the manuſcript account was not produced, or even mentioned, when Hadley's inſtrument was ſhewn to the Royal ſociety, nor was made known till the year 1742. (See Phil. Tranſ. N° 465.) Hence ſome doubt has been entertained whether ſir Iſaac Newton or Hadley was the firſt inventor of the reflecting quadrant. The moſt probable inference is, that each invented his own, ſeeing that though the principle is the ſame in both conſtructions, yet the mode of applying it is different, as will be ſeen from a compariſon of the figures, and from our deſcription of each in ſucceſſion. Sir Iſaac Newton's quadrant was preſerved for ſeveral years at the houſe of Mr. Heath, who was a mathematical inſtrument maker in the Strand, London, and it is probably in exiſtence at this time. Dr. Hooke is alſo ſaid, by Dr. Pratt, to have invented a quadrant that was, or might be, uſed at ſea with one reflection only; and, indeed, he is aſſerted to have been the firſt man who propoſed the uſe of a *mirror* in a nautical inſtrument. See CIRCLE.

Sir Iſaac Newton's quadrant, repreſented by *fig.* 7. of *Plate* I. of *Aſtronomical Inſtruments*, conſiſts of an entire ſectoral plate of braſs, P Q R S, to the plane of which the teleſcope A B is fixed and lies parallel, and an index, which is moveable about an axis of motion at A. The limb D Q was accurately divided into half degrees, and, as is ſaid, half minutes, on a ſcale of four feet radius, and was ſubdivided by a diagonal ſcale into $\frac{1}{12}$th of a minute. The principle on which this ſemi-diviſion is founded is this; *viz.* "If a fixed ray of light be reflected at a plane reflector, and if the reflector be made to revolve about an axis perpendicular to the plane paſſing through the incident and reflected rays, which may be called the plane of reflection, the angular velocity of the reflected ray will be *double* to the angular velocity of the reflector." See Vince's Practical Aſtronomy, p. 7, &c.

Hence one ſmall mirror, G, is made faſt to the plane of the ſectoral plate, and perpendicular thereto, but inclined in an angle of 45° to the axis, or length of the teleſcope, and in ſuch a way, as to cover one half of the aperture, while another ſimilar mirror is borne by the index, in ſuch a poſition, that when the index is at zero, both the mirrors are not only perpendicular to the plane of the quadrant, or rather octant, but are parallel to each other. Now, according to the principle that we have juſt mentioned, when the index is moved forward, a ray of light from any fixed luminous body, when caught by the index mirror, will be reflected on the fixed mirror, and an eye directed through the fixed teleſcope towards the ſaid body, will ſee it divide into two bodies the inſtant that the index begins to move; that is, the body itſelf will be ſeen *ſtationary* through one half of the teleſcope's aperture, and its *image* will be ſeen in the other half *in motion*, and this motion has double the velocity that the index has, which bears the revolving reflector; and on this account it is, that the diviſions for half degrees and half minutes, are read as whole degrees and whole minutes, as well as the $\frac{1}{12}$th read as $\frac{1}{6}$th by the diagonal ſcale. From this ſhort explanation of the principle and ſtructure of ſir Iſaac Newton's reflecting quadrant, it is eaſy to perceive that the conſtruction is derived immediately from the principle in the ſimpleſt, though in practice not the beſt manner; for the inſtrument itſelf illuſtrates the principle in the moſt obvious way; but, from its magnitude and mode of being uſed, it is very inconvenient to be ſupported without a ſtand, which on board a ſhip is inadmiſſible.

Perhaps it might be on this account that Dr. Halley did not pay more attention to it than he appears to have done, according to the information that we at this diſtance of time poſſeſs. However, it is evident, that the inſtrument before us is capable of meaſuring either vertical, horizontal, or oblique angles, in the way it profeſſes.

Cole's Quadrant by ſingle Reflection.—*Fig.* 2. of *Plate* XXIII. of *Aſtronomical Inſtruments*, is the figure of an inſtrument, which, like Dr. Hooke's contrivance, meaſured altitudes by ſingle reflection, as we conceive, the drawing having fallen into our hands without the deſcription. An arc compoſed of an entire quadrant, and an index with a ſingle mirror fixed to it at its centre of motion, conſtitute its leading features, while a ſight-vane, at the remote end of the prolonged index, inſtead of a teleſcope, has a plane hole, through which the ſun is viewed after reflection from the index-glaſs, his rays having firſt paſſed through a coloured

glaſs.

glaſs. This conſtruction, with the addition of ſir Iſaac Newton's ſecond mirror, would conſtitute an union of two inſtruments, that would greatly reſemble the combination adopted by Mr. Hadley, which follows next in our liſt of quadrants; but which may not have been copied from ſuch union; for Cole has got the vernier ſcale, which is preferable to the diagonal one adopted by Hadley, and therefore probably he followed Hadley, though the quadrant before us has not recommended itſelf to general uſe, as being an improvement.

Hadley's Quadrant.—As we cannot help conſidering Hadley's *quadrant*, or more properly *octant*, as a near relative at leaſt to his friend ſir Iſaac Newton's, we will deſcribe it next in order, while the principle of its conſtruction is freſh in the reader's memory. The circumſtance of Mr. Hadley's being preſident of the Royal Society was favourable to the early notice of his inſtrument; and the intereſt that the Britiſh nation took, and muſt ever take, from its inſular ſituation, in nautical improvements, contributed to its early adoption, at a time when ſuch an inſtrument was greatly wanted.

Mr. Hadley, we learn, tried various modifications in the conſtruction, but that which has been approved from long uſage is the one we ſhall ſelect for deſcription. *Fig.* 1. in *Plate* XXIII. of *Aſtronomical Inſtruments*, is the repreſentation of Hadley's octant, as it is now conſtructed with a vernier, which it had not at firſt, and which is preferable to the diagonal diviſions at firſt applied by Hadley, as well as by ſir Iſaac Newton. For the ſake of lightneſs, united with ſtrength, the frame of the inſtrument, when made of any of the hard woods, is put together uſually as is repreſented in the figure, but when made all in braſs, and particularly when the limb is extended to 120 half degrees, reading as 120°, in which caſe it is called a *ſextant*, the beſt modern makers make it double; that is, have two ſeparate light frames, united by ſhort pillars, ſtanding at right angles to their planes, which thus become parallel. This conſtruction, we believe, was introduced by Mr. Troughton, and allows a more ſteady motion to all the moveable and adjuſtable parts, by lengthening their axes of motion, which penetrate acroſs both parts of the double frame, and by that contrivance have longer bearings. But we are now propoſing to deſcribe a quadrant of Hadley's own conſtruction. A B C is a frame of ſome hard wood, ſuch as ebony, which may be of any convenient radius, from eighteen inches downwards to three, or leſs, if required for the pocket, and A D is the index bearing the vernier at D, together with the uſual clamping apparatus for ſlow motion, in making the contact in any obſervation. This apparatus, together with the powers of the vernier, and mode of uſing it, have been explained under our article CIRCLE, (ſee alſo VERNIER,) and therefore may be referred to by the reader unacquainted with their uſes. When the radius is very ſmall, the vernier ſubdivides half degrees, and has thirty diviſions on it, but has twenty or fifteen, accordingly as the degree of the limb is ſubdivided into *thirds* or *fourths* of a degree. The peculiar excellence of this inſtrument, either in the form of an octant or ſextant, is, that all ſorts of angles can be meaſured with it on board a ſhip, even while the ſhip is toſſed by the waves; and alſo, that it requires no other auxiliary means, than the natural horizon, which at ſea is always, or moſtly preſent, when a heavenly body can be ſeen. The plumb-line and ſpirit-level are equally diſpenſed with: to which may be added, that, if any accidental injury be received, a circumſtance not improbable in the hands of ſailors, the adjuſtments are ſo ſimple, that, generally ſpeaking, the derangements may be eaſily rectified. In the beſt inſtruments, a ſmall teleſcope is ſcrewed into the ſight-vane, which not only prevents parallax, by limiting the line of ſight between two parallel wires, but aſſiſts the ſight greatly in obtaining exact contacts. There is uſually an arc of exceſs at each end of the limb, one of which is uſeful in adjuſting the index-error by the ſun or moon, and the other is ſerviceable when angular diſtances are meaſured beyond a quadrantal arc; indeed it would be well if the arc were always extended to meaſure 120°, or more, for then a ſextant would be competent to meaſure all ſorts of angles that the mariner can require, to find his latitude, time, and longitude.

When the octant has not the tangent ſcrew of ſlow motion for adjuſtment in making the contact, the index is nicely moved by hand, and then fixed by a ſcrew behind it for this purpoſe, and in either caſe the examination and noting down of the altitude, or horizontal angle taken, may be read at any time, for hours afterwards, which is another important advantage that this inſtrument poſſeſſes in common with the ſextant; for where more obſervers than two are not preſent, one obſerver may thus manage to take both an altitude and a diſtance in a lunar obſervation with two ſeparate inſtruments in quick ſucceſſion, while another obſerver is taking the altitude of the ſecond object; or with the help of Margett's horary tables, the ſecond altitude may be had by inſpection, when the hour, latitude, and declination of the body are known, in which caſe *one obſerver* can take a lunar obſervation with tolerable accuracy. The limb of the inſtrument is beſt of metal, ſuch as braſs, ſilver, or platina, when made and divided in the beſt way by a ſuperior dividing engine, ſuch as Troughton's; but in ordinary inſtruments a piece of ivory is frequently let into the wood, and ſometimes the diviſions are made even on the wood itſelf, which is liable to be affected by moiſture. The index is moſt frequently entirely of braſs, and wider as it aſcends to the centre of motion, to prevent lateral bending, which would deſtroy the accuracy of the readings. When an obſervation is made by the larger ſort, the right hand ſhould be applied to the lower extremity of the index to give it ſteady motion, while the left holds the lower end of the remote radial bar; and the plane of the inſtrument muſt be kept in the line that joins the two objects, of which the horizon is one, when an altitude is taken, and then the inſtrument is held vertical. In bringing down the image of an object to the horizon by a *fore* obſervation, the body of the obſerver muſt gradually incline towards the horizon, and a little vibrating motion will aſſiſt in determining the exact plane of contact; but in taking a horizontal angle, the obſerver will handle the inſtrument as beſt ſuits his convenience. The mirror at A is placed over the centre of motion of the index, in a direction pointing to zero on the vernier, and perpendicular to the flat face of the index: this index-glaſs, being completely ſilvered, reflects the light it receives directly at right angles on the glaſs E, when the zero of the vernier is at the zero of the limb; but as the limb proceeds forwards, this angle alters, and, as we have ſaid, is *double* of the meaſure of the real angle to be meaſured and indicated. This glaſs E is alſo fixed perpendicular, and has ſcrews of adjuſtment for perpendicularity above its ſocket of braſs, and a tail-piece with a fixing-ſcrew behind the frame, for fixing the parallelism; the want of which is called the *index-error:* one half only of this glaſs, which is called the *fore-horizon* glaſs, is ſilvered, and the other half remains unſilvered, in order that both the direct rays tranſmitted through the unſilvered part, and the reflected rays coming from the ſilvered part, may meet at the eye, on which account the middle of this glaſs, where the line of ſeparation croſſes, is the part to be viewed

viewed in making a contact, otherwiſe both the image of one object, and the ſubſtance of the other, could not be ſeen at the ſame inſtant. F is the ſight-vane, with two holes, uſually an upper and a lower, inſerted into the firſt radial bar of the frame, ſo that the holes are at the ſame diſtance from the plane of the inſtrument as the line of ſeparation is in the half-ſilvered glaſs E, to prevent parallax of the reflected rays, and in the beſt inſtruments this vane, with its teleſcope, has an adjuſtable motion to and from the plane, in order that more or leſs light may fall on either of the bodies obſerved, which is not only uſeful, but neceſſary, in taking a lunar diſtance; for by this adjuſtment the image of one body may be made as luminous as the real body of the other, by increaſing the light of one, while it decreaſes that of the other; that is, by making more of the ſilvered, or of the unſilvered part of glaſs E, fall before the object-glaſs of the ſmall teleſcope, when this adjuſtment is neceſſary. It may be neceſſary to obſerve here, that every ſilvered glaſs of ſenſible thickneſs has two reflections, one on the anterior, and the other, which is the principal one, on the poſterior or ſilvered face, and in many caſes errors may be occaſioned by theſe double reflections; to remedy which, Dr. Maſkelyne propoſed, that the ſilvered portion of the poſterior face ſhould be ground rough and painted black, taking care that the grinding be ſo performed, that the line of ſeparation between the poliſhed and unpoliſhed parts be parallel to the plane of the octant. In the *back* horizon-glaſs, which is that ſeen with its ſight-vane at G, with adjuſtments ſimilar to thoſe of the *fore* horizon-glaſs at E, the whole poſterior face is ſilvered, except a ſlit, that divides it in a line parallel to the plane of the frame, through which ſlit the body is obſerved in a back obſervation. But when the ſun is the body obſerved, his light is generally too intenſe for the eye to bear, particularly when the ſmall teleſcope is uſed; to render the rays tolerable to the eye, a coloured glaſs, or glaſſes, muſt be interpoſed, and a blank tube inſtead of a teleſcope be uſed, by which means the ſun may be viewed without doing injury to the eye; and uſually a ſyſtem of coloured glaſſes are ſlided into a ſquare hole, as at H, and a joint in each allows them, or any one of them, to be brought forwards into the ſituation where the direct rays muſt paſs to the eye. The ſame remedy is alſo ſometimes applied at the eye-piece of the blank tube, when the ſun alone is obſerved. The plane of the back horizon-glaſs is placed not only parallel to the plane of the frame, but at right angles to the plane of the fore horizon-glaſs, in order that the ſame readings may apply in both kinds of obſervation, and this object was effected by the maker by the ſimple rectangular poſition of the two horizon glaſſes to each other, and by reverſing the poſition of the body in making a back obſervation; for as the inclination of the index-glaſs to the fore horizon-glaſs gives *double* the angle directly meaſured; ſo *twice* the *complement* of this inclination to the back horizon-glaſs gives the ſame quantity, and on the ſame part of the graduated limb, when meaſured in a reverſed poſition.

Adjuſtments.—The adjuſtments of every inſtrument are of the utmoſt importance to the accuracy of obſervations taken thereby, but they are particularly ſo in the inſtrument before us, becauſe a ſmall deviation from parallelism in the fore horizon-glaſs, or from perpendicularity in the back horizon-glaſs, as compared with the index-glaſs, (with the vernier at zero of the limb,) will *double* the *error* occaſioned by it in the quieſcent ſituation, as ſoon as motion is given to the index-glaſs. 1. The firſt adjuſtment is, *to ſet the index-glaſs perpendicular to the plane of the inſtrument:* this is done by firſt ſliding the index to about 40° or 45° of the limb, while the octant is held with its plane nearly parallel to the horizon, then a glance into the index-glaſs will ſhew, whether the ſharp edge of the limb ſeen by reflection, is an exact and ſtraight continuation of the ſame edge of the limb ſeen by direct viſion, and if this is not the caſe, it muſt be made ſo by the ſcrews that adjuſt the bed of the mirror; and in all caſes where two ſcrews are to be uſed, one muſt be releaſed as much as the other is ſcrewed inwards. Dr. Mackay propoſes to place two ſmall pieces of metal as adjuſting tools, with each a horizontal line drawn on it, at equal heights from the plane of the limb, at ſome diſtance from each other, ſo that the horizontal line of one may be a continuation of the horizontal line of the other, when one is viewed by reflection, and the other by direct viſion, but the ſharp edge of the inner part of the limb will anſwer all ordinary purpoſes. 2. The ſecond adjuſtment is, *to ſet the fore horizon-glaſs perpendicular to the plane of the inſtrument:* this is done by firſt fixing the zero of the vernier at zero on the limb, and while the plane of the frame is held parallel to the horizon, by applying the eye to the lower hole of its ſight-vane; then if the horizon, or any diſtant horizontal line, appear to be a ſtraight line, the glaſs is placed perpendicular already; but if the parts ſeen by reflection and by direct viſion do not conſtitute a ſtraight line, they muſt be made to do ſo by the ſcrews at the bed of the glaſs, one or other of which muſt be ſcrewed in, as the fracture of the line demands; that is, if the line ſeen by reflection appear *above* that ſeen by direct viſion, that ſcrew muſt be urged *inwards* which is on the *farther* glaſs, and *vice verſâ*, until the fractured line be ſtraight. 3. The third adjuſtment is, *to rectify for the index-error* of the fore horizon-glaſs, or to place it parallel to the index-glaſs, when the zero of the vernier is placed at zero on the limb. To do this properly, a bright diſtant object muſt be choſen, ſuch as the ſun, moon, or ſtar, and while the zeros coincide, look through the vane, or teleſcope, and obſerve if the body and its image coincide; that is, if the image is inviſible: in this caſe, the fore horizon-glaſs is parallel to the index-glaſs, or is truly adjuſted; but if not, releaſe the tail-piece or lever behind this horizon-glaſs, and with the thumb-piece give it a ſmall motion, till the body and its image coincide, in which ſituation it muſt be fixed by the fixing nut before releaſed. Sometimes the act of ſcrewing will diſplace in ſome degree the tail-piece, and thereby again occaſion a ſenſible index-error. When this cannot be completely avoided, the error muſt be aſcertained and allowed for with its ſign + or − in every ſubſequent obſervation, while it remains unaltered. This error may be aſcertained by meaſuring the diameter of the ſun, firſt forwards on the limb, and then backwards on the arc of exceſs, and one half of the difference of the meaſures will be the *index-error* + or −, as the caſe may be. 4. The fourth adjuſtment is, *to ſet the back horizon-glaſs perpendicular to the plane of the inſtrument:* this adjuſtment is ſimilar to the ſecond, and may be performed by the directions there given, ſuppoſing them to be for the back horizon-glaſs and its vane, inſtead of the fore horizon-glaſs. 5. The fifth and laſt adjuſtment is, *to ſet the back horizon-glaſs perpendicular to the plane of the index-glaſs produced, the zero of the vernier being placed at zero on the limb:* this adjuſtment at ſea is performed thus; let the vernier be put as much to the right of zero, as is equal to twice the dip of the horizon, in the ſituation where the obſerver ſtands, then hold the quadrant in a vertical poſition, and apply the eye to the back-horizon vane: now, if the horizon ſeen by reflection happen to coincide with that ſeen by direct viſion, the glaſs is already right; but if not, the lever or tail-piece behind the frame at this place muſt be releaſed by the proper fixing

ſcrew,

ſcrew, and turned ſlowly by the thumb-ſcrew or nut, till this coincidence is perfect, and then the lever muſt be made faſt again; the reflected horizon will be inverted when viewed in the manner here deſcribed. When the inſtrument is uſed in a back obſervation on the land, which is not likely to happen often, the adjuſtment will require ſome artificial aid: by Dollond's method, an index is applied to the back horizon-glaſs, by which it may be put parallel to the fore horizon-glaſs, by the third adjuſtment applied thereto, and then, by a graduated arc of 90°, inſerted on purpoſe, the index of the back horizon-glaſs is ſet perpendicular to its former ſituation, and conſequently is made perpendicular to the plane of the fore horizon-glaſs. By Mr. Blair's method, the under edge of the index-glaſs is ground and poliſhed, ſo as to be at right angles to the plane of the glaſs, and hence the back horizon-glaſs is adjuſted, by making the direct and reflected horizons agree, while the vernier ſtands at zero on the limb, exactly as is done in the third adjuſtment. But we are to ſuppoſe the inſtrument not furniſhed with either of the above named auxiliary means; when this is the caſe, a long level ſpace muſt be choſen in ſome common or park, where three ſtaves can be put up in the ſame ſtraight line exactly, and at an interval from each other of not leſs than 500 yards, but if 600 or 700 the better; then, the vernier being truly placed at zero, let the plane of the octant be held horizontally with its back horizon-glaſs exactly on the top of the middle ſtaff, and let one of the rods be viewed directly through the back ſight-vane, then if the other rod, ſeen by reflection, coincide with it, the poſition of the back horizon-glaſs is true, but if not, it muſt be made ſo, by the tail-piece behind, as before directed; if in fixing the tail-piece a derangement ſhould take place, which cannot be *exactly* done away by a ſecond or third trial, then the index-error for the back obſervation muſt be aſcertained.

This error may be obtained by reverſed obſervations by two methods; thus, let the coincidence of the two extreme ſtaves be made from the middle ſtaff as juſt directed, by a motion of the vernier, inſtead of the tail-piece of the back horizon-glaſs, and read the quantity moved forwards or backwards; then turn the downward face of the frame upwards, and repeat the operation, and read again; now, if theſe two readings are found to be one on the limb, and the other on the arc of exceſs, half of their difference will be the error ſought, + or −; but if they both are read on the ſame ſide of zero, half their ſum, + or −, will be the error; when they are both read on the limb, or if the greater quantity be read on the limb, when the leſs is on the arc of exceſs, the ſign will be −, and *vice verſâ*. By the ſecond method, inſtead of reverſing the plane of the inſtrument, let the obſerver reverſe his poſition, making the right-hand ſtaff to be the left-hand one, and *vice verſâ*, and then let him repeat his firſt obſervation, with the ſame face of his inſtrument up that he had in that, and the ſame reſult will follow, that was obtained by reverſing the plane of the inſtrument. Theſe two modes of obtaining the error in queſtion, by reverſed obſervations, may be made to check each other, and will then give an average of the two reſults, for the error to be applied to each ſubſequent obſervation, taken with the back horizon-glaſs in its laſt determined poſition.

Examination of the Inſtrument.—Theſe ſeveral adjuſtments being finiſhed, the obſerver might proceed to make his obſervations, provided he could rely on the ſkill and credit of the maker of his inſtrument; but if not, he would act prudently to examine the materials of which it is compoſed, before he relies on its performance, and alſo to put to ſome teſt the accuracy of the diviſions on the vernier and limb, as well as the care that has been taken in ſelecting glaſſes of uniform thickneſs, and of good poliſh. The exactneſs of the total arc may be aſcertained from compariſon with meaſurements taken with a circle, or ſome well-known ſuperior inſtrument; or by careful trigonometrical meaſurement on ſome level and extenſive ground, where the ſides of the triangle can be accurately meaſured, for which purpoſe Troughton's new chain of five-feet links is admirably calculated: but the intermediate diviſions may be examined by the vernier itſelf, by ſtepping the arc with it; and if all parts of the arc are found alike divided, when examined by the coincidence of the extreme ſtrokes of the vernier, the intermediate ſtrokes of the vernier itſelf may laſtly be examined by the ſtrokes on the limb taken in various places. Dr. Mackay recommends a table of corrections to be made, in caſe of errors being detected in the dividing, but we ſhould rather recommend new diviſions from a good engine, the inſerting of which can now be performed at a trifling expence. When the planes of the mirrors are examined, try if a candle reflected appears in two images; if it does, the two faces of the glaſs are not parallel, and conſequently the glaſs is not fit for its purpoſe.

To try whether the ſurfaces of the mirrors be perfect planes, bring two diſtinct diſtant objects into good contact, and let them be ſeen at the upper edge of the ſilvered part; then move the inſtrument in its own plane, and move the image and body along the line of ſeparation or edge of the ſilvered part, and if the coincidence is not diſturbed the plane is perfect, but not otherwiſe. Alſo, when an obſervation is taken of the ſun, and the vernier has been fixed by the fixing ſcrew, read the altitude, as the dark glaſs, or glaſſes, may have been uſed; then remove them from the ſocket that holds them, and reverſe their planes, by putting their remote faces neareſt; and if, after this change, the ſame altitude is given, the planes are parallel, otherwiſe *half the difference* muſt be applied, in all ſuch caſes, as an *error* of the *coloured glaſſes*. This examination is beſt made exactly at noon, when the ſun's altitude is not ſenſibly changed during the examination; unleſs a good chronometer or regulator, duly regulated, and put to exact time, be at hand; for then the ſucceſſive examinations may take place at equal diſtances from noon. Or the ſame thing may be done by means of a luminous object placed at a diſtance, and ſo elevated, that an artificial horizon may give its *double* altitude before and after the coloured glaſſes are reverſed in poſition. The beſt artificial horizons are either a veſſel of pure mercury, with a roof of good glaſs framed over it to prevent agitation by the wind; or otherwiſe a piece of black glaſs, well poliſhed, and placed on ſcrews of adjuſtment, with a good ſpirit-level in a glaſs tube, ſo ground, that it will reverſe in poſition, and will place the glaſs in a perfect level in the two requiſite directions, at right angles to each other.

It may be proper to examine further if the two holes in the ſight-vane are ſo made that the ſun or other luminous body dazzles the eye more in looking through one, than in looking through the other, the intention being that one ſhall take in more of the ſilvered part, and the other more of the unſilvered part of the glaſs, ſo as to accommodate the quantity of direct light to the ſtrength of the eye.

Illuſtration of the Uſe.—When Hadley's octant, or ſextant, is uſed for altitudes at ſea, the ſun, moon, or ſtar, as the caſe may be, muſt be viewed in the way that the eye can beſt bear, with or without the dark glaſſes, teleſcope, &c. as occaſion may require, and as experience will dictate; and in a fore obſervation the body obſerved muſt have its image brought gradually down, ſo as to be in exact contact with the

the horizon: if the ſun or moon be obſerved, either the upper or lower limb muſt be ſubſtituted for the centre, and the obſervation muſt be afterwards reduced to the centre, by applying the ſemi-diameter, + or −, from the proper column for the given day, as given in the Nautical Almanac, or Ephemeris; in doing this, the face of the obſerver muſt be turned towards the object whoſe altitude is to be meaſured, and while the index is gradually moved forward along the limb, the image will deſcend till it approaches the horizon: in this ſituation, care muſt be taken that the contact of the image be made with the viſible horizon at the line of ſeparation, between the ſilvered and unſilvered parts of the fore horizon-glaſs, that both objects may be viſible together; and alſo that the index may not be puſhed too far, ſo as to require a retrograde motion in finiſhing the contact: therefore fix the clamping piece, if there is a tangent ſcrew, and complete the contact by a ſlow motion, and the altitude will remain unaltered till the vernier has been examined by a magnifying glaſs, which ought always to be at hand, to aſſiſt the eye in examining the coincidence of ſome one line of the vernier with ſome line of the limb; or, when there is not an exact coincidence, in eſtimating the quantity that is beyond coincidence, as compared with the contiguous quantity that is ſhort of it. To ſucceed well in perfecting a fore obſervation taken at the horizon, the obſerver muſt learn to give a vibratory ſlow motion of his body to the right and left, his heel being the centre of motion, that the image obſerved may be made to move backwards and forwards in the arc of a circle, of which the horizon is a tangent, in order that the altitude may not be taken at one ſide of the tangental point, and conſequently be too great. Care muſt alſo be taken that the faint ſecondary image reflected from the poſterior face be not miſtaken for the primary image, reflected from the proper, or anterior face of the mirror. When the altitude is marked down, as read on the limb and vernier, the corrections muſt be applied, for either the ſun or moon, for parallax, refraction, dip of the horizon, and ſemi-diameter, before the true altitude of the centre is obtained: but for a ſtar no parallax is wanted, nor yet allowance for ſemi-diameter; theſe apparently diminutive bodies being ſituated at ſuch an immenſe diſtance from the earth, as to ſubtend no ſenſible angle, nor to have any perceptible parallax in altitude.

It is from meridian altitudes thus taken, that, by the application of a heavenly body's declination, + or −, as the body may be below or above the equator, the co-latitude, and conſequently the latitude, is readily determined; and alſo, the latitude being known, from an altitude taken towards the eaſt or weſt, that the time is determined at one obſervation, but more accurately by a ſeries of equal altitudes taken at oppoſite ſides of the meridian; the reduction, however, for the ſun's change of declination during the interval, muſt, in this caſe, be taken from tables of correction for equal altitudes, ſuch as are contained in the pamphlet of the late Mr. Wales.

In making the *back* obſervation, the coloured glaſs, or glaſſes, muſt be ſelected, as before, to ſuit the eye, and the plane of the inſtrument held vertically, as in the fore obſervation, but the face of the obſerver muſt view the point of the horizon *oppoſite* the ſun, or that pointed to by his own ſhadow; firſt, let the eye be directed through the vane of the back horizon-glaſs to the tranſparent ſlit that divides the mirror, and let it view the horizon, then move the index till the image of the ſun is juſt ſeen on the ſilvered part of the glaſs; a vibratory motion now given to the octant from the eye, as the centre of motion, will make the ſun's image move in a curve of which the convex part appears uppermoſt; in this ſituation, let the ſlow motion by the tangent ſcrew, if any, bring this image till one of its limbs coincides with the horizon ſeen through the tranſparent ſlit, and the obſerved altitude will be determined as before. Whenever the horizon is clear both before and behind the obſerver, he may reverſe his inſtrument and alſo his body haſtily, when the ſun is on the meridian, and make the fore and back obſervations check each other, which will alſo, from time to time, prove the reſpective poſitions of the two mirrors, and lead to a detection of the error of the back horizon-glaſs, when that of the former is known, which it may always be from a double meaſure, one back and one forwards, of the ſun's diameter. If the difference of the altitudes of the ſame body taken both ways be equal to the known index-error of the fore horizon-glaſs, it will be known that the back horizon-glaſs has no error; but if the ſaid quantities are not the ſame, their difference, + or −, will be the index-error of the back horizon-glaſs; hence the back horizon-glaſs may be adjuſted from a knowledge of the error of adjuſtment of the fore horizon-glaſs, which method, we believe, was never before ſuggeſted.

QUADRANT, *Hadley's, Theory of.* It is a firſt principle in optics, that the angle of incidence, whatever be the inclination of the incident ray, is equal to the angle of reflection, *i. e.* if the angle of incidence D B A be 30°, the angle of reflection D B C will be alſo 30°. It is alſo plain, that if while the radiant A (*Plate* II. *Navigation, figs.* 1 and 2.) remains in the ſame place, the mirror E F, by revolving round B, moves into the poſition *f e*, then the alteration in the angle between the incident and reflected ray will be double to the angle ſhewing the change of poſition in the mirror. Suppoſe the mirror changes 10° from the radiant, then the perpendicular B D goes 10° farther from the radiant A into the poſition B *d*; and the incident angle *d* B A is 40°, and the reflected angle *d* B *c* is 40°; ſo the angle A B C is altered from 60° to 80°; a difference of 20° for 10° change of poſition in the mirror. Suppoſe again the mirror to change, in poſition, 10° towards the radiant A, then the perpendicular is changed into B *d*, 10° nearer to the radiant; and the angle D B A of 30° becomes *d* B A of 20° = *d* B *c*; ſo that the angle A B *c* is 40°, whereas A B C was 60°; that is, by altering the poſition of the mirror 10°, the angle A B C was altered 20°. It may be otherwiſe demonſtrated, that with a Hadley's quadrant, the angle of elevation under which an object is ſeen, is equal to twice the arc which the index has paſſed over. The inſtrument or angle A C B (*fig.* 3.) is 45°; *a b* is a reflecting glaſs fixed parallel to C B; C D is the index with a reflecting glaſs at G, ſo fixed as to be parallel to *a b*, when C D coincides with C B; S the ſun; S G a ſolar ray reflected from G to F, and from F to E, the place of the eye; and H F E the horizontal line at the time of the obſervation. Then will the angle of elevation I G S be equal to twice the angle B C D; for the angle of reflection D G F = the angle of incidence S G C = C G L. And the angle of reflection *b* F E = the angle of incidence *a* F G = F L E (*a b* being parallel to L E) = F E L. But I G C = H P C = P C E + P E C (the external angle being equal to the two internal and oppoſite) = P C E + F L E = P C E + G C L + C G L. Or, I G C = I G S + S G C = P C E (or G C L) G C L + C G L = 2 B C D + C G L. Conſequently I G S = 2 B C D. See Robertſon's Navigation, book ix. p. 295, &c. p. 390, &c.

Mr. Mitchell has recommended Hadley's quadrant for ſurveying, and eſpecially the ſurveying of harbours, and alſo for piloting ſhips into harbours. Phil. Tranſ. vol. lv. art. 10. p. 70.

Mr. Wales, in captain Cook's Voyage, applied it to meaſuring the quantity eclipſed in an eclipſe of the ſun; in which operation it anſwers the purpoſe of a micrometer, to a great degree of certainty. See an account of the improvements ſuggeſted in the conſtruction of theſe inſtruments, and alſo of the various uſes to which they may be applied, in Magellan's Deſcription des Octants & Sextants Anglois, &c. 4to.

Other quadrants have been contrived ſince, by ſome ingenious artiſts, all of which have their merit; but the particulars of their conſtruction are too many for this place; and perhaps, on the whole, nothing preferable to Mr. Hadley's invention has yet been found.

QUADRANT, *Horodictical*, is a pretty commodious inſtrument; thus called from its uſe in telling the hour of the day.

Its conſtruction is ſo ſimple and eaſy, and its application ſo ready, that we ſhall deſcribe both, for the uſe of ſome who may want other conveniences.

QUADRANT, *Conſtruction and Uſe of the Horodictical.* From the centre of the quadrant, C, (*Plate* XIX. *Aſtronomy, fig.* 8.) whoſe limb A B is divided into 90°, deſcribe ſeven concentric circles at intervals, at pleaſure; and to theſe add the ſigns of the zodiac in the order they are repreſented in the ſcheme.

2. Applying a ruler to the centre C, and the limb A B, mark upon the ſeveral parallels the degrees correſponding to the altitude of the ſun when therein, for the given hours; connect the points belonging to the ſame hour with a curve line, to which add the number of the hour. To the radius C A fit a couple of ſights, and to the centre of the quadrant C, tie a thread with a plummet; and, upon a thread, a bead to ſlide.

If, now, the bead be brought to the parallel in which the ſun is, and the quadrant be directed to the ſun till a viſual ray paſs through the ſights, the bead will ſhew the hour.

For the plummet, in this ſituation, cuts all the parallels in the degrees correſponding to the ſun's altitude. Since, then, the bead is in the parallel which the ſun then deſcribes, and through the degrees of altitude to which the ſun is elevated every hour there paſs hour-lines, the bead muſt ſhew the preſent hour. Some perſons, who are not very nice, repreſent the hour-lines by arcs of circles, or even by ſtraight lines; and that without any ſenſible error.

QUADRANT, *Sinical*, is an inſtrument of uſe in navigation. It is repreſented *Plate* II. *Navigation, fig.* 4, and conſiſts of ſeveral concentric quadrantal arcs, divided into eight equal parts by radii, with parallel right lines croſſing each other at right angles.

Now any of the arcs, *e. gr.* B C, may be accounted a quadrant, of any of the great circles of the ſphere, chiefly of the horizon and meridian: if, then, B C be taken for a quadrant, *e. gr.* of the horizon, either of the ſides, *e. gr.* A B, may repreſent the meridian; and the other, A C, will repreſent a parallel, or line of eaſt and weſt; and all the other lines parallel to A B will alſo be meridians; and all thoſe parallel to A C will be eaſt and weſt parallels, or eaſt and weſt lines.

Again, the eight ſpaces into which the arcs are divided by the radii, repreſent the eight points of the compaſs in a quarter of the horizon; each containing 11° 15′.

The arc B C is likewiſe divided into 90°, and each degree is ſubdivided into 12′, diagonalwiſe.

To the centre is fixed a thread, as A L; which being laid over any degree of the quadrant, ſerves to divide the horizon.

If the ſinical quadrant be taken for a fourth part of the meridian, one ſide thereof, A B, may be taken for the common radius of the meridian and the equator; and then the other, A C, will be half the axis of the world. The degrees of the circumference, B C, will repreſent degrees of latitude, and the parallels to the ſide A B, aſſumed from every point of latitude to the axis A C, will be radii of the parallels of latitude, as likewiſe the ſine-complements of thoſe latitudes.

Suppoſe, then, it be required to find the degrees of longitude contained in 83 of the leſſer leagues, in the parallel of 48°. Lay the thread over 48° of latitude, on the circumference, and count thence the 83 leagues, on A B, beginning at A; theſe will terminate at H, allowing every ſmall interval four leagues, and the interval between the broad lines twenty leagues. Then tracing out the parallel H G, from the point H to the thread; the part A G of the thread ſhews that 125 greater, or equinoctial leagues, make 6° 15′, allowing twenty leagues to a degree, and three minutes for one league; and therefore that 83 leſſer leagues A H, which make the difference of longitude of the courſe, and are equal to the radius of the parallel G I, make 6° 15′ of the ſaid parallel.

If the ſhip ſail on an oblique courſe, ſuch courſe, beſides the north and ſouth greater leagues, gives leſſer leagues eaſterly and weſterly; to be reduced to degrees of longitude of the equator. But theſe leagues being made neither on the parallel of departure, nor on that of arrival, but in all the intermediate ones, we muſt find a mean proportional parallel between them.

To find this, we have on the inſtrument a ſcale of croſs latitudes. Suppoſe, then, it were required to find a mean parallel between the parallels of 40° and 60°. With your compaſſes take the middle between the 40th and 60th degree on the ſcale: this middle point will terminate againſt the 51ſt degree, which is the mean parallel required.

QUADRANT, *Uſe of the Sinical.* There are formed triangles upon this inſtrument ſimilar to thoſe made by a ſhip's way, with the meridians and parallels; the ſides of which triangles are meaſured by the equal intervals between the concentric quadrants, and the lines N. and S.E. and W.

The lines and arcs are diſtinguiſhed, every fifth, by a broader line; ſo that if each interval be taken for one league, there will be five between one broad line and another; and if every interval be taken for four leagues, then there will be twenty leagues, which make a ſea degree, from one broad line to the other.

Now, ſuppoſe a ſhip to have ſailed 150 leagues north-eaſt, one fourth north; which is the third point, and makes an angle of 33° 45′ with the north part of the meridian. Here are given two things; *viz.* the courſe, and the diſtance ſailed; by which a triangle may be found on the inſtrument, ſimilar to that made by the ſhip's courſe, and her longitude and latitude; and hence may the unknown parts of the triangle be found.

Thus, ſuppoſing the centre A to repreſent the place of departure; count, by means of the concentric arcs, along the point the ſhip ſailed on, as A D, 150 leagues from A to D; then is the point D the place the ſhip is arrived at, which note. This done, let D E be parallel to the ſide A C; and then there will be formed a right-angled triangle A E D, ſimilar to that of the ſhip's courſe, difference of longitude, and latitude: the ſide A E gives 125 leagues for the difference of latitude northwards; which makes 6° 15′, reckoning twenty leagues to a degree, &c. and the ſide D E gives 83 leſſer leagues anſwering to the parallels; which

which being reduced, as ſhewn above, gives the difference of longitude. And thus is the whole triangle found.

QUADRANT, in *Gunnery*, called alſo the *gunner's ſquare*, is an inſtrument ſerving to elevate or point cannons, mortars, &c. according to the places they are to be levelled or directed to.

It conſiſts of two branches, made of braſs or wood; one about a foot long, eight lines broad, and one line in thickneſs; the other four inches long, and of the ſame thickneſs and breadth as the former. Between theſe branches is a quadrant divided into ninety degrees, beginning from the ſhorter branch, and furniſhed with a thread and plummet. See its figure repreſented in *Plate* I. *Gunnery*, *fig.* 5.

The uſe of this inſtrument is eaſy; nothing more being required but to place the longeſt branch in the mouth of the cannon or mortar, and elevate or lower it, till the thread cuts the degree neceſſary to hit a propoſed object. See *Pointing of a* GUN.

Sometimes, alſo, on one of the ſurfaces of the long branch, is noted the diviſion of diameters, and weights of iron bullets; as alſo the bores of pieces. See CALIBER.

QUADRANT *of Altitude*, is an appendage of the artificial globe, conſiſting of a lamina or ſlip of braſs, the length of a quadrant of one of the great circles of the globe; and divided into ninety degrees.

At the end, where the diviſions terminate, there is a nut rivetted on, and furniſhed with a ſcrew, by means of which the inſtrument is fitted on to the meridian; and is moveable round upon the rivet, to all points of the horizon. See its figure in *Plate* XIX. *Aſtronomy*, *fig.* 9.

Its uſe is to ſerve as a ſcale in meaſuring of altitudes, amplitudes, azimuths, &c. See the manner of its application under the *Uſe of the* GLOBE.

QUADRANTAL, in *Antiquity*, a veſſel in uſe among the Romans for the meaſuring of liquids.

It was at firſt called *amphora*; and afterward *quadrantal*, from its form, which was ſquare every way, like a die.

Its capacity was eighty libræ, or pounds of water, which made forty-eight ſextaries, two urnæ, or eight congii.

QUADRANTAL *Space*, in *Geometry*. See QUADRANT.

QUADRANTAL *Triangle*, is a ſpherical triangle, one of whoſe ſides at leaſt is a quadrant of a circle, and one of its angles a right angle.

QUADRANTATA TERRÆ, in our *Ancient Law Books*, is uſed for a quarter of an acre, now called a *rood*; which ſee.

QUADRAS ISLES, in *Geography*, iſlands ſituated on the N.W. coaſt of North America, between Pintard's ſound and the ſtraits of Fuca; among which lies NOOTKA'S *ſound*, which ſee. They were ſo called by Capt. Ingraham, after the name of a Spaniſh commander of two ſchooners, who paſſed through this channel in the year 1792.

QUADRAT, QUADRATUM, called alſo *geometrical ſquare*, and *line of ſhadows*, is an additional member on the face of the common Gunter's and Sutton's quadrants; of ſome uſe in taking altitudes, &c.

The quadrat more diſtinctly exhibited in *Plate* VI. *Surveying*, *fig.* 13. has each of its ſides divided into a hundred equal parts, commencing from the extremes; ſo that the number 100 falls on the angle, repreſenting tangents to the arc of the limb.

The diviſions are diſtinguiſhed by little lines from 5 to 5, and by numbers from 10 to 10; and the diviſions being occaſionally produced acroſs, form a kind of lattice, conſiſting of 10,000 little ſquares.

The proportion here is, as radius is to the tangent of the angle of altitude at the place of obſervation (*i. e.* to the parts of the quadrat cut by the thread), ſo is the diſtance between the ſtation and the foot of the object, to its height above the eye. See ALTITUDE.

Uſe of the Quadrat, Geometrical Square, or *Line of Shadows*. 1. The quadrant being vertically placed, and the ſights directed to the top of the tower, or other object, whoſe height is required; if the thread cut the ſide of the quadrat marked *right ſhadows*, the diſtance from the baſe of the tower to the point of ſtation is leſs than the tower's height. If the thread falls on the diagonal of the ſquare, the diſtance is juſt equal to the height. If it fall on that ſide marked *verſed ſhadows*, the diſtance exceeds the height.

Hence, meaſuring the diſtance, the height is found by the rule of three; inaſmuch as there are three terms given. Indeed, their diſpoſition is not always the ſame; for when the thread cuts the ſide of right ſhadows, the firſt term in the rule of three ought to be that part of the ſide cut by the thread; the ſecond, the ſide of the ſquare; and the third, the diſtance meaſured. If the thread cut the other ſide, the firſt term is the whole ſide of the ſquare; the ſecond, the parts of the ſide cut by the thread; and the third, the diſtance.

For an inſtance of each. Suppoſe, *e. gr.* in looking at the top of a ſteeple, the thread cut the ſide of right ſhadows in the point 40, and that the diſtance meaſures 20 poles, the caſe then will ſtand thus: as 40 is to 100, ſo is 20 to a fourth term, which we find to be 50; the height of the ſteeple in poles. Again, ſuppoſing the thread to fall on the other ſide, in the point 60, and the diſtance to meaſure 35 poles; the terms are to be diſpoſed thus: as 100 is to 60, ſo is 35 to a fourth term, *viz.* 21, the height required. See ALTITUDE.

Uſe of the Quadrat without Calculation.—The preceding caſes may be formed without calculation, where the diviſions of the ſquare are produced both ways, ſo as to form the area into little ſquares.

Thus, ſuppoſe, 1. The thread to fall on 40 in the ſide of right ſhadows, and the diſtance be meaſured 20 poles; ſeek among the little ſquares for that perpendicular to the ſide which is 20 parts from the thread; this perpendicular will cut the ſide of the ſquare next the centre, in the point 50, which is the height required in poles.

2. If the thread cuts the ſide of verſed ſhadows in the point 60, and the diſtance be 35 poles; count 35 parts on the ſide of the quadrat from the centre; count alſo the diviſions of the perpendicular from the point 35 to the thread, which will be 21, the height of the tower in poles.

Note, In all caſes the height of the centre of the inſtrument is to be added. See ALTITUDE, and SHADOW.

QUADRAT, in *Aſtrology*, called alſo *Quartile*, an aſpect of the heavenly bodies, in which they are diſtant from each other a quadrant, or ninety degrees. See ASPECT.

QUADRAT, in *Printing*, is a ſort of ſpace; that is, a piece of metal, caſt like the letters, to be uſed occaſionally in compoſing, in order to form the intervals between words, at the end of lines, &c. See PRINTING.

There are quadrats of divers ſizes, as *m* quadrats, *n* quadrats, &c. which are reſpectively of the dimenſions of ſuch letters.

QUADRATA, in *Ancient Geography*, a town of Higher Pannonia, placed on the banks of the Save by Antonine's Itinerary.

QUADRATA, in *Geography*, a town of Naples, in the province of Bari; five miles N.W. of Ruvo.

QUADRATA is the Italian term in canto fermo for Gregorian or ſquare black notes.

QUADRATA *Legio*, among the Romans. See *Square* LEGION.

QUADRATIC EQUATION, in *Algebra*, is an equation of which the higheſt power of the unknown quantity riſes only to the ſecond degree. If this power enters alone, it is called a *ſimple quadratic*; and when the ſecond power and ſimple quantity both occur, it is termed an *adfected quadratic* equation, thus:

$x^2 \pm ax = b$, is an *adfected quadratic*, and

$x^2 = b$, or $ax^2 = b$, a *ſimple quadratic* equation.

Some authors claſs all ſuch equations as contain two different powers of the unknown quantity, the one being the double of the other, under the general term quadratics, ſuch as $x^4 \pm ax^2 = b$, $x^{2m} \pm ax^m = b$, &c. each of which is called a quadratic equation, becauſe their ſolution depends upon preciſely the ſame principles as the former.

Every quadratic may be reduced to the form $x^2 + ax = b$; in which it is, however, to be underſtood, that a and b may be either poſitive or negative; and the general ſolution of it is expreſſed by the formula

$$x = \frac{-a}{2} \pm \sqrt{\left(\frac{a^2}{4} + b\right)}$$

If we give to a and b all the variety of ſigns they admit of, quadratic equations may be divided into four diſtinct claſſes, *viz.*

1. $x^2 + ax = -b$
2. $x^2 - ax = -b$
3. $x^2 + ax = +b$
4. $x^2 - ax = +b$;

and their ſeveral roots will be exhibited by the following formulæ, *viz.*

1. $x = \frac{-a}{2} \pm \sqrt{\left(\frac{a^2}{4} - b\right)}$
2. $x = \frac{a}{2} \pm \sqrt{\left(\frac{a^2}{4} - b\right)}$
3. $x = \frac{-a}{2} \pm \sqrt{\left(\frac{a^2}{4} + b\right)}$
4. $x = \frac{a}{2} \pm \sqrt{\left(\frac{a^2}{4} + b\right)}$

See EQUATIONS.

From theſe forms it is obvious that every quadratic equation has two roots ariſing out of the ambiguous ſign $\pm$, prefixed to the ſecond member of the root. It is alſo obvious, that if in the 1ſt and 2d form, b be greater than $\frac{a^2}{4}$, the two roots in both forms are imaginary, or impoſſible; but if b be leſs than $\frac{a^2}{4}$, then they are in each form both real, being in the 1ſt both negative, and in the 2d both poſitive; becauſe the quantity exhibited under the radical form is, in both equations, leſs than that without the radical; and conſequently both the ſum and difference will have the ſame ſign as $\frac{a}{2}$.

In the 3d and 4th forms, the roots are neceſſarily both real, but one poſitive and the other negative; the 3d form having its greateſt root negative, and 4th its greateſt root poſitive; as is obvious by inſpection.

It is, however, not neceſſary to conſider quadratic equations under theſe four forms, as the ſolution of them all may be reduced to one general rule, as exhibited in the preceding part of this article, and which may be given in words as follows. Having reduced the propoſed equation to any one of the above forms, the roots of it will be equal to half the co-efficient of the ſecond term, with its ſign changed; plus and minus the ſquare root of the ſquare of that half co-efficient prefixed to b, with its proper ſign, whether plus or minus. The principles on which the preceding formulæ are obtained, are theſe, *viz.* $(x \pm \frac{1}{2}a)^2 = x^2 \pm ax + \frac{1}{4}a^2$; therefore, if an equation be propoſed under the form $x^2 \pm ax = \pm b$, by adding $\frac{1}{4}a^2$ to both ſides, we ſtill preſerve the equality, and render the firſt ſide a complete ſquare, that is, we have

$$x^2 \pm ax + \tfrac{1}{4}a^2 = \tfrac{1}{4}a^2 \pm b;$$

and, by extraction,

$$x \pm \tfrac{1}{2}a = \pm \sqrt{(\tfrac{1}{4}a^2 \pm b)};$$

conſequently

$$x = \mp \frac{a}{2} \pm \sqrt{(\tfrac{1}{4}a^2 \pm b)},$$

which form includes all the preceding formulæ. We ſhall not here give the ſolution of any examples, as the reader will find ſufficient exerciſes under the article EQUATION; but it may not be amiſs to ſhew other methods of obtaining the roots of quadratic equations, *viz.* by ſines and tangents, continued fractions, &c.

The Solution of Quadratic Equations by means of a Table of Sines, Tangents, &c.—Here, referring to our preceding four forms, the ſolution of them may be exhibited as follows:

Form 1. $x^2 + ax = -b$.

Put $\frac{2}{a}\sqrt{b} = \text{ſin. } z$; then

$$x = \begin{Bmatrix} -\sqrt{b} \times \text{tan. } \frac{1}{2}z \\ -\sqrt{b} \times \text{cot. } \frac{1}{2}z \end{Bmatrix} \text{ or,}$$

$$x = \begin{Bmatrix} -\frac{1}{2}a\,(1 - \text{coſ. } z) \\ -\frac{1}{2}a\,(1 + \text{coſ. } z) \end{Bmatrix}$$

Form 2. $x^2 - ax = -b$.

Put $\frac{2}{a}\sqrt{b} = \text{ſin. } z$; then

$$x = \begin{Bmatrix} +\sqrt{b} \times \text{tan. } \frac{1}{2}z \\ +\sqrt{b} \times \text{cot. } \frac{1}{2}z \end{Bmatrix} \text{ or,}$$

$$x = \begin{Bmatrix} +\frac{1}{2}a\,(1 - \text{coſ. } z) \\ +\frac{1}{2}a\,(1 + \text{coſ. } z) \end{Bmatrix}$$

Form 3. $x^2 + ax = b$.

Put $\frac{2}{a}\sqrt{b} = \text{tan. } z$; then

$$x = \begin{Bmatrix} +\sqrt{b} \times \text{tan. } \frac{1}{2}z \\ -\sqrt{b} \times \text{cot. } \frac{1}{2}z \end{Bmatrix} \text{ or,}$$

$$x = \begin{Bmatrix} +\frac{1}{2}a\,(\text{ſec. } z - 1) \\ -\frac{1}{2}a\,(\text{ſec. } z + 1) \end{Bmatrix}$$

Form 4. $x^2 - ax = b$.

Put $\frac{2}{a}\sqrt{b} = \text{tan. } z$; then

$$x = \begin{Bmatrix} +\sqrt{b} \times \text{cot. } \frac{1}{2}z \\ -\sqrt{b} \times \text{tan. } \frac{1}{2}z \end{Bmatrix} \text{ or,}$$

$$x = \begin{Bmatrix} +\frac{1}{2}a\,(\text{ſec. } z + 1) \\ -\frac{1}{2}a\,(\text{ſec. } z - 1) \end{Bmatrix}$$

The above formulæ reſult immediately from the conſtruction of quadratic equations. Thus, in the two firſt forms, let A B, (*Plate* XIII. *fig.* 6. *Analyſis*,) repreſent a, and C D $= \sqrt{b}$, then A D and D B will be the required roots from the known conſtruction of equations. See CONSTRUCTION.

Now here it is obvious that the ſin. z repreſents the ſin. of C E D,

C E D, and therefore angle D C B, which is $= \frac{1}{2}$ angle C E D, $= \frac{1}{2}$ angle z. Consequently D B $=$ C D $\times$ tan. $\frac{1}{2} z$, and A D $=$ C D $\times$ cot. $\frac{1}{2} z$, becauſe the angle C A D $=$ the angle B C D; which agree with the leading formulæ above given. As to the two latter formulæ for the two firſt caſes, they are obvious without any explanation.

In the 3d and 4th caſes, let A B repreſent a, and D C $= \sqrt{b}$, then A D and D B will repreſent the two roots; join B C, and draw D E parallel to B C, ſo ſhall C E $=$ B D, and the angle C D E $=$ the angle B O C. Now here the tan. z will repreſent the tan. of B O C, and $\frac{1}{2} z =$ C D E; but C E $=$ B D is obviouſly equal to D C $\times$ tan. C D E $= \sqrt{b} \times$ tan. $\frac{1}{2} z$; and in the ſame manner A D $= \sqrt{b} \times$ cot. $\frac{1}{2} z$. The two latter formulæ require no illuſtration.

The ſame reſults might have been obtained, though not perhaps quite ſo obviouſly, from the preceding analytical ſolution.

There are but few caſes in which it is adviſable to employ the methods above deſcribed to the ſolution of quadratics, and therefore one example will be conſidered a ſufficient illuſtration.

Exam.—Given $x^2 + \frac{7}{44} x = \frac{1695}{12716}$, to find the two roots of the equation by ſines and tangents.

Here tan. $z = \frac{88}{7} \sqrt{\frac{1695}{12716}}$

log. 1695	3.2291697
log. 12716	4.1043505
	2)—1.1248192
log. $\sqrt{\frac{1695}{12716}}$	—1.5624096
log. 88	1.9444827
co. log. 7	9.1549020
log. tan. z	10.6617943

whence $z = 77° 42' 32''$, and $\frac{1}{2} z = 38° 51' 16''$

log. tan. $\frac{1}{2} z$	9.9061115
log. $\sqrt{\frac{1695}{12716}}$	—1.5624096
	9.4685211
deduct radius	10.0000000
log. x	—1.4685211

or $x = .2941176$ the poſitive root; and if cot. $\frac{1}{2} z$ be taken inſtead of tan. $\frac{1}{2} z$, the other value of x will be found $= -.4532085$. See Bonnycaſtle's Algebra, vol. i. p. 141.

For the ſolution of quadratic equations by the method of *continued fractions*, we muſt refer the reader to the "Eſſai ſur la Théorie des Nombres," by Le Gendre.

The root of a quadratic equation may be exhibited under the form of a continued ſurd, as follows:

Let $x^2 - ax = b$, or $x^2 = ax + b$; then

$$x = \sqrt{b + ax}$$

Or, by ſubſtituting for x, under the radical, its whole value $\sqrt{b + ax}$, we have

$$x = \sqrt{b + a\sqrt{b + ax}}$$

Subſtituting again for x as above, we obtain

$$x = \sqrt{b + a\sqrt{b + a\sqrt{b + ax}}}$$

and by continuing thus our ſucceſſive ſubſtitutions for x, we have

$$x = \sqrt{b + a\sqrt{b + a\sqrt{b + a\sqrt{b + \&c.}}}}$$

which is an analytical expreſſion for the poſitive value of x in the propoſed equation.

It is obvious, however, that ſuch an expreſſion as this is of little or no uſe for ſolving quadratic equations; but we have by means of the latter, a very ready means of finding the ultimate value of ſuch a continued ſurd. Suppoſe, for example, the value of the following continued ſurd were required, *viz.*

$$\sqrt{12 + \sqrt{12 + \sqrt{12 + \sqrt{12 + \&c.}}}}$$

Aſſume

$$x = \sqrt{12 + \sqrt{12 + \sqrt{12 + \sqrt{12 + \&c.}}}}$$

By ſquaring both ſides

$$x^2 = 12 + \sqrt{12 + \sqrt{12 + \sqrt{12 + \&c.}}}$$

Or, ſince the latter part

$$\sqrt{12 + \sqrt{12 + \sqrt{12 + \&c.}}} = x$$

this becomes

$$x^2 = 12 + x, \text{ or } x^2 - x = 12;$$

whence $x = \frac{1}{2} + \sqrt{12\frac{1}{4}} = 4$, which is the value of the infinite ſurd propoſed.

Again, let there be propoſed the following infinite ſurd, *viz.*

$$\sqrt{5 + 4\sqrt{5 + 4\sqrt{5 + \&c.}}}$$

Aſſume the infinite ſum $= x$, then by ſquaring

$$x^2 = 5 + 4\sqrt{5 + 4\sqrt{5 + 4\sqrt{5 + \&c.}}}, \text{ or}$$

$$x^2 = 5 + 4x, \text{ or } x^2 - 4x = 5;$$

whence $x = 2 \pm \sqrt{4 + 5} = 5$, the value ſought. For other examples of this kind, ſee SURDS.

QUADRATING *of a Piece*, among *Gunners*, is the ſeeing that a piece of ordnance be duly placed, and poiſed in its carriages; and that its wheels be of an equal height, &c.

QUADRATO, in *Muſic*. See QUADRO.

QUADRATO-CUBUS, QUADRATO-QUADRATO-CUBUS, and QUADRATO-CUBO-CUBUS, are names uſed by Diophantus, Vieta Oughtred, and others, for the fifth, ſeventh, and eighth powers of numbers. See POWER.

QUADRATO-QUADRATUM, or BIQUADRATUM, the fourth power of numbers; or the product of the cube multiplied by the root.

QUADRATRIX, in *Geometry*, a mechanical line, by means of which we would find right lines equal to the circumference

cumference of circles, or other curves, and of the ſeveral parts of it.

Or, more accurately, the quadratrix of a curve is a tranſcendental curve deſcribed on the ſame axis, the ſemi-ordinates of which being given, the quadrature of the correſpondent parts in the other curve is likewiſe given. See CURVE.

Thus, *e. gr.* the curve A N D (*Plate* XIII. *Analyſis*, *fig.* 7.) may be called the quadratrix of the parabola A M C, ſince it is demonſtrated, that A P M A is = P N, or A P M A = A P × P N, or A P M A = P N × *a*, a conſtant quantity, &c.

The moſt eminent of theſe quadratrices are, that of Dinoſtrates, and that of Mr. Tſchirnhauſen, for the circle; that of Mr. Perks for the hyperbola.

QUADRATRIX *of Dinoſtrates*, is a curve A M *m m* (*fig.* 8.) by which the quadrature of the circle is effected, though not geometrically, but mechanically; it is thus called from its inventor Dinoſtrates.

Its geneſis is thus: divide the quadrantal arc A N B into any number of equal parts, in N, *n*, &c. by a continual biſection; divide the radius A C into the ſame number of parts in the points P, *p*, &c. Draw radii C N, C *n*, &c. Laſtly, on the points P, *p*, &c. erect perpendiculars P M, *p m*, &c. The curve formed by connecting theſe lines is the quadratrix of Dinoſtrates.

This curve may be deſcribed by continual motion; if we ſuppoſe the radius C N by its extreme N to deſcribe uniformly the arc A B, and at the ſame time a ruler P M, always parallel to itſelf, to move uniformly along A C, in ſuch a manner that when the ruler P M arrives at C, the radius C N may coincide with C B; and thus the continual interſection of C N with the ruler P M will deſcribe the quadratrix A M D.

Here, from the conſtruction, A N B : A N :: A C : A P; and therefore, if A N B = *a*, A C = *b*, A N = *x*, A P = *y*; *a y* = *b x*. See QUADRATURE.

QUADRATRIX *Tſchirnhauſiana*, is a tranſcendental curve A M *m m* B (*fig.* 9.) by which the quadrature of the circle is likewiſe effected; invented by Mr. Tſchirnhauſen, in imitation of that of Dinoſtrates.

Its geneſis is thus conceived; divide the quadrant A N B, and its radius A C, into equal parts, as in the former; and from the points P, *p*, &c. draw the right lines P M, *p m*, &c. parallel to C B; and from the points N, *n*, &c. the right lines N M, *n m*, &c. parallel to A C. The points A, M *m*, being connected, the quadratrix is formed; in which A N B : A N :: A C : A P. And therefore, if A B = *a*, and A C = *b*, A N = *x*, and A P = *y*; *a y* = *b z*. See QUADRATURE.

This curve may be alſo deſcribed by continued motion, if two rulers, N M and P M, perpendicular to each other, be made to move uniformly and parallel to themſelves, the one along the quadrant of the circle A C, and the other along the radius.

QUADRATUM-CUBI, QUADRATO-QUADRATO-QUADRATUM, and QUADRATUM *Surdoſolidi*, &c. are names uſed by the Arabs for the ſixth, eighth, and tenth powers of numbers. See POWER.

QUADRATUM *Os*, in *Comparative Anatomy*, *os carrè* of the French; a ſmall bone in the head of birds, to which the lower mandible is articulated. See BIRDS, in *Comparative Anatomy*, in the diviſion relating to the bones.

QUADRATURE, in *Geometry*, ſignifies literally the finding of a ſquare equal in area to any given figure, which was the method the ancients made uſe of when they had in view the determination of the ſurface of any ſpace; but the term *quadrature* has now a more indefinite ſignification; implying, in general, the determination of the area of a figure, without any reference to the geometrical exhibition of it, in a ſquare or other rectilinear form.

All rectilinear figures being immediately reduced to, or dependent upon, the area of triangles, their quadratures have been known from the higheſt antiquity; but the quadratures of curvilineal ſpaces are, with very few exceptions, of modern date, two only having been known till near the beginning of the eighteenth century.

The firſt curvilinear ſpace whoſe quadrature was accurately determined, was the lune of Hippocrates, of which an account will be found under the article LUNE. Archimedes next found the area of the common parabola; which he obtained in a very ingenious manner, by inſcribing an iſoſceles triangle in the parabola, then two iſoſceles triangles on the equal ſides of the former, four others on theſe, and ſo on, which he found to have a certain relation, decreaſing in the proportion 1, $\frac{1}{4}$, $\frac{1}{16}$, &c. the infinite ſum of which ſeries would therefore expreſs the area of the parabola, or the area of all the triangles of which he thus conceived it to be compoſed; and which ſum he found to be $1\frac{1}{3}$ or $\frac{4}{3}$ of the circumſcribing rectangle. After this time, a period of near two thouſand years elapſed, without producing the quadrature of a ſingle curvilinear figure, although the ſubject ſeems to have engaged the attention of the moſt eminent mathematicians during that long interval, particularly the quadrature of the circle. This figure, being the moſt ſimple in appearance and conſtruction of any contained under a curve line, was well calculated to excite the curioſity of mathematicians. Archimedes doubtleſs attempted the ſolution of this problem; but failing in producing the exact quadrature, he contented himſelf with giving an approximation, ſhewing by the inſcription and circumſcription of a polygon of ninety-ſix ſides, that the diameter being 1, the circumference was greater than $3\frac{10}{71}$, but leſs than $3\frac{10}{70}$; and as it was known, even before the time of Archimedes, that the area of a circle is equal to that of a right-angled triangle, whoſe altitude is equal to the radius, and baſe equal to the circumference of the circle, it follows, that the area would be greater than $\frac{22}{28}\frac{3}{1}$, but leſs than $\frac{22}{28}\frac{0}{0}$.

It would be uſeleſs to attempt in this place to enumerate the various abſurd quadratures which have been, from time to time, publiſhed by minor geometers, with all that conceit and confidence which ſeldom fail to accompany inferiority. Some attributed their ſucceſs to divine inſpiration; others to their own ſuperior talents: ſome offered large ſums of money to thoſe who ſhould diſcover any error in their inveſtigation, while others expected great rewards from their government, as a recompence for their diſcovery, fooliſhly attaching great importance to a problem, which, if it could be accurately ſolved, would ſerve no other purpoſe but to gratify the curioſity of mathematicians. Many of theſe attempts, however, have been rendered ſomewhat amuſing by an exceſs of abſurdity. This is particularly the caſe with regard to the work of Jaime Falcon, a Spaniard of the order of Nôtre Dame, of Monteſa, publiſhed at Anvers in 1587. This treatiſe opens with a dialogue in verſe between himſelf and the circle, which thanks him very affectionately for having ſquared him; but the good and modeſt knight attributes all the honour of the diſcovery to the holy patron of his order. See Montucla's "Hiſtoire des Recherches ſur la Quadrature du Circle;" or his "Hiſtoire des Mathematiques," vol. iv. p. 619.

Referring thoſe readers who have the curioſity to examine the reveries above-mentioned to the two preceding works, we propoſe to give here an abſtract from the ſame, of what

has

has been done on this ſubject, by way of approximation. We have already obſerved that Archimedes was the firſt who gave an approximation of the ratio of the diameter to the circumference of a circle, placing it between the limits 1 to $3\frac{10}{70}$, and 1 to $3\frac{10}{71}$; and it is ſaid that Apollonius and Philo found more accurate approximations, which, however, have not been tranſmitted to us.

Towards the year 1585, Metius, combatting the falſe quadrature of Simon Duchêne, gave the ratio of 113 to 355, which is very exact, being only $\frac{3}{10000000}$ in exceſs. Vieta found a ſtill nearer approximation, carrying it to ten decimals, whereas the former is true only to ſix places. He alſo gave a kind of ſeries, the infinite ſum of which was equal to the entire circle.

Adrianus Romanus carried the approximation to ſeventeen figures, and Ludolph van Ceulen to thirty-ſix; which he publiſhed in his work "De Circulo et Adſcriptis;" and of which Snellius publiſhed a Latin tranſlation in 1619. He afterwards verified Van Ceulen's approximation by ſome theorems of his own invention, which greatly facilitated the computation, and which he publiſhed in 1621, under the title of "Willebrordi Snellii Cyclometricus de Circuli Dimenſione, &c."

Deſcartes found a geometrical conſtruction from which it was eaſy to draw an expreſſion in the form of a ſeries; and Huygens afterwards diſcovered ſome curious theorems connected with this ſubject, but did not advance the approximation, though he made ſome uſeful rules for approximating towards the length of the circular arc.

One of the moſt curious diſcoveries connected with this ſubject, which had yet been publiſhed, was that given by Wallis in his "Arithmetica Infinitorum," in 1655: where he ſhews that the ratio of a circle to the ſquare of its diameter, is truly expreſſed by the infinite fraction

$$\frac{3^2.\ 5^2.\ 7^2.\ 9^2.\ 11^2.\ \&c.}{2.\ 4^2.\ 6^2.\ 8^2.\ 10^2.\ 12^2.\ \&c.}$$

If we limit ourſelves, as we muſt do to, a finite number of terms, we ſhall have a ratio alternately too great and too ſmall, according as we take an even or an odd number of terms: thus, $\frac{3}{2}$ is too great; $\frac{3\cdot3}{2.4}$ too ſmall; $\frac{3\cdot3\cdot5}{2.4.4}$ too great; and $\frac{3\cdot3\cdot5\cdot5}{2.4.4.6}$ too ſmall, and ſo on; but each of theſe is a nearer approximation than the preceding ones. But in order to approach ſtill nearer in both caſes, the author propoſed to multiply the whole product by the ſquare root of a binomial, *viz.* unity, plus unity divided by the laſt figure, with which the ſeries terminated either in the numerator or denominator; in which caſe, the product will be a much nearer approximation; it will be too great if we uſe the laſt figure of the numerator, and too ſmall if the laſt of the denominator. Thus we ſhall have for the ratio ſought, alternately in exceſs and defect.

In exceſs.	In defect.
$\frac{3\cdot3\cdot5\cdot5}{2.4.4.6}\sqrt{(1\times\frac{1}{5})}$	$\frac{3\cdot3\cdot5\cdot5}{2.4.4.5}\sqrt{(1\times\frac{1}{6})}$
$\frac{3\cdot3\cdot5\cdot5\cdot7\cdot7}{2.4.4.6.6.8}\sqrt{(1\times\frac{1}{7})}$	$\frac{3\cdot3\cdot5\cdot5\cdot7\cdot7}{2.4.4.6.6.8}\sqrt{(1\times\frac{1}{8})}$
&c.	&c.

Prior to the above ſeries of Dr. Wallis, however, ſome thing of an equivalent expreſſion, though given under a different form, was diſcovered by lord Brounker, which is as follows. The circle itſelf being 1, the ſquare of its diameter is expreſſed by the infinite continued fraction.

$$1+\cfrac{1}{2+\cfrac{3^2}{2+\cfrac{5^2}{2+\cfrac{7^2}{2+\cfrac{9^2}{2+\&c.}}}}}$$

of which the law of the denominators is obvious. See CIRCLE.

Such was the progreſs which mathematicians had made towards the ſolution of this intereſting problem prior to the invention of fluxions, which, by reducing the quadrature of all curves to one general principle, again revived the hopes of ſucceſs with regard to the circle, notwithſtanding ſome pretended demonſtrations of its impoſſibility; and its quadrature was accordingly again attempted with the greateſt eagerneſs. The quadrature of a ſpace, and the rectification of a curve, were now reduced to that of finding the fluent of a given fluxion but ſtill the problem was found to be incapable of a general ſolution in infinite terms. The fluxion of a given fluent was found to be always aſſignable, but the converſe propoſition, *viz.* of finding the fluent of a given fluxion, could only be effected in particular caſes; and amongſt the exceptions, to the great regret and diſappointment of geometricians, was included the caſe of the circle with regard to every form of fluxion under which it could be obtained. Some exceedingly near approximations have, however, ſince been made towards the true ratio of the diameter to the circumference of the circle, but theſe belonging rather to the article RECTIFICATION than to QUADRATURE, we ſhall enter again upon the ſubject under the former term, and ſhall occupy the remainder of the preſent article on the quadrature of curves in general.

On the Quadrature of Curves by Fluxions. In order to exhibit more diſtinctly and at large the uſe of fluxions, according to the modern method of notation, in finding the areas of curves, we ſhall premiſe the two following caſes.

Caſe 1.—Let A R C (*Plate* XIII. *Analyſis, fig.* 10.) be a curve of any kind, whoſe ordinates R *b*, C B, are perpendicular to an axis A B. Imagine a right line *b* R *g*, perpendicular to A B, to move parallel to itſelf from A towards B; and let its velocity, or the fluxion of the abſciſſe A *b*, in any propoſed ſituation of that line, be denoted by $\dot{b}\,\dot{d}$; then will the rectangle $\dot{b}\,\dot{n}$ expreſs the fluxion of the generated area A *b* R, which (if A *b* = x, and *b* R = y) will be = $y\,\dot{x}$: whence, by ſubſtituting for y or $\dot{x}$ (according to the equation of the curve,) and taking the fluent, the area itſelf will become known.

Caſe 2.—Let A R M (*fig.* 11.) be any curve whoſe ordinates C R, C R, are all referred to a point or centre; and conceive a right line C R H to revolve about the given centre C, and a point R to move along the ſaid line, ſo as to deſcribe the curve line A R M. If this point were to move from Q, without changing its direction or velocity, it would proceed along the tangent Q S (inſtead of the curve), and deſcribe areas Q *s* C, Q S C, about the centre C, proportional to the times in which they were deſcribed; becauſe, having the ſame altitude C P, they are as the baſes Q *s* and Q S. Conſequently, if R S be taken to denote the value of $\dot{z}$ the fluxion of the curve line A R, the correſponding

fluxion

fluxion of the area A R C will be juſtly repreſented by the uniformly generated triangle Q C S; which, expreſſing C P by s, will be $= \frac{\text{Q S} \times \text{C P}}{2} = \frac{s\dot{z}}{2}$: whence the area itſelf may be determined. But ſince, in many caſes, the value of $\dot{z}$ cannot be computed (from the property of the curve) without trouble, the two following expreſſions, for the fluxion of the area, will be found more commodious, *viz.* $\frac{s\,y\dot{y}}{2\,t}$ and $\frac{y^2\dot{x}}{2a}$; where $t =$ R P, and $x =$ the arc B N of a circle, deſcribed about the centre C, at any diſtance $a =$ C B. Theſe expreſſions are derived from that above in the following manner; *viz.* $\dot{z} : \dot{y} :: y\,(\text{C R}) : t\,(\text{R P})$; therefore $\dot{z} = \frac{y\dot{y}}{t}$; conſequently $\frac{s\dot{z}}{2} = \frac{s\,y\dot{y}}{2\,t}$. Moreover, becauſe the celerity of R in the direction of the tangent is denoted by $\dot{z}$, that in a direction perpendicular to C Q (whereby the point R revolves about the centre C) will, therefore, be $= \frac{\text{C P}}{\text{C R}} \times \dot{z} = \frac{s\dot{z}}{y}$; which, being to $\dot{x}$ the celerity of the point N about the ſame centre as the diſtance or radius C R (y) to the radius C N (a), we ſhall, by multiplying extremes and means, have $\frac{a\,s\dot{z}}{y} = y\dot{x}$, and, conſequently, $\frac{s\dot{z}}{2} = \frac{y^2\dot{x}}{2a}$. In the examples ſubjoined, the letters x, y, z, and u will be uſed to denote the abſciſſe, ordinate, curve-line, and area reſpectively.

QUADRATURE *of a Right-angled Triangle.* Let the baſe A H (*fig.* 12.) $= a$, the perpendicular H M $= b$, and let A B (x) be any portion of the baſe, conſidered as a flowing quantity, and B R (y) be the correſponding ordinate. Then, the triangles A H M and A B R being ſimilar, we ſhall have $a : b :: x : y = \frac{b\,x}{a}$. Whence $y\,\dot{x}$ (the fluxion of the area A B R) $= \frac{b\,x\,\dot{x}}{a}$; and its fluent (ſee *Inverſe Method of* FLUXIONS) or the area itſelf $= \frac{b\,x^2}{2a}$, which, when $x = a$, and B R coincides with H M, will become $\frac{ab}{2} = \frac{\text{AH} \times \text{HM}}{2}$ = the area of the whole triangle A H M. See *Menſuration of* TRIANGLES.

QUADRATURE *of a Circular Sector.* Let A O R (*fig.* 13.) be the ſector; A O or O R, its radius, $= a$, the arc A R, conſidered as variable by the motion of R, $= z$, and R $r = \dot{z}$; the fluxion of the area will be $\frac{a\dot{z}}{2} =$ the triangle O R r: whence the area itſelf is $= \frac{a\,z}{2} =$ A O $\times \frac{1}{2}$ A R: that is, the area of any circle is expreſſed by a rectangle under half the circumference and half the diameter. See CIRCLE.

QUADRATURE *of a Semicircle.* Let the ſemicircle be A R E H (*fig.* 14.); its diameter A H $= a$, A B $= x$, and B R $= y$, &c. and we have y^2 (B R^2) $= ax - x^2$ (A B $\times$ B H), and, conſequently, $u\,(y\dot{x}) = \dot{x}\sqrt{(ax - x^2)} = a^{\frac{1}{2}}\,x^{\frac{1}{2}}\,\dot{x} \times \left(1 - \frac{x}{a}\right)^{\frac{1}{2}}$; which expreſſion being reſolved into an infinite ſeries, we ſhall have $\dot{u} = a^{\frac{1}{2}}\,x^{\frac{1}{2}}\,\dot{x} \times \left(1 - \frac{x}{2a} - \frac{x^2}{8a^2} - \frac{x^3}{16a^3} - \frac{5x^4}{128a^4}, \text{ \&c.}\right) = a^{\frac{1}{2}} \times \left(x^{\frac{1}{2}}\dot{x} - \frac{x^{\frac{3}{2}}\dot{x}}{2a} - \frac{x^{\frac{5}{2}}\dot{x}}{8a^2} - \frac{x^{\frac{7}{2}}\dot{x}}{16a^3}\right)$, &c. Whence, the fluent of every term being taken, there will ariſe $u = a^{\frac{1}{2}} \times \left(\frac{2\,x^{\frac{3}{2}}}{3} - \frac{x^{\frac{5}{2}}}{5a} - \frac{x^{\frac{7}{2}}}{28a^2} - \frac{x^{\frac{9}{2}}}{72a^3} - \frac{5\,x^{\frac{11}{2}}}{704a^4}, \text{ \&c.}\right) = x\sqrt{ax} \times \left(\frac{2}{3} - \frac{x}{5a} - \frac{x^2}{28a^2} - \frac{x^3}{72a^3} - \frac{5\,x^4}{704a^4}, \text{ \&c.}\right)$ = the area A B R. When $x = \frac{1}{2}a$, the ordinate B R will coincide with the radius O E; in which caſe the area becomes $= \frac{1}{2}a\sqrt{\frac{1}{2}aa} \times (\frac{2}{3} - \frac{1}{10} - \frac{1}{112} - \frac{1}{576} - \frac{5}{11264}$, &c.) $= \frac{a^2\sqrt{\frac{1}{2}}}{2} \times (0.6666 - 0.1 - 0.0089 - 0.0017 - 0.0004$, &c.) $= 0.1964\,a^2$; which, multiplied by 2, gives $0.3928\,a^2$ for the area of the ſemicircle, nearly. In order to obtain a more converging ſeries, let the arc A R be $= \frac{1}{3}$ A E $= 30°$, and the ſine B R (being half the chord of double the arc or half the ſide of a hexagon, *i. e.* half the radius), will be $= \frac{1}{2}$ A O; and A B (x) $=$ A O $-$ O B $=$ A O $-\sqrt{(\text{OR}^2 - \text{BR}^2)}$; which, radius being 1, will be $= 0.1339746$ nearly: ſubſtitute this quantity, with the value of a in the above ſeries, $\sqrt{a}\,x^3 \times (\frac{2}{3} - \frac{x}{5a} - \frac{x^2}{28a^2} -$ &c.) and we ſhall have $0.0693505 \times (0.6666666 - 0.0133975 - 0.0001603 - 0.0000042 -$ &c.) $= 0.0693505 \times 0.6531046 = 0.0452931$ = the area A B R: which, added to the area O B R (= O B $\times \frac{1}{2}$ B R $= \sqrt{\frac{3}{4}} \times \frac{1}{4} = 0.2165063$) gives 0.2617994 for the area of the ſector A O R; the treble of which, or 0.7853982 (A R being $= \frac{1}{3}$ A E), will be the content of the whole quadrant A O E; which number, found by taking only four terms of the ſeries, is true to the laſt decimal place.

We might have found a ſeries of more rapid convergency, but ſhall reſerve that part of our inveſtigation for the article RECTIFICATION.

QUADRATURE *of the Lunes.* See LUNES.

QUADRATURE *of the Ellipſe.* The ellipſe, alſo, is a curve whoſe preciſe quadrature in definite terms is not yet effected. Indeed the area of an ellipſe, being an exact mean proportional between the areas of the circles deſcribed upon its two axes, is obviouſly dependent upon the latter; and it is, therefore, uſeleſs to repeat the operation.

QUADRATURE *of the Parabola.* Let the curve A R M H (*fig.* 15.), be the common parabola, in which y^2 (B R^2) $= ax$ (A B $\times$ a, the parameter). See CONIC *Sections.* Whence we have $y = a^{\frac{1}{2}}\,x^{\frac{1}{2}}$, and $\dot{u}\,(y\dot{x}) = a^{\frac{1}{2}}\,x^{\frac{1}{2}}\,\dot{x}$; and, therefore, $u = \frac{2}{3} \times a^{\frac{1}{2}}\,x^{\frac{3}{2}} = \frac{2}{3}\,a^{\frac{1}{2}}\,x^{\frac{1}{2}} \times x = \frac{2}{3}\,y\,x = \frac{2}{3}$ $\times$ A B $\times$ B R. Hence a parabola is $\frac{2}{3}$ of a rectangle of the ſame baſe and altitude.

The value of the area may alſo eaſily be found in terms of y. Thus x being $= \frac{y^2}{a}$, we have $\dot{x} = \frac{2\,y\dot{y}}{a}$, and $\dot{u}\,(y\dot{x}) = \frac{2\,y^2\dot{y}}{a}$: whence $u = \frac{2\,y^3}{3\,a} = \frac{2\,y}{3} \times \frac{y^2}{a} = \frac{2\,y}{3} \times x = \frac{2}{3} \times$ A B $\times$ B R. See PARABOLA.

In the cubic parabola, whoſe equation is $p^2\,x = y^3$; we have

have $y = p^{\frac{2}{3}} x^{\frac{1}{3}}$; multiply this by $\dot{x}$, and we have $y\dot{x} = p^{\frac{2}{3}} x^{\frac{1}{3}} \dot{x}$, for the fluxion of the area. Therefore fluent $y\dot{x} = \frac{3}{4} p^{\frac{2}{3}} x^{\frac{4}{3}} = \frac{3}{4}$ of xy, that is, area $= \frac{3}{4}$ of circumſcribing rectangle.

And in the ſame manner, it will be found that in the general parabola, whoſe equation is $a^{n-1} x = y^n$; the area $= \frac{n}{n+1} \times$ circumſcribing rectangle.

Quadrature *of the Hyperbola.* The analytical quadrature of this curve was firſt given by N. Mercator of Holſtein, the firſt inventor of infinite ſerieſes. But Mercator finding his ſeries by diviſion, ſir Iſaac Newton and M. Leibnitz improved upon his method; the one ſeeking them by the extraction of roots, the other by a ſeries preſuppoſed. See Hyperbola.

Quadrature *of the Aſymptotic Spaces in an Hyperbola.* Let D E F (*fig.* 16.) be an hyperbola, of which the aſymptotes are C M and C N; to find the area E G H F, comprehended between the ordinates G E and F H.

Let C G $= a$, G E $= b$, G H $= x$, F H $= y$; then by the property of the hyperbola, C G $\times$ G E $=$ C H $\times$ H F, or $ab = (a - x)\, y$, or $y = \frac{ab}{a+x}$; and, therefore, $y\dot{x} = \frac{ab\dot{x}}{a+x}$; the fluent of which is $ab \times$ hyp. log. $(a + x)$, which fluent, however, requires a correction, for when $x = 0$, the area $= 0$; but the above expreſſion when $x = 0$ is $ab \times$ hyp. log. of a, therefore the correction is $- ab \times$ hyp. log. of a, that is, the correct fluent which expreſſes the area is $ab \times$ hyp. log. $(a + x) - ab \times$ hyp. log. a, or area E G F H $= ab \times$ hyp. log. $\frac{a+x}{a}$.

If C G and G E each $= 1$; $y\dot{x} = \frac{\dot{x}}{1+x}$, the fluent of which is hyp. log. $(1 + x)$, which requires no correction.

Quadrature *of the Cycloid.* Let C A L (*fig.* 17.) be a cycloid, A D the axis, A B D the generating circle, A F a tangent at the vertex, C F parallel to A D.

Take any point P in the arc, and draw P M perpendicular to A M. Then the fluxion of the external area A M P $=$ P M $\times$ the fluxion of A M.

Let A E $= x$, A D $= 2a$; then B E $= \sqrt{(2ax - x^2)}$ and the fluxion of B E $= \frac{(a-x)\dot{x}}{\sqrt{(2ax - x^2)}}$.

Alſo P B $=$ the arc B A; therefore the fluxion of P B $= \frac{a\dot{x}}{\sqrt{(2ax - x^2)}}$; and the fluxion of P B + B E, or of A M $= \frac{(2a-x)\dot{x}}{\sqrt{(2ax - x^2)}}$; therefore the fluxion of the area A P M, or P M, $\times$ by the fluxion A M $= \frac{(2ax - x^2)\dot{x}}{\sqrt{(2ax - x^2)}} = \dot{x} \sqrt{(2ax - x^2)}$.

But the fluent of this fluxion is the ſame as that found above for a circle, whoſe radius is a, and verſed ſine x; that is, the area A B E; and, therefore, when $x = 2a$, the whole external area C F A is equal to the area of the ſemicircle A B D. But C D being equal to the ſemicircumference A D, the whole rectangle C D A F $=$ four times the ſemicircle A B D, and conſequently the internal area A C D $=$ three times the ſemicircle A B D; or the whole area of the cycloid equal three times the area of its generating circle.

Quadrature *of the Logiſtic,* or *Logarithmic Curve.* Let the ſubtangent P T (*fig.* 18.) $= a$, P M $= x$, P $p = dx$; then will

$$\frac{y\dot{x}}{\dot{y}} = a$$

$$y\dot{x} = a\dot{y}$$

and fluent of $y\dot{x} = ay$.

Wherefore the indeterminate ſpace H P M I, is equal to the rectangle of P M into P T.

Hence, 1. Let Q S $= z$; then will the indeterminate ſpace I S Q H $= az$; and, conſequently, S M P Q $= ay - az = a\,(y - z)$; that is, the ſpace intercepted between the two logiſtic ſemiordinates is equal to the rectangle of the ſubtangent into the difference of the ſemiordinates.

2. Therefore the ſpace B A P M is to the ſpace P M S Q as the difference of the ſemiordinates A B and P M is to the difference of the ſemiordinates P M and S Q. See Logarithmic *Curve.*

Quadrature *of the Logarithmic Spiral.* Let C B A C (*fig.* 19.), be the area propoſed: let the right line A T touch the curve at A, upon which, from the centre C, let fall the perpendicular C T: then, ſince by the nature of the curve, the angle T A C is every where the ſame, the ratio of A T (t) to C T (s) will be conſtant: and, therefore, the fluent of $\frac{s}{t} \times \frac{y\dot{y}}{2} = \frac{s}{t} \times \frac{y^2}{4} =$ the required area.

Quadrature *of the Spiral of Archimedes.* Let C R R (*fig.* 20.) be the curve, whoſe area C R g C is required. Let A C be a tangent at the centre C, about which centre, with any radius A C $(= a)$, ſuppoſe a circle A gg to be deſcribed: then the arc or abſciſs A g correſponding to any propoſed ordinate C R, being to that ordinate in a conſtant ratio (*e. gr.* as m to n) we have x (A g) $= \frac{my}{n}$; therefore $\dot{u} = \frac{y^2\dot{x}}{2a} = \frac{my^2\dot{y}}{2an}$; conſequently $u = \frac{my^3}{6an} =$ the area C R R g C. See Spiral *of Archimedes.*

Quadrature *of Deſcartes' Curve,* which is defined by the expreſſion, $b^2 : x^2 :: b - x : y$.

Since $b^2 y = bx^2 - x^3$

$$y = (bx^2 - x^3) \div b^2$$

$$y\dot{x} = (bx^2\dot{x} - x^3\dot{x}) \div b^2$$

flu. $y\dot{x} = x^3 \div 3b - x^4 \div 4b^2$.

Quadrature *of all Curves comprehended under the general Equation,* $y = \sqrt[m]{(x + a)}$.

Since $y = (x + a)^{\frac{1}{m}}$

$$y\dot{x} = \dot{x}\,(x + a)^{\frac{1}{m}}$$

Make $(x + a)^{\frac{1}{m}} = v$

Then $x + a = v^m$, or $x = v^m - a$

Whence $\dot{x} = m v^{m-1} \dot{v}$

$y\dot{x} = m v^m \dot{v}$, the fluent of which is $\frac{m v^{m+1}}{m+1} = \frac{m}{m+1} (x + a)\, (x + a)^{\frac{1}{m}} = \frac{m}{m+1} (x + a)^{\frac{m+1}{m}}$.

Let $x = 0$; the remainder will be $\frac{m}{m+1}\, a \sqrt[m]{a}$.

Whence, the area of the curve $= \frac{m}{m+1}(x+a)\sqrt[m]{(x+a)} - \frac{ma}{m+1}\sqrt[m]{a}$.

See on the ſubject of this article Maclaurin's Fluxions, and Simpſon's Fluxions, vol. i. ſect. 7. p. 121, &c.

QUADRATURE, in *Aſtronomy*, that aſpect, or ſituation of the moon, when ſhe is 90 degrees diſtant from the ſun.

Or, the quadrature is when ſhe is in a middle point of her orbit, between the points of conjunction and oppoſition; which happens twice in each revolution, *viz.* in the firſt and third quarter.

When the moon is in her quadrature, ſhe exhibits that phaſis which we call the half-moon, *i. e.* ſhe ſhines with juſt half her face; and is ſaid to be biſected, or dichotomized.

In the moon's progreſs from the ſyzygies to her quadrature, her gravity towards the earth is continually increaſing by the action of the ſun; and her motion is retarded for the ſame reaſon. Her motion then, in her orbit, is ſloweſt as her gravity to the earth is greateſt when in the quadratures.

In her receſs from the quadratures to the ſyzygies, the gravity continually decreaſes, and the velocity increaſes. The ratio is thus: as radius is to the ſum, or difference of one and a half the coſine of double the diſtance of the moon from the ſyzygy, and half the radius; ſo is the addition of gravity in the quadratures to the diminution or increaſe of it in any other ſituation. See SYZYGY.

Hence the moon's orbit is more convex in the quadratures, than in the ſyzygies; and hence the circular figure of the moon's orbit is changed into an oval, whoſe greater axis goes through the quadratures; and hence, alſo, the moon is leſs diſtant from the earth at the ſyzygies, and more at the quadratures.

It is no wonder, therefore, that the moon ſhould approach nearer the earth when her gravity is diminiſhed; that acceſs not being the immediate effect of this diminution, but of the inflexion of the orbit towards the quadratures.

In the quadratures, and within thirty-five degrees of them, the apſides of the moon go backwards, or move *in antecedentia*; but they move forwards in the ſyzygies. See APSIDES.

The moon's orbit undergoes various alterations in each revolution. Its excentricity is the greateſt when the line of the apſides is in the ſyzygies; and the leaſt, when in the quadratures.

Conſidering one entire revolution, the nodes move ſlower and ſlower as the moon approaches the quadratures, and they reſt when ſhe is in them; but conſidering ſeveral revolutions, the nodes go back faſter in the quadratures.

The inclination of the plane of the moon's orbit increaſes as the nodes go from the ſyzygies, and is greateſt when the nodes are in the quadratures. See MOON and NODES.

QUADRATURE *Lines*, or *Lines of Quadrature*, are two lines frequently placed on Gunter's ſector.

They are marked with the letter Q, and the figures 5, 6, 7, 8, 9, 10; of which Q ſignifies the ſide of a ſquare, and the other figures the ſides of polygons of 5, 6, 7, &c. ſides. S there ſtands for the ſemi-diameter of a circle; and 90 for a line equal to ninety degrees in circumference.

QUADRATUS, in *Biography*, an early Chriſtian writer, who flouriſhed under the reigns of Trajan and Adrian. He is ſtyled by Jerome and Euſebius "a diſciple of the apoſtles," and he was reported to have been endowed with the gift of prophecy. According to Euſebius, Quadratus preſented to the emperor Adrian, in the year 126, an apology for the Chriſtian religion, with a view of mitigating the ſufferings inflicted upon the profeſſors of that period. This is ſuppoſed to have been the firſt written apology preſented on the ſame ſubject to any of the Roman emperors, and it produced a conſiderable effect on the mind of Adrian. Of this work only a fragment remains, which is preſerved by Euſebius, and which is extremely valuable on account of the teſtimony which it affords to the reality of the miracles of Chriſt and his apoſtles, by aſſerting that ſome of thoſe miracles were wrought on perſons who were living at the time when Quadratus wrote. Nothing is known reſpecting the time and manner of his death. Lardner.

QUADRATUS, in *Anatomy*, a name given to ſeveral muſcles of the body, on account of their form.

QUADRATUS *Femoris*, *le carrè*, *iſchio-trochantèrien*; is ſituated at the upper and back part of the thigh, and extends from the tuberoſity of the iſchium to the great trochanter. It is flattened, quadrilateral, and tolerably thick. The poſterior ſurface is covered by the gluteus maximus, the ſciatic nerve, and the ſemi-membranoſus; the anterior ſurface covers the obturator externus, the extremity of the tendon of the pſoas magnus, and the back of the trochanter minor. The ſuperior edge is parallel to the inferior geminus; and the inferior to the upper fibres of the adductor magnus. The inner edge, or origin of the muſcle, is fixed to the outer ſide of the tuberoſity of the iſchium, in front of the ſemi-membranoſus; the outer is attached to the bony ridge, which runs from the great to the ſmall trochanter. It is tendinous at its two attachments, and fleſhy in other parts. It will rotate the thigh outwards upon the pelvis; or, if the former be fixed, it will move the pelvis upon the thigh. When the thigh has been carried upwards and outwards, it will reſtore the limb to its natural poſition.

QUADRATUS *Genæ*, a muſcle of the lower lip; ſee the article DEGLUTITION, where it is deſcribed under the name of *depreſſor labii inferioris*.

QUADRATUS *Lumborum*. See LUMBORUM.

QUADRATUS *Occipitis*, a name of the poſterior or occipital portion of the *Epicranius*; which ſee.

QUADRELLA, in *Geography*, a town of Naples, in Lavora; 20 miles E.N.E. of Naples.

QUADRELS, in *Building*, a kind of artificial ſtones, perfectly ſquare; whence their name. They are made of a chalky, or whitiſh and pliable earth, &c. dried in the ſhade for at leaſt two years.

They were formerly in great requeſt among the Italian architects.

QUADRICEPS, in *Anatomy*, a name under which it has been propoſed to deſcribe the extenſors of the knee-joint, *viz.* the vaſtus internus and externus, the cruræus, and rectus; and the adductors of the thigh, with the pectinalis.

QUADRIGA, formed from *quatuor*, *four*, and *jugum*, *yoke*, in *Antiquity*, a car, or chariot, drawn by four horſes, harneſſed abreaſt.

Various are the accounts we have of the inventor of the quadriga. Cicero makes it the invention of Minerva. Hyginus attributes it to Erichthonius IV. king of the Athenians; which ſentiment Virgil alſo follows in his Georgics, lib. iii. ver. 113. Æſchylus gives Prometheus the honour of it. Tertullian, De Spectac. lib. ix. ſays, it was invented among the Argians, by Trochilus, in honour of Juno; and at Rome, by Romulus, in honour of Mars, or Quirinus. Ado of Vienne, Chronic. act iii. will have it to have been invented by one Procidus, about the time of the eſtabliſhment of the kingdom of Athens. Laziardels, Hiſt.

Hiſt. Univerſ. Epitom. lib. xxiv. ſays the ſame of Triptolemus. Laſtly, if there be not opinions enough already, Herodotus gives us another; and ſays, the Greeks borrowed it from the Libyans. Pliny tells us, that his ſeal was a quadriga, lib. xvi.

On the reverſes of medals we frequently ſee Victory, or the emperor, in a quadriga, holding the reins of the horſes; whence theſe coins are called, among the curious, *nummi quadrigati*, and *victoriati*. See BIGATI.

QUADRIGA, from *quatuor* and *juga*, yokes, in *Surgery*, a bandage for the ſternum and ribs, ſo called from its reſemblance to the trappings of a four-horſe car. It was formerly employed in caſes of fractured ribs; but, as it is not now in uſe, a more particular account of it ſeems unneceſſary.

QUADRIGEMINA CORPORA, in *Anatomy*, a part of the brain, known more commonly by the terms nates and teſtes. See BRAIN.

QUADRILATERAL, in *Geometry*, a figure whoſe perimeter conſiſts of four right lines, making four angles; whence it is alſo called a quadrangular figure.

If the ſeveral angles be right, the figure is a rectangular quadrilateral. If oblique, an oblique-angular quadrilateral.

If the ſides of a quadrilateral be equal, and the angles right, the figure is a ſquare.

If the ſides be equal, but the angles unequal, the figure is a rhombus.

If the angles be equal, and the ſides unequal, the figure is a rectangle.

If only the oppoſite angles and ſides be equal, the quadrilateral is a rhomboides.

If the oppoſite angles and ſides be unequal, the quadrilateral is a trapezium.

If any ſide of a quadrilateral, inſcribed in a circle, be produced out of the circle, the external angle will be equal to the oppoſite, internal angle.

Hence, the two oppoſite angles of any quadrilateral figure inſcribed in a circle, always make two right angles: and, therefore, no oblique-angled parallelogram can have a circle deſcribed about it, becauſe its oppoſite angles being equal, muſt together be greater or leſs than two right angles. See CIRCLE.

QUADRILL, QUADRILLA, a little troop or company of cavaliers, pompouſly dreſſed and mounted; for the performance of carouſals, juſts, tournaments, runnings at the ring, and other gallant divertiſements.

The word is borrowed from the Italian, being a diminutive of *ſquadra*, a company of ſoldiers ranged in a ſquare: for *ſquadrare* is, properly, to diſpoſe any thing ſquare; whence their *quadriglia*, the French *ſquadrille* and *quadrille*, and our *quadrill*. The French formerly wrote *ſquadrille*, and *eſquadrille*.

A regular carouſal is to have at leaſt four, and at moſt twelve, quadrills.

Of theſe quadrills, each is to conſiſt of at leaſt three cavaliers, and at moſt of twelve.

The quadrills are diſtinguiſhed by the form of their habits, or the diverſity of their colours.

QUADRILLE, a well-known game at cards; and which has been, in ſeveral caſes, the object of mathematical computations. See M. De Moivre's Doctrine of Chances, 3d edit. p. 97, &c.

QUADRIO, FRANCESCO SAVERIO, in *Biography*, a Jeſuit, author of a voluminous hiſtory and deſcription of every kind of Italian poetry, "Della ſtoria e della Ragione d'ogni Poeſia," eight vols. 4to. publiſhed at Bologna between the years 1739 and 1752.

The author ſeems a mere compiler, without ſelection, taſte, or accuracy. It is a heavy work, hardly intereſting enough to ſtimulate a regular peruſal; and from the diſorder of arrangement, very difficult to conſult. Creſcembeni is as ſuperior to Quadrio in every requiſite of an hiſtorian of literature, as Tiraboſchi is to Creſcimbeni.

QUADRIPARTITION, the dividing by four; or a taking of the fourth part of any number, or quantity.

Hence quadripartite, &c. ſomething divided into four.

QUADRIREME, QUADRIREMIS, a galley, or veſſel, with four oars on a ſide; the invention of which was attributed by the ancients to the Carthaginians.

QUADRISETÆ, the four-haired flies, a term uſed by the writers in natural hiſtory to expreſs thoſe flies of the ſeticaude or hair-tailed kind, which have four hairs or briſtles growing from the tail, as the others have three, two, or one.

QUADRIVIUM, the centre of four ways, where four roads meet and croſs each other. By ſtatute, poſts with inſcriptions are to be ſet up at ſuch croſs-ways, as a direction to travellers, &c. 8 & 9 W. III. c. 10.

QUADRIVIUM, beſides the centre of four ways, was a ſcholaſtic diviſion, uſed in the middle ages in our univerſities, to expreſs the higheſt claſs of philoſophical learning and ſcience; comprehending arithmetic, geometry, aſtronomy, and muſic: as the trivium did grammar, rhetoric, and logic. During this period, muſic, ſuch as it was, muſt have been highly prized to be ranked with the moſt ſublime ſciences, and thought an eſſential part of a learned education.

QUADRO, Ital. literally means ſquare, and in muſic, at preſent, it implies a natural, ♮, or Gothic B, in oppoſition to *tondo*, round, or the round ♭, uſed for a flat. The durum hexachord is ſometimes called the quadro hexachord, from the circumſtance of B being ♮.

It was the opinion of Padre Martini and the prince abbot of St. Blaſius, that accents and points, enlarged, diſfigured, and lengthened, became muſical characters for time as well as tune. At firſt, when lines and ſpaces were uſed, from their being chiefly employed in a ſquare form for writing the chants eſtabliſhed by St. Gregory, they acquired the name of Gregorian notes, quadrata, and in barbarous Latin, quadriquarta. As the church is ſlow in receiving new doctrines, and generally a century later in admitting thoſe improvements or corruptions in muſic (the reader may call them which he pleaſes) that are adopted by the laity as the fortunate efforts of cultivated genius, the notation of chants was at firſt cenſured and prohibited by ſeveral councils; and figurative harmony being regarded as a *crying ſin* by pope John XXII., was formally excommunicated by a bull from the conclave 1321. See NOTES, and TIME-TABLE.

QUADRUGATA TERRÆ, in *Old Law Records*, denotes a team-land; or ſo much as can be tilled by four horſes.

QUADRULA, in *Natural Hiſtory*, a word ſometimes uſed in the ſame ſenſe as teſſela, and ſpoken of the cubic pyrites. Sometimes it is uſed alſo as the name of thoſe little ſpangles of ſhining matter that are mixed among ſand. Theſe are generally fragments of talc; and are of various colours, white, yellow, and blackiſh.

Solinus has uſed the word quadrula to expreſs the fragments of yellow talc that are found in that ſand called *ammochryſos*, or golden ſand. He miſtakes theſe ſhining particles for maſſes of real gold, and makes the ſand itſelf a kind of precious ſubſtance ranked among the gems, and brought from Perſia; but in this he does not agree with the reſt of the ancients.

QUADRUPED. The eſſential character of quadru-

peds is, that they have a hairy body and four feet, and that the females are viviparous, and give ſuck to their young.

Quadrupeds are diſtinguiſhed, by the number of their feet, from other animals, which have only two feet, as birds; from thoſe which have no feet, as fiſhes and reptiles; and from thoſe which have more than two feet, as inſects.

Ariſtotle diſtributes quadrupeds into three claſſes; denominating thoſe whoſe feet are terminated by a hoof in one piece, *ſolipedes;* thoſe which have a cloven hoof he diſtinguiſhed by the name of forked or cloven-footed; and thoſe whoſe feet are digitated he called *fiſſipedes*. With this general diviſion he contented himſelf, without deſcending to a methodical diſtribution of each claſs into their ſeveral orders, genera, &c. Geſner, Aldrovand, Jonſton, and many other naturaliſts, have, adopted the diſtribution of Ariſtotle: but we are indebted for the regular ſyſtematic arrangement of quadrupeds to Mr. Ray, who publiſhed his "Synopſis Methodica Animalium Quadrupedum et Serpentini generis," &c. in 1693. According to this writer, quadrupeds are divided into thoſe which are hoofed, *ungulata;* and thoſe which are clawed, or digitate, *unguiculata*.

QUADRUPEDS, *Hoofed*, are either,

1. *Whole-hoofed, ſolipeda*, μωνοχηλα, μωνυχα, *ſolidungula;* as the horſe and aſs, the onager or wild aſs, the mule; and the zebra of Africa, or the fine ſtriped Indian or African aſs, almoſt like a mule in form and ſtature.

Of the whole-hoofed kind, Ariſtotle has obſerved, that no one hath two horns (he might have ſaid any horns); no one hath the talus, or aſtragalus; nor have the males any appearance of teats.

2. *Cloven-footed:* and that either, 1. Into two diviſions only; as the διχηλα, or biſulcate kind; which are again ſubdivided into ſuch as are,

Firſt, *Ruminant*, μηρυκαζοντα, that is, ſuch as chew the cud; and theſe either have hollow and perpetual horns, as the bull, ſheep, and goat kind; or deciduous horns, as the hart and deer kind, which uſually ſhed their horns annually.

Of the *bull* kind are reckoned theſe; the common bos or bullock, of which the male is taurus, the female vacca; the German urus, urochs, or aurochs; the biſon; the bonaſus; the bubalus, or bufalo; and the bos Africanus of Bellonius, Obſ. lib. ii. c. 50. which he takes to be the bubalus of the ancients.

Of the *ſheep* kind, beſides the common ſort, are reckoned the Arabian ovis laticauda, whoſe tail is ſometimes of thirty pounds weight; the ovis ſtrepſiceros Cretica Bellonii; the ovis Africana, with ſhort hair inſtead of wool; and the ovis Guineenſis, or Angolenſis, of Marcgrave, Hiſt. Braſil. lib. vi. c. 10.

Of the *goat* kind are, beſides the common capra domeſtica, the ibex, or German ſteinbock, found on the tops of the alps; the rupicapra, French chamois, or German gems; the gazella Africana, or antelope; the gazella Indica; the gazella Africana with ſhorter, annulated, and bent horns; the capra ſylveſtris Africana Grimmii; the capra Mambrina, or Syriaca of Geſner; the bucephalus, or moſchelaphus Caii, in Geſner; the tragelaphus Caii, in Geſner; and the tragelaphus of Bellonius.

Of the *hart*, or *deer* kind, are reckoned, the cervus, ελαφος, or red deer; the cervus platyceros, or palmatus, the fallow deer; alce, or the elk; rangifer, the rein deer; the axis Plinii, according to Bellonius; the caprea Plinii, the cuguacu-ete, and cuguacu-apara, of Marcgrave; the caprea Groenlandica.

Secondly, of animals whoſe feet are divided into two parts only, and which do not chew the cud, there is only the hog and ſwine kind. Under this head, beſides the common ſwine, are reckoned the wild boar, or ſwine; the Guineenſis Marcgravii; the porcus Indicus, or babyrouſſa; the tajacu or aper Mexicanus moſchiferus of Dr. Tyſon, called, by Marcgrave, tajacu caaigoara; by others, quauhtla coymatl, and quapizotl; and by Acoſta, and ſome others, zaino.

2. There are ſome quadrupeds, whoſe hoof is cloven into four diviſions, and theſe ſeem to be not ruminant; as the rhinoceros, the hippopotamus, the tapijerete of Braſil, the capy-bara of Braſil, and the animal moſchiferum.

QUADRUPEDS, *Clawed* or *Digitate*. Of this kind, there is, firſt, a ſort whoſe claws are not divided or ſeparated, but adhere to one another, and are covered with one common ſkin, but with obtuſe nails, ſticking out round the margin of the foot; as the elephant, which is anomalous, and not clearly referrible to this kind, or to that of cloven-footed quadrupeds.

A ſecond ſpecies of this digitate kind of quadrupeds, which has only two claws, is the camel; and though theſe have no horns, they both ruminate, and have alſo the four ſtomachs of horned ruminant animals.

Of the camel there are two ſorts; one having but one hunch on the back, the other two.

To this kind alſo belong the Peruvian glama, which ſome have reckoned among the ſheep kind; as alſo the pacos, the ovis Indica, or Peruviana vulgo, which is much leſs than the glama.

A third ſpecies of this unguiculate kind includes ſuch animals as the Greeks called Πιθηκωνυχα, and Ανθρωπομορφα, which have the foot divided into many claws, with broad nails on them; as the ape and monkey kind.

Of theſe, ſome have no tails, and are called ſimiæ, or apes: others have tails, and are called monkies, cercopitheci; and ſuch as have either long or ſhort tails, if they are of a larger ſize, are called papiones, or baboons. There are great numbers and varieties of this ſpecies of quadrupeds; of which naturaliſts have deſcribed theſe, *viz.* the orang-outang, or homo ſylveſtris of Dr. Tyſon, deſcribed by him in a particular diſcourſe; the guariba of Braſil, Marcgravii; the cagui of Braſil, greater and leſſer; the cay of the ſame region, deſcribed by Lerius; the caitaia of the ſame country; the cercopithecus barbatus Guineenſis, two or three ſorts of it; the cercopithecus Angolenſis major; the cercopithecus non barbatus Cluſii; the cercopithecus Cluſ. called ſagouin. Laſtly, if apes and monkies have their ſnouts very prominent, like dogs, they are called cynocephali.

A fourth ſpecies of this unguiculate kind is, when, though the claws are many, yet they are not covered at the end with broad flat nails, like monkies or apes; but are rather like the talons of hawks, &c. crooked and ſharp-pointed.

Theſe, in reſpect of their teeth, may be divided into ſuch as have many dentes primores, or inciſores (that is, cutting teeth) in each jaw, of which there are two ſorts; a greater, which either have a ſhort, round head, as the cat kind; or a leſſer ſort, having a long ſlender body, with very ſhort legs, as the weaſel or vermin kind. There are alſo ſome of this ſpecies of quadrupeds which have only two large remarkable teeth in each jaw: theſe are the hare kind; and theſe live only upon herbs, graſs, &c.

Of the *cat* kind of quadrupeds are reckoned to be the lion; the tyger; the pardalis, whoſe male is pardus, and female panthera; the leopard; the lupus cervarius, or lynx; the catus pardus, or cat-a-mountain; the common cat; and the bear.

Of the *dog* kind are reckoned the wolf; the lupus aureus, or jackall; beſides the common dog, of which kind they

they enumerate the maſtive, or maſtiff; the canis venaticus Graius, Græcus, or Scoticus, the greyhound; Graius Hibernicus, or the Iriſh greyhound; the canis venaticus ſagax, indagator, fectator ferarum, &c. the hound; canis venaticus Hiſpanicus, or aviarius, the ſpaniel for land or water; vertagus, or tumbler; canis Οικαρος, or domeſticus, the houſe-dog; canis melitæus, or the lap-dog; canis Getulus, or Iſlandicus, the ſhock: and of all theſe ſorts there are many varieties of mongrels, and hybridous breeds.

Other ſpecies of the dog kind are, the fox; the animal zibethicum, or civet-cat, as it is corruptly called, but by its teeth and ſnout is plainly of the dog tribe; the American coati, or rackoon, or rattoon; the yzquiepatl; the carigueya, maritucaca, carigoy, ropoza, or opoſſum; the taiubi; the taxus, or meles, the badger, grey, or pate; the lutra, or otter. To theſe ſome add the phoca, ſea-calf or ſeal; the equus marinus, morſe, or ſea-horſe, miſtaken by ſome for the hippopotamus; the Dutch call him walrus, the Danes and Icelanders roſmarus; laſtly, the manati, or vacca marina, the ſea-cow.

Of the *vermin*, or *weaſel* kind of quadrupeds, is, firſt, the muſtela vulgaris, the common weaſel, in Yorkſhire called foumart, or fitchet, γαλεη: the viverra Indica, called quil and quirpele; another ſort called mungo, and mungathia, of a reddiſh-grey; the muſtela, ermine, or ſtoat, and muſtela ſylveſtris, the ferret; putorius, the pole-cat; martes, or foyna, the martin, or martlet; muſtella zibellina, the ſable: laſtly, the genetta; and the ichneumon Bellonii.

Of the *hare* kind of quadrupeds are, firſt, lepus, or the common hare; cuniculus, the rabbet, or coney; tapeti, or Braſil coney, and the aperea of Braſil; the hyſtrix, or porcupine, and the hyſtrix Americanus, or cuanda of Braſil; caſtor, fiber, or the beaver; ſciurus vulg. or ſquirrel; the Virginian, Zeylandic, Barbary, and American flying ſquirrel; mus domeſticus, major and minor, the common rat and mouſe: to theſe alſo may be referred mus major aquaticus, the water-rat; the muſk-rat, mus avellanarum, major and minor; the dormouſe or ſleeper, mus Noricus, Cricetus, Alpinus, ſeu marmotta; the cavia cobaya, or cuniculus Americanus, the Guinea-pig; the aguti, and paca of Braſil; the mus Norwegicus, or leming; the glis Geſneri, or the rell; the mus Indicus, &c.

QUADRUPEDS, *Anomalous*. To theſe ſeveral kinds, the following anomalous ones muſt alſo be added:

1. Such four-footed viviparous animals as have a longiſh ſnout, with their feet divided into many claws, and toes, and having teeth; as the echinus terreſtris, or common urchin, or hedge-hog; erinaceus Indicus albus; tatu or armadillo prima of Marcgrave; tatuete of Braſil, or the ſecond ſpecies of the armadillo, according to Marcgrave; tatu apara, his third ſpecies of armadillo; tatu muſtelinus, Soc. Reg. Muſ. the weaſel-headed armadillo; talpa, the molewarp, or moldwarp; and the mus araneus, ſhrew, hardy ſhrew, ſhrew-mouſe.

2. Quadrupedous and viviparous animals with a longiſh ſnout, having their feet divided into many claws or toes, but without teeth; as the tamandua guacu of Braſil, Marcgravii, urſus formicarius Cardani, the great ant-bear; the tamandua of Braſil, or Marcgrave, the leſſer ant-bear.

3. Anomalous flying quadrupeds, with a ſhorter ſnout, and their feet divided as above; being of the bat kind, or flitter-mice, of which there are ſeveral ſizes, and of different forms.

4. There is one very anomalous animal, which has but three claws on each foot; and that is the ai or ignavus of Marcgrave, the ſloth or ſluggard.

5. Viviparous and ſanguineous quadrupeds, breathing with lungs, but having only one ventricle in the heart; as the rana aquatica, the frog, or froſh; rana arborea, ſeu ranunculus viridis, the ſmall tree or green frog; bufo, ſive rubeta, the toad; teſtudo, the tortoiſe, in Greek χελωνη; of theſe there are land and water ones, and many different ſpecies in foreign parts.

6. Oviparous quadrupeds, with a long tail ſtretched out horizontally. Such are the lizard kind; as lacertus omnium maximus, the crocodile; cordylus, ſive caudiverbera, uromaſtrix Græcis, larger than the green lizard; tapayaxin Novæ Hiſpaniæ, or lacertus orbicularis of Hernandez; lacertus vulgaris, the common eft, ſwift, or newt; lacertus viridis, the green lizard; lacertus ſucetanus Aldrovandi, at Rome and Naples called the tarantula; lacertus Indicus, called ſenembi and iguana; lacertus Braſilienſis, called tejuguacu, and temapara by Marcgrave; the taraguira ameiva, taraguico Arcuraba, Americima, Curapopeba, Teiunhana, &c. of Marcgrave; the lacertus Indicus; the ſcincus, or crocodilus terreſtris; the ſeps, or lacerta chalcidica, a kind of footed ſerpent; ſtellio, the ſwift, or ſpotted lizard; ſalamandra, called the ſalamandra aquatica, the water-eft, lacerta volans Indica; and the chamæleo, or cameleon.

This ſyſtem of Mr. Ray obtained very generally among naturaliſts, till, in the year 1735, Linnæus firſt publiſhed his ſyſtem. This was followed by ſeveral others, varying in the arrangement of the animal kingdom, even to the laſt edition of 1767. Under the claſs, which he denominates *Mammalia*, (which ſee,) he comprehends not only all the animals which we call quadrupeds (the lizard genus, or rather the reptiles pedati excepted), but alſo the cetaceous order, or whales, cachalots, and porpeſſes: juſtifying this arrangement of whales with quadrupeds, from the agreement of theſe animals in the ſtructure of the heart, in the reſpiration by means of lungs, in their having moveable eye-lids and ears, in being viviparous, furniſhed with teeth, and other particulars, by which they differ ſo materially from fiſhes, as more than to counterbalance their living with them in the ſame element. The mammalia are divided into ſeven orders, the diſtinctions of which are principally eſtabliſhed on the difference in the numbers, ſituation, and form of the three kinds of teeth, *viz.* the primores or inciſores, called fore-teeth, or cutting-teeth; the laniarii or canini, called dog-teeth, canine or lacerating teeth; and the molares, double teeth or grinders. But Linnæus does not entirely neglect the feet. See the characters of the ſeveral orders under PRIMATES, BRUTE, FERÆ, GLIS, PECORA, BELLUA, and *Cete* or WHALE. This part of the Linnæan ſyſtem, including a few ſpecies deſcribed in the Appendix of the third tome, and in the Mantiſſa of 1771, contains about two hundred and thirty ſpecies.

Mr. Pennant, in his "Synopſis of Quadrupeds," and profeſſor Martin, in his "Elements of Natural Hiſtory," by including ſome animals that were unknown to Linnæus, and giving the rank of ſpecies to ſeveral that were conſidered by him as varieties, have extended the number of mammalia to two hundred and eighty-nine ſpecies. Mr. Klein, in 1751, publiſhed a new ſyſtem of quadrupeds, intitled "Quadrup. Diſpoſitio brevifque Hiſt. Natur." in which he diſtributes them into two orders, the firſt comprehending thoſe whoſe feet are terminated by one or more hoofs, and the ſecond thoſe which are digitated; and each of theſe orders is ſubdivided into five families or claſſes. In his firſt order he follows the general arrangement of Mr. Ray, which he has conſiderably improved: but in the ſecond, by a ſervile regard to a method founded on the number of toes, he has combined very oppoſite animals; the camel and the ſloth, the mole and the bat,

bat, the glutton and apes. Mr. Briſſon, in 1756, publiſhed another ſyſtem, in which he has arranged animals by the number or defect of their teeth; beginning with thoſe that are toothleſs, ſuch as the ant-eater, and ending with thoſe that have the greateſt number, ſuch as the opoſſum. By this arrangement, ſome quadrupeds, very diſtant from each other in their manners, are too nearly connected. We ſhall ſay nothing of Mr. Buffon's "Hiſtory of Quadrupeds," though it contains much valuable information, becauſe he ſeems to have diſregarded ſyſtematic arrangement. Mr. Pennant has introduced ſome uſeful alterations in his "Hiſtory of Quadrupeds;" this ingenious naturaliſt has followed Mr. Ray in his greater diviſion of animals into *hoofed* and *digitated*; but, after the manner of Mr. Klein, he has formed ſeparate genera of the rhinoceros, hippopotamus, tapiir, and muſk. The apes are continued in the rank in which Mr. Ray placed them, and are followed by the maucaucos. The carnivorous animals are arranged according to the ſyſtem of Linnæus, omitting the ſeal, mole, ſhrew, and hedge-hog. The herbivorous or frugivorous quadrupeds occupy the claſs aſſigned to them by Mr. Ray, to which he has allotted likewiſe the ſhrew, the mole, and the hedge-hog. The fourth ſection of digitated quadrupeds conſiſts of thoſe which are abſolutely deſtitute of cutting teeth, ſuch as the ſloth and armadillo. The fifth ſection is formed of thoſe which are deſtitute of teeth of every kind, ſuch as the manis and ant-eater. The third and fourth orders or diviſions which Mr. Pennant has added, are the *pinnated* and the *winged* quadrupeds: the firſt comprehends the walrus, the ſeals, and (in conformity to preceding writers) the manati. But theſe, he obſerves, ſeem as the links between the quadrupeds and the cetaceous animals. The bats are winged quadrupeds, and form the next gradation from this to the claſs of birds. See Pennant's Hiſt. of Quadrupeds, ed. 8vo. 1781. Preface. See CLASSIFICATION.

QUADRUPEDS, *Alated*. Among the many fabulous things with which natural hiſtory has been loaded, ſtories of flying quadrupeds ſeem to claim a very high rank; the gryphon, the quadruped dragon, and a great many other imaginary animals, having been introduced ſo ſeriouſly among the deſcriptions of real animals, that too many have been taught to believe them. Scheuchzer, in his "Phyſica Sacra Jobi," has done much toward diſcountenancing ſuch relations; and Hyacinthus Gemma, who has written expreſsly "De Fabuloſis Animalibus," has added much on the ſame occaſion; yet all is not done. The world have late hiſtories of lemmas and baſiliſks, which never exiſted but in the imagination of the relator, or in the ſubtle contrivance of the fabricator; as is evidently the caſe in the baſiliſks which we find in the muſeums of the curious, and which are all made out of the ray-fiſh. And the generality of readers are ſo fond of any thing that is marvellous, that theſe things are ſure to be remembered, while perhaps all the truths in the book are forgotten.

Upon the whole, the ſtandard of the flying or alated quadrupeds ſeems to be properly enough reducible to this: that the words flying and alated are not ſynonimous terms, and that there are three kinds of flying among the quadruped claſs. The firſt abſolute and ſwift, flying as perfect as in birds: this peculiarly belongs to the bat; which is the only alated or winged quadruped, properly ſpeaking. 2. An imperfect flying by means of certain membranes ſerving as wings, but imperfectly, and not turning quick, or enduring long flights; ſuch is the flying of the lizard, which is not properly an alated animal. And laſtly, the imperfect flying of the ſquirrel kind, which even in that ſpecies called, by way of eminence, the flying ſquirrel, is not properly flying, but only long leaping; the creature being able to turn but very little out of a right line, and only to ſuſpend itſelf during a ſhort time in a leap from a high place to a lower. Phil. Tranſ. N° 247. p. 34.

QUADRUPEDS, in *Agriculture*, all ſuch animals as walk on four legs, and are of the domeſtic kind, as horſes, neat cattle, ſheep, ſwine, and many other ſorts, which are beneficial either for the purpoſes of working, fattening, or in any other way. Some animals of this nature are diſpoſed for one of theſe purpoſes in preference to others; while others are capable of being made to ſerve more than one of them. Thus, horſes of the lighter and more active kind are adapted to the ſaddle, and ſome ſorts of road work, and thoſe of the more heavy ſort to all deſcriptions of team work in the field or other places. And neat cattle of the ox kind, in the leſs heavy breeds, as the Devonſhire, Herefordſhire, and ſome others, are well ſuited to team labour as well as fattening; while thoſe of the more heavy ſorts, as the Lancaſhire breed, or long horſes, &c. are better calculated for feeding only. Among ſheep, ſome breeds are valuable for their mutton as well as their wool; ſome for the former, or latter, of theſe articles only; and others again for their ready diſpoſition in taking on fleſh. In ſwine, ſome breeds are much better formed than others; require much leſs food, in proportion to their ſizes, in keeping and fattening, and are more diſpoſed to feed, &c.

The ſame is likewiſe the caſe with ſome other animals of this deſcription, which ſhould conſtantly be taken into the account in ſelecting and chooſing them for the uſe of the farmer.

Quadrupeds of all ſorts, ſhould alſo, in all caſes, be well adapted in their numbers, natures, and kinds, to the qualities of the lands as farms, their extents, and the quantities of labour to be performed upon them, as much in the ſucceſs of farming depends on this being properly done. They ſhould likewiſe be conſtantly well kept and in proper condition, according to the different intentions for which they are deſigned, as badly fed or half-ſtarved animals never anſwer any good purpoſe for the farmer, they always requiring a much larger proportion of food for reſtoring or bringing them again into proper order and for fattening them, than would otherwiſe have been neceſſary; and they never ultimately turn out ſo well, or produce ſo much advantage, as might have been the caſe under other circumſtances. And, in labouring animals, where this is the caſe, they are never capable of performing nearly ſo much work, in conſequence of which a vaſt continual loſs is ſuſtained, though ſcarcely perceived. See LIVE-*Stock*, and TEAM.

QUADRUPLATORES, among the Romans, were informers, who had the fourth part of the confiſcated goods for their pains.

QUADRUPLE, a ſum or number multiplied by four, or taken four times.

QUADRUPLE is particularly uſed for a gold coin, worth four times as much as that of which it is the quadruple.

The quadruple of the Spaniſh piſtole is a piece of four piſtoles, called alſo the *double doubloon*.

The quadruple of the louis d'or is a piece of gold coined in the reign of Louis XIII. in 1641. The legend on one ſide is CHRISTUS VINCIT, REGNAT, IMPERAT: and on the middle of this ſide it has a croſs with four crowns, and cantoned in four fleurs-de-lis: on the other ſide it has the legend, LUDOVICUS DECIMUS TERTIUS DEI GRATIA FRANCORUM REX, with the head of Louis XIII. Its value under this king was twenty livres.

QUADRUPLE *Croche*, in *French Muſic*, is a note with four hooks or four ties, one degree quicker than our demi-ſemiquaver,

ſemiquaver, and for which we have no name. The term *croche*, in French a quaver, is not derived from *crotchet*, but from the tail being *crooked*. And why our crotchet, with a *ſtraight tail*, has its name, is a whimſical abſurdity, for which we are unable to account.

QUÆ *eſt eadem*, in *Pleading*, is uſed to ſupply the want of a traverſe. (2 Lill. Abr. 405.) In a *clauſum fregit* ſuch a day, the defendant pleads the plaintiff's licence to him to enter on the ſame day, and that *virtute inde* he entered; he need not ſay, *quæ eſt eadem tranſgreſſio*.

QUÆ *Plura*, a writ that anciently lay where inquiſition had been made by an eſcheator, of ſuch lands or tenements as any man died ſeiſed of, and all was ſuppoſed not to be found by the office or inquiſition.

This writ was to inquire what more lands or tenements the parties died ſeiſed of. But it is now made uſeleſs, by taking away the courts of wards and offices poſt mortem.

QUÆ *Servitia*. See PER *quæ ſervitia*.

QUÆRENS *non invenit plegium*, a return made by the ſheriff upon a writ directed to him with this clauſe, *viz. Si A. fecerit B. ſecurum de clamore ſuo proſequendo*, &c. F. N. B. 38.

QUAERNES, in *Geography*, a town of Norway; 55 miles N. of Romſdal.

QUÆSTA, in our *Ancient Writers*, denotes an indulgence, or remiſſion of penance, expoſed to ſale by the popes.

QUÆSTIONARII, in our *Ancient Law Books*, were people who went about with indulgences from door to door, deſiring charity either for themſelves or others.

Matt. Weſt obſerves, 1240, that the king, "Terram ſuam per papale queſtionarios, depauperari, &c. permiſit."

QUÆSTOR. See QUESTOR.

QUÆSTUS, in *Law*, is that eſtate, or thoſe effects, which a man hath by acquiſition or purchaſe; in contradiſtinction to *hæreditas*, which is what he hath by deſcent. See ACQUEST, and GOODS.

Glanv. lib. vii. "aut habet hæreditatem tantum, vel quæſtum tantum, aut hereditatem & quæſtum."

QUAG, in *Agriculture*, a name given to any ſort of wet, ſwampy, moraſſy, or boggy ſituation in land, which has a tremulous or ſhaking feel under the foot, and which produces nothing but a coarſe graſſy herbage that is unfit for the food of animals. Low as well as high grounds are ſubject to ſpots of this kind wherever water is confined and retained near the ſurface. They are to be removed by proper means of draining, and the application of ſolid earthy matters of different kinds upon the ſurfaces of them, with the uſe of rollers in order to conſolidate the whole. See BOG and SWAMP.

QUAGGA, in *Zoology*. See EQUUS.

QUAGLIATI, PAOLO, in *Biography*, the muſic-maſter of the celebrated traveller, Pietro della Valle, at Rome, in the beginning of the 17th century. His diſciple, della Valle, ſays, "that he was an excellent maeſtro di cappella, who introduced a new ſpecies of muſic into the Roman churches, not only in compoſitions for a ſingle voice (*monodie*), but for two, three, or four, and very often more voices, in chorus, ending with a numerous crowd of many choirs or choruſſes, ſinging together; ſpecimens of which may be ſeen in many of his motets that have been ſince printed. And the muſic of my *cart*, or moveable-ſtage, compoſed by the ſame Quagliati, in my own room, chiefly in the manner he found moſt agreeable to me, and performed in maſks through the ſtreets of Rome during the carnival of 1606, was the firſt attempt at an opera, or ſecular drama in muſic, which had been heard in that city." See OPERA, RECITATIVE, and PIETRO DELLA VALLE.

QUAGMIRE, in *Agriculture*, the name of a ſort of ſoft miry ſhaking or quaking bog, ſwamp, or moraſs, which is frequently and commonly met with in low hollow ſituations, where there is none, or very little deſcent, for the diſcharge of the ſtagnant water or wetneſs. They are formed in many different ways according to the nature of the circumſtances which firſt gave riſe to them, and that of the places in which they are found. The author of the "Treatiſe on Landed Property" has remarked, that beſides the common moory quagmires or bogs, there is a ſpecies which is conſtantly charged with moiſture, yet does not accumulate a thick covering of moory earth, owing probably, it is ſuppoſed, to the want of fertility in the water by which it fed. Theſe ſorts of quagmires are, in his opinion, for the moſt part, found in mountainous and hilly ſituations. Other kinds are occaſionally ſeen on large peat moſſes, and hollow meadows, in ſpots where the water is confined and kept up nearly to their upper parts, and where there is much decay of vegetable productions on their ſurfaces, and the reception of earthy materials from other places. Theſe quagmires occupy large ſpots of ground in many different ſituations, and are, of courſe, a great loſs to individuals and the public, as little or nothing of any uſe is ever produced by them. (See MORASS.) They are, for the moſt part, capable of being readily drained by proper means, a ſort of improvement which ought never to be neglected where it can be performed with any chance of ſucceſs.

QUAHU, in *Geography*, a diſtrict of Africa, on the Gold Coaſt, in the kingdom of Acambou, or Aquamboe; which ſee.

QUAHVITLA, in *Botany*, a name uſed by ſome authors for the tree from which the reſin commonly called gum copal is procured.

QUAICHA, in *Geography*, a town of Africa, in Sennaar; 38 miles E.S.E. of Gieſſim.

QUAIL, COTURNIX, or Tetrao coturnix of Linnæus, in *Ornithology*, the leaſt of all the birds of the gallinaceous kind. They have, however, the genius of the cock kind, and may be bred to fight like our game cocks.

This was an old cuſtom among the Athenians, and is ſtill kept up in ſome parts of Italy, and in Aſia.

Quails are birds of paſſage, ſome entirely quitting our iſland, others ſhifting their quarters from one county to another, and ſheltering themſelves among the weeds near the ſea-ſide; with us they frequent the corn-fields, and ſometimes the meadows. They begin to ſing in April, and make their neſts in the month of May, building on the ground, and ſeldom lay more than than ſix or ſeven whitiſh eggs, marked with ragged ruſt-coloured ſpots.

Quails are to be taken by means of the call during their whole wooing time, which laſts from April to Auguſt. The proper times for uſing the call are at ſun-riſing, at nine o'clock in the morning, at three in the afternoon, and at ſun-ſet; for theſe are the natural times of the quail's calling. The notes of the cock and hen-quail are very different, and the ſportſman who expects to ſucceed in the taking of them, muſt be expert in both; for when the cock calls, the anſwer is to be made in the hen's note; and when the hen calls, the anſwer is to be made in the cock's. By this means they will come up to the perſon, ſo that he may, with great eaſe, throw the net over them, and take them. If a cock-quail be ſingle, on hearing the hen's note he will immediately come; but if he have a hen already with him, he will not forſake her. Sometimes, though only one quail anſwers to the call, there will three or four come up; and

and then it is beſt to have patience, and not run to take up the firſt, but ſtay till they are all entangled, as they will ſoon be.

The quail is a neat cleanly bird, and will not run much into dirty or wet places: in dewy mornings they will often fly inſtead of running to the call; and in this caſe, it is beſt to let them go over the net, if it ſo happens that they fly higher than its top, and the ſportſman then changing ſides, and calling again, the bird will come back, and then will probably be taken in the net.

The calls are to be made of a ſmall leather purſe, about two fingers wide, and four fingers long, and made in the ſhape of a pear; this is to be ſtuffed half full of horſe-hair, and at the end of it is to be placed a ſmall whiſtle, made of the bone of a rabbet's leg, or ſome other ſuch bone; this is to be about two inches long, and the end formed like a flageolet, with a little ſoft wax. This is to be the end faſtened into the purſe; the other is to be cloſed up with the ſame wax, only that a hole is to be opened with a pin, to make it give a diſtinct and clear ſound. To make this ſound, it is to be held full in the palm of the hand, with one of the fingers placed over the top of the wax: then the purſe is to be preſſed, and the finger is to ſhake over the middle of it, to modulate the ſound it gives into a ſort of ſhake. This is the moſt uſeful call; for it imitates the note of the hen-quail, and ſeldom fails to bring a cock to the net, if there be one near the place.

The call that imitates the note of the cock, and is uſed to bring the hen to him, is to be about four inches long, and above an inch thick; it is to be made of a piece of wire, turned round and curled, and covered with leather; and one end of it muſt be cloſed up with a piece of flat wood, about the middle of which there muſt be a ſmall thread or ſtrap of leather, and at the other end is to be placed the ſame ſort of pipe, made of bone, as is uſed in the other call. The noiſe is made by opening and cloſing the ſpiral, and gives the ſame ſound that the cock does when he gives the hen a ſignal that he is near her.

QUAKERS, in *Eccleſiaſtical Hiſtory*, the common denomination of a ſociety of Chriſtians, who appeared firſt in England about the middle of the ſeventeenth century, and who continue to be diſtinguiſhed from others by peculiar tenets and practices. They call themſelves *Friends*. They are remarkable for aſſerting the continuance, to the preſent time, of immediate revelation, or the communication of divine inſtruction to the mind, by the teſtimony of the ſpirit of God. This revelation they affirm to be neceſſary for the production of true faith, and that it neither does nor can contradict the outward teſtimony of the ſcriptures, or right and ſound reaſon. Their doctrine on this ſubject has been often miſunderſtood, even by theological writers; and they have in conſequence been ſubjected to much obloquy. It is, however, the principal feature in that peculiar view of Chriſtianity, which has occaſioned their ſeparation from other churches.

Origin and Hiſtory.—Before the period above mentioned, many ſerious perſons, ſatisfied with none of the modes of religion which the reformation brought forth, had withdrawn from the communion of every viſible church, to cultivate in retirement, impreſſions which they attributed to the operation of the ſpirit of Chriſt on their own minds: it is chiefly from ſuch, when brought to recognize each other by the miniſtry of an individual, that the Quakers conſider their ſociety to have been originally gathered. George Fox, the individual in queſtion, was born in 1624. He has left a journal of his own life, written with a ſimplicity of ſtyle, which proves that he has fairly laid open his own character. In this work, the peculiar principles of Quakeriſm may be ſatisfactorily explored in their early beginnings, which it may be worth while briefly to review. Fox's parents, who were pious members of the church of England, had intended him for the prieſthood, his character affording very early promiſe of fitneſs for religious ſervice; but others perſuading to the contrary, he was put under a maſter to a country buſineſs. Being engaged herein at a fair, when about the age of nineteen, a couſin of his, with another profeſſor of religion, attempted to engage him in drinking to intoxication. "The Lord had ſhewn me," ſays George, "that I might not eat or drink to make myſelf wanton, but for health, uſing the creatures in their ſervice, as ſervants in their places, to the glory of Him who created them."

Accordingly, on perceiving the deſign of his companions, he roſe up, paid for the refreſhment they had had, and departed, with emotions of virtuous indignation. Returning home, he paſſed a ſleepleſs night, walking up and down, and crying to the Lord; who, he affirms, ſaid unto him, "Thou ſeeſt how young people go together into vanity, and old people into the earth; thou muſt forſake all, young and old, keep out of all, and be as a ſtranger unto all." The reader will underſtand this, and generally all revelations profeſſed to have been received by Quakers, as conſiſting not in an outward voice, but in an internal communication to the mind. Taking the command literally, he detached himſelf from his connexions; and having ſome property of his own whereon to ſubſiſt, removed from place to place, obſerving the religion and profeſſors of the age, without engaging in cloſe fellowſhip with any. He devoted much of his time to faſting, ſolitary prayer, and reading the bible.

He became at length quite detached in his affections from the world, diſtreſſed at the ſpiritual condition of his fellow men, and in much anxiety, bordering on deſpair, about his own; yet was not without intervals of heavenly joy and comfort. Such a ſtate of mind naturally led him to ſeek for ſpiritual counſel from others, and he had conferences with many of the clergy, beginning with his own pariſh prieſt. In anſwer to a queſtion from the latter, we find him profeſſing faith in Chriſt, who, by his death as man, (for he died not as he was God,) became an offering for the ſins of the whole world. The general reſult of theſe conferences was, however, unſatisfactory to him; "for," he obſerves, "they could not reach my condition." Purſuing, therefore, his meditations on the ſubject as before, he came to be ſatisfied reſpecting ſeveral propoſitions which it involved, ſuch as the following:—that although it was ſaid that all Chriſtians are believers, both Proteſtants and Papiſts, yet that none were truly ſuch, but thoſe who were born of God, and who had paſſed from death unto life. Again, that to be bred at Oxford or Cambridge, was not enough to fit and qualify men to be miniſters of Chriſt. At this he wondered, becauſe it was the common belief that ſuch qualification was ſufficient. "At another time," he ſays, "it was opened in me, that God, who made the world, did not dwell in temples made with hands. This at firſt ſeemed ſtrange, becauſe both prieſts and people uſed to call their temples or churches dreadful places, holy ground, and the temples of God; but the Lord ſhewed me clearly that he did not dwell in thoſe temples, which men had commanded and ſet up, but in people's hearts." George Fox now ceaſed to attend the eſtabliſhed preachers; at which his relations being offended, he ſhewed them from the ſcriptures, "that there was an anointing within man to teach him, and that the Lord would teach his people himſelf."

Obſerving,

Obſerving, as he thought, more of the fruits of this internal teaching among the "diſſenting people," he went for a while among them; but, he continues, "as I had forſaken the prieſts, ſo I left the ſeparate preachers alſo, and thoſe called the moſt experienced people; for I ſaw there was none among them all that could ſpeak to my condition. And when all my hopes in them, and in all men, were gone, ſo that I had nothing outwardly to help me, nor could tell what to do, then, O then, I heard a voice, which ſaid, 'There is One, even Chriſt Jeſus, that can ſpeak to thy condition.' When I heard it my heart did leap for joy. Then the Lord let me ſee why there was none that could ſpeak to my condition, namely, that I might give him all the glory. For all (he continues, alluding to Rom. xi. 32.) are concluded under ſin, and ſhut up in unbelief, as I had been, that Jeſus Chriſt might have the pre-eminence, who enlightens and gives grace, faith, and power."

The preceding is a ſpecimen of Fox's own account of the manner in which the doctrine he afterwards preached aroſe in his mind. The reader will perceive that he refers all his real edification to the means which have been already indicated, immediate revelation. He ſays, "though I read the ſcriptures, that ſpoke of Chriſt, and of God, yet I knew *Him* not but by revelation, as he who hath the key did open, and as the Father of life drew me to his Son by his Spirit." Yet that he was ſenſible of the importance of the holy ſcriptures, as the ſource from whence, under this influence, Chriſtian inſtruction muſt be drawn, is evident, both from his declaring that they were very precious to him, and from his having inceſſantly uſed, and conſtantly appealed to them, both before and after beginning to promulgate his ſyſtem.

Having at length attained to a view of Chriſtianity in which he found peace of mind, he believed himſelf required and divinely commiſſioned to become a teacher of it to others: and from the year 1647, the reader may conceive him always engaged in this office. He travelled as before, preaching firſt to ſmall companies of enquiring perſons, then to public congregations, ſuch as upon his appearance among them were willing to hear him, and at length to large aſſemblies of people, convened on purpoſe. This he did with the courage and perſeverance of a reformer; in the face of oppoſition from the national and ſtipendiary preachers, of frequent perſonal abuſe from their hearers, and occaſional ſevere treatment by the magiſtrates. In moſt places where he came, he met with perſons who received his doctrines, a proportion of whom, after aſſociating with him for a time, became impreſſed with the like apprehenſions of duty to propagate their principles; which they attempted by ſimilar methods. Thus, although interrupted at different periods by impriſonment, he found himſelf, before many years had elapſed, in connection with a numerous band of fellow-labourers, and a widely diffuſed and reſpectable ſociety of religious friends. No inconſiderable number of theſe quitted, for the ſake of their principles, livings in the church, commiſſions in the army, or ſeats as magiſtrates.

When we conſider that this happened in an age equally remarkable for religious zeal and political turbulence, it will appear that ſome deviations from Chriſtian propriety, ſome fruits of the mixture of imagination with good intentions, could ſcarcely fail to be exhibited among them. If the new ſociety, from a regard to its principle of internal impulſes to particular duties, was ſlow to condemn theſe, it was careful, on the other hand, not to engraft them, by imitation on its practice. Individuals, therefore, were alone reſponſible for ſuch acts, and the general conduct of the members, from the period of their firſt aſſociating together, was found in no mean degree conformable to the morality of the goſpel.

The moſt ſerious inſtance of miſconduct occurred in the caſe of James Nayler and his followers. This fell out in 1656, and was magnified beyond its real importance by being ſuffered to occupy for ten days the attention of parliament. Nayler had been an Independent, and a quarter-maſter of horſe under major-general Lambert. He was one of George Fox's earlieſt converts, and for ſome years an able preacher and diſputant in the ſame cauſe. Coming to London, he found a ſet of people who extolled him in his office above meaſure. His friends, and George Fox among the reſt, ſeeing his danger, gave him ſuitable cautions; but ſlighting theſe, he became expoſed to the flatteries of a train of followers, chiefly women, whom he ſuffered, at length, from a deluſive notion of its being done to *Chriſt in him*, to addreſs him with the name and titles of the Saviour, and with acts amounting to worſhip. In particular, his entrance into Briſtol was conducted, by theſe infatuated people, in imitation of the proceſſion of Chriſt into Jeruſalem. The parties implicated in this tranſaction were committed to priſon; but Nayler alone was ſelected by parliament, after examination and long debates on his caſe, for puniſhment as a blaſphemer. Cromwell kept aloof from the proceedings, which, by their exceſſive ſeverity, moved great commiſeration in the public. The culprit was twice ſcourged through the ſtreets, twice pilloried, branded in the forehead, and bored through the tongue with a hot iron: all which he endured with ſurpriſing patience and fortitude. His puniſhment ended with two years' cloſe impriſonment in Bridewell, during which he attained to repentance, and a ſounder mind. Having given proof of this by ſeveral public confeſſions, the Quakers, who had diſowned both him and his followers, received him back into their communion, in which he lived circumſpectly the ſhort remainder of his life.

Quakeriſm prevailed at firſt chiefly in the northern counties; but many preachers having riſen up here, who travelled in different directions, it was not long in ſpreading to the metropolis, and the remoter ſouthern and weſtern parts. Wherever its profeſſors appeared, the ordeal of ſuffering awaited them; for which their negative tenets commonly furniſhed the occaſion. They refuſed to the prieſts every kind of payment, to the government military ſervice, to the magiſtrate oaths, and to all perſons the cuſtomary, and at that time much looked for *worſhip*, of kneeling or bowing with the head uncovered. They adhered too, in every inſtance, to their northern Engliſh of *thou* and *thee*, judging the plural mode of addreſſing one perſon to have originated, together with all empty titles, in a ſpirit of flattery unbecoming Chriſtians. Theſe peculiarities were a check to ſuperficial converſions; ſince an upright conformity to the profeſſion was in moſt caſes purchaſed by the loſs of friends, contempt, and hardſhips. Even the privilege of meeting to worſhip, apart from the national congregations, was acquired only by perſevering in the practice, through almoſt every kind and degree of coercive obſtruction, down to the period of complete toleration, the revolution of 1688. Hence their hiſtory conſiſts in great part of a detail of buffetings, impriſonments, and ſpoiling of goods. So early as 1659 they ſtated to parliament, that in the preceding ſix years about two thouſand individuals had ſuffered in perſon and eſtate, for being Quakers: and this repreſentation was accompanied by one of the moſt extraordinary public acts on record. One hundred and ſixty-four Friends offered themſelves by name to the houſe, to be impriſoned in the places of an equal number, who from ſickneſs or the hard-

ſhips of their confinement, were conceived to be in danger of periſhing. The houſe, however, rejected this propoſal, and expreſſed ſome diſpleaſure at "the reflections on magiſtracy and miniſtry," ſaid to be contained in the memorial. It will be proper to give ſome particular inſtances of their ſufferings.

James Parnel, a youth of good parts and education, going to ſee George Fox in a dungeon at Carliſle, became a convert to his principles: and, preaching in Eſſex, was the means of raiſing many congregations of Quakers in that county. He was impriſoned in Colcheſter caſtle, and at the age of nineteen ſunk under the cruel treatment there inflicted on him. In 1656, two Quaker women arrived at Boſton, New England. They were apprehended 'ere they could land, committed to cloſe priſon, and ſearched in a brutal manner, by ſtripping them naked, leſt they might alſo be *witches;* an object to the coloniſts of equal and equally rational dread. Theſe two, with eight others who arrived afterwards, were forcibly ſent away: but the precaution was in vain, their principles entered the colony. An aged citizen, and church member of Boſton, was firſt found favourably inclined to them; he was fined, impriſoned, and baniſhed in the depth of winter. In Rhode iſland he was hoſpitably received by an Indian chief, who offered, if he would live with him, "to make him a warm houſe;" obſerving, "What a God have the Engliſh who deal ſo with one another about their God!" So far is intolerance from recommending the religion of thoſe who practiſe it. Penal laws againſt Quakeriſm ſoon followed the appearance of this people in New England. The ſcourge was firſt applied, without regard to age or ſex: mutilation, by cutting off the ears, followed: but theſe being found inſufficient, cruelty proceeded through another intermediate ſtep, baniſhment on pain of death, to its dreadful extreme; and four Quakers were hanged at Boſton. Their names were William Robinſon, Marmaduke Stevenſon, William Leddra, and Mary Dyar. Their caſes, as related by Sewel, in his "Hiſtory of the Quakers," form an intereſting piece of martyrology.

Charles II., on notice of theſe proceedings, granted a mandamus, which prevented further executions in the colonies; but he was not equally ready to reſtrain perſecution at home. The Quakers had ſeveral meeting houſes in London. When aſſembled at theſe, they were often diſperſed by ſoldiers, under the direction of the magiſtrates; theſe effected the purpoſe by ſevere beatings with their arms. One John Trowel being evidently mortally wounded in this way, a coroner's inqueſt was held, but the verdict of the jury was ſuppreſſed: and the king, on being informed of the facts, evaded interference, telling the complainants to proſecute the law againſt the ſoldiers! Similar proceedings took place at Colcheſter; where the congregation, being kept out of their houſe, met for many weeks in winter ſtanding in the ſtreet. Here they were aſſailed by ſoldiers on horſeback, who wounded many of them, and a man of ſeventy loſt his life in conſequence. On one of theſe occaſions a trooper's ſword, by violent uſing, came out of the hilt. The man he had been beating handed it up to him with theſe words, "I deſire the Lord may not lay this day's work to thy charge." In this inſtance, as in others, the patience of the ſufferers at length triumphed, and they were quietly allowed their right of meeting.

In 1665 a hundred and twenty Quakers were in Newgate, ſentenced to tranſportation, under an act recently made "to prevent and ſuppreſs ſeditious conventicles." The maſters of ſhips generally refuſing to carry them, an embargo was laid, and it was made a condition of ſailing to the Weſt Indies, that ſome Quakers ſhould be taken thither by every veſſel. A *mercenary wretch* being at length found for the ſervice, the Quakers, unwilling to be active in their own baniſhment, refuſed to walk on board, as did alſo the ſeamen to hoiſt them in. By the help of ſoldiers from the Tower, fifty-five of them were at length ſhipped. But the maſter was now in priſon for debt; and the ſhip, after ſeven months' detention, quitting the coaſt, was immediately taken by a Dutchman, and twenty-eight of the priſoners (the remainder having died of the plague) were liberated in Holland and ſent home. Other parties of Quakers were ſet on ſhore again from different veſſels, ſo that the number actually ſent to the Weſt Indies was ſmall.

The preceding inſtances may ſerve to ſhew the kind of perſecution which this ſociety endured for many years; it may be obſerved in concluſion, that the court (or rather the clergy) of Charles, in their eagerneſs to ſuppreſs the growing ſociety, actually deſcended to the meaſure of iſſuing a formal order of council for demoliſhing their meeting-houſe in Southwark, which was addreſſed to no leſs a perſon than Chriſtopher Wren, eſq. ſurveyor-general of his majeſty's works; but it was executed by the military, by whom the congregation, who had the courage to meet on the ruins, were dragooned as often as they aſſembled, for nearly three months together, without however overcoming their firmneſs.

Though the Quakers never ſent out miſſionaries, in the manner of ſome other ſocieties, we have ſeen that individuals went, under apprehenſions of religious duty, to diſtant parts. Several of theſe viſited Italy, where they did not conceal their diſlike of ſuperſtition; and one John Love, being detained at Rome on this account, died (as it ſeems a violent death) in the priſon of the inquiſition. Catharine Evans, and Sarah Cheevers, after three years' confinement, and many ſufferings in the inquiſition at Malta, were releaſed and returned to England. But the moſt extraordinary enterprize, in this way, was performed by Mary Fiſher, a maiden, and one of the two who had been ſo ill treated at Boſton. She, apprehending ſhe had a meſſage from God to ſultan Mahomet IV. actually made her way from England to his camp before Adrianople, where ſhe delivered, through his interpreters, what was on her mind, was treated with reſpect, and offered an eſcort to Conſtantinople, which ſhe declined, and returned, as ſhe had gone, alone and in perfect ſafety. A young man, named George Robinſon, went, through ſtill greater difficulties, to Jeruſalem, where, ſpeaking againſt the ſuperſtition of the pilgrimages, the friars procured him to be forced into a moſque, whence the Turks, on his refuſing to turn Mahometan, led him out to be put to death, as for wilfully violating the place: but a ſudden change taking place in their ſentiments concerning him, he alſo was permitted to return.

In 1660 the Quakers held their firſt general meeting, for the care of their poor and other concerns of the ſociety, at Skipton in Yorkſhire; within a few years after which, meetings for diſcipline were eſtabliſhed throughout England and Ireland, chiefly by the inceſſant perſonal labours and epiſtolary recommendations of George Fox. At this period the ſociety received a conſiderable acceſſion of reſpectability by the converſion of William Penn and Robert Barclay. The celebrated Apology of the latter gave the world an opportunity of fairly appreciating doctrines till then but partially known, and on this account the more decried: and the ſettlement of the Jerſeys, and ſubſequently, of Pennſylvania, under the auſpices of Penn, opened to the Quakers a new and promiſing field of increaſe, which they did not fail ſpeedily to occupy. Another perſon of con-

ſiderable learning, George Keith, after aſſociating with them for near thirty years, became the author of a ſchiſm, the circumſtances of which it will be proper to notice. Keith was a native of Scotland, and educated at Aberdeen; he was impriſoned, as a Quaker, in 1664, and in 1675 aſſiſted Barclay in a public diſputation againſt the ſtudents at Aberdeen: he wrote much in defence of the principles of the Quakers, which he thoroughly underſtood, and was employed in the education of their youth; but is thought by them to have indulged too much in curious and uſeleſs ſpeculations, which his brethren did not encourage. Being again repeatedly impriſoned, about 1684 he removed to America in diſguſt. Here, after ſome previous general cenſure of his friends, he accuſed ſeveral, in particular, of groſs error in doctrine; the pretext for which was, their holding (as he himſelf had done) that the knowledge and belief of the hiſtory of Chriſt is not neceſſary for the ſalvation of thoſe who have no poſſible means of acquiring it. His complaints againſt individuals leading to more general contention, the Friends in England interfered, and the parties were heard before the yearly meeting in London, which decided the cauſe againſt Keith, and he remained under the "diſownment" pronounced againſt him in America. He now ſet up a ſeparate Quakers' meeting in London, attacked the principles he had formerly defended, (on which occaſions the Quakers replied by quotations from his own works,) and finally entered into the church of England. He was ſoon after ordained prieſt, and made a miſſionary to America, to bring over his former brethren. But his efforts, though for a while troubleſome to the Quakers, were attended with very little ſucceſs: he returned to England, ſunk into obſcurity on a ſmall living in Suſſex, and his party gradually diſappeared.

The jeopardy in which the Quakers almoſt conſtantly ſtood on account of their principles, very early introduced them to an immediate intercourſe with the throne; and they thus acquired the privilege, which they ſtill exerciſe, of preſenting public addreſſes to the king, by a deputation from their body, in a manner which does not violate their conſcientious ſcruples. The acceſſion of a new ſovereign, the concluſion of a peace, or an impending war, have commonly drawn from them addreſſes, in which ſentiments not unworthy of their Chriſtian profeſſion, are conveyed in ſimple but reſpectful language. And very recently (1814), they availed themſelves of the preſence in this country of the emperor of Ruſſia, and the king of Pruſſia, to addreſs each of theſe monarchs in favour of a perfect toleration in their reſpective dominions: in which they met with a favourable reception. Another great and intereſting object, the abolition of the ſlave trade, has frequently brought them forward to government in this way. In the cauſe of humanity, as it regards the oppreſſed Africans, they have proved themſelves ſtrenuous and indefatigable: the reproach, even of holding a fellow man in ſlavery, was wiped away from the members of this ſociety many years before the abolition of the trade was decreed, either in England or America. This was effected by their diſcipline; and it was made a part of this, in conſequence of that view of Chriſtianity, which regards every individual of the human race as a fit object of its benefits, and as entitled to the charitable regard which it inculcates. Much was done on the Negroes' behalf, in America, by Anthony Benezet, whoſe character is well known to the world; and by John Woolman, a miniſter of the ſociety, whoſe writings diſcover a mind of uncommon purity, ſimplicity, and tenderneſs.

The Quakers as a body have been long relieved from actual perſecution: yet they are ſtill involved by their principles in occaſional trouble as individuals. The refuſal to bear arms, or to pay military fines, ſubjects them to legal diſtraint on their goods, and if none of theſe be found, to impriſonment. Tithes and other eccleſiaſtical claims, enforced upon them, likewiſe render diſtraint a very common, and ſometimes an oppreſſive occurrence: and if the proſecutor be more rigorous, they may be impriſoned for an indefinite time. In America they are exempt from eccleſiaſtical but not from military ſeizures; by which, during the war for independence, many of them were impoveriſhed. It is obvious that, refuſing to ſwear, they cannot fill any office of profit or truſt under government. Except for theſe purpoſes however, for ſerving on juries, and in caſes of criminal proſecution, their ſolemn affirmation before the magiſtrate has the legal force of an oath.

The Quakers are diſperſed over the united kingdom, and moſt of the ſtates of North America; from the ſouthern ſtates of the latter they have moſtly emigrated of late to the Ohio. In America they are chiefly engaged in agriculture; and for a ſeries of years have been making judicious and ſucceſsful efforts to introduce this, with the other arts, and the manners of civilized life, among the Indian natives. There are a few Quakers in Germany, and their principles are entertained by ſome perſons in France.

In this country they are found chiefly in the middle claſs of citizens, and in trade or manufacture. Their general dereliction of agriculture ſeems to have reſulted from the impediments offered by the tithing ſyſtem: a yoke which, under their ſcruple, becomes doubly heavy on the farmer. There is a greater approach to equality in the civil condition of the Quakers, than obtains in almoſt any other body: the children of ſuch as become very rich are apt to quit the ſociety, either by marrying perſons not in its communion, or for the ſake of liberties which it prohibits: and the children of the poor commonly get a plain but ſolid education, ſuperior to their condition, by means of which they riſe in civil ſociety to a higher level. They have ſeveral excellent eſtabliſhments for this purpoſe: the principal of which, ſituated at Ackworth in Yorkſhire, contains, of both ſexes, three hundred children, and was founded in 1778, at the inſtance of Dr. Fothergill. With proviſion for mathematical and claſſical learning, the Quakers, though they have ſome good private ſchools, are but ſlenderly furniſhed; and they have in conſequence few accompliſhed men in theſe branches. They are by no means deficient in general information, and of late years many of them have cultivated natural philoſophy with ſucceſs. The ſociety in its earlier ſtage, including many men of regular ſcholaſtic education, who had joined it on principle, had of courſe the advantage, in point of theological knowledge, over the modern Friends, who chiefly inherit their profeſſion, and whoſe education has but of late begun to include ſyſtematic inſtruction in the doctrines of Chriſtianity at large.

In morals they are allowed to excel: their youth is watched over in this reſpect with more than ordinary care; and when grown up, their diſcipline prohibits, to all conditions, thoſe amuſements which offer to the mind the ready means of diſſipating ſerious impreſſions. Habitual offenders againſt their peculiar regulations forfeit their membership, as well as thoſe who violate the more obvious rules of juſtice and morality: their moral character, and conſiſtency as a body, are thus kept up. But it is alleged, that they are not equally well guarded againſt a money-getting ſpirit; which is apt to grow upon thoſe who intently proſecute trade and commerce to the excluſion of all other purſuits. From the occaſional tenor of the ſociety's advices to its members, it ſhould ſeem that this is in a certain degree true; and that it

behoves them to ſeek for an adequate remedy. They are not, however, chargeable with the love of money for its own ſake; no claſs of men being more beneficent, or more prompt to contribute their time and ſubſtance to various public inſtitutions, which the ſpirit of the Chriſtian religion has at length raiſed up, for relieving the diſtreſſes, promoting the comforts, and improving the moral and religious condition of mankind.

As to the minuter features of their character, the Quakers are prudent and methodical in their buſineſs; generally good economiſts of time and money. Their converſation has many peculiarities; ſome of which flow from their principles, others merely from their aſſociating chiefly among themſelves. They were early thought to be habitually crafty ("the Quaker fly," ſays Pope); but there ſeems no other ground for this, than the extreme caution with which they incur engagements, or make profeſſions and promiſes. Viewed at a diſtance, they appear cold, formal, and reſerved in their manners; and have hence been unjuſtly concluded void of domeſtic cheerfulneſs, and incapable of the enjoyments ariſing from ſocial converſe, and the intercourſe of cultivated minds. They are plain in their dreſs; the peculiarities obſervable in which reſult, not from any regulations on the ſubject, but from an indiſpoſition to vary with the faſhion; they have, however, ſlowly followed changes which have proved general and permanent, and thus become leſs conſpicuouſly ſingular. Mourning habits they reject on principle: and with a people whoſe ordinary dreſs is ſo grave, the moral reaſon for them ſeems not to exiſt. They are averſe to ſplendour in furniture and equipage: though the rich among them, in theſe articles, and moſt of their females in dreſs, have contrived, without ceaſing to be known as Quakers, to refine conſiderably upon abſolute ſimplicity.

Doctrine.—A recent publication on behalf of the ſociety, entitled, "A Summary of the Hiſtory, Doctrine, and Diſcipline of Friends," aſcribed to one of the ſociety, held in high eſtimation, *viz.* Mr. J. G. Bevan, who died whilſt this article was in the preſs, ſtates their doctrine as follows:

"We agree with other profeſſors of the Chriſtian name, in the belief of one eternal God, the creator and preſerver of the univerſe; and in Jeſus Chriſt his Son, the Meſſiah, and mediator of the new covenant.

"When we ſpeak of the gracious diſplay of the love of God to mankind, in the miraculous conception, birth, life, miracles, death, reſurrection, and aſcenſion of our Saviour, we prefer the uſe of ſuch terms as we find in ſcripture; and contented with that knowledge, which divine wiſdom hath ſeen meet to reveal, we attempt not to explain thoſe myſteries which remain under the veil; nevertheleſs we acknowledge and aſſert the divinity of Chriſt, who is the wiſdom and power of God unto ſalvation.

"To Chriſt alone we give the title of the Word of God, and not to the ſcriptures; although we highly eſteem theſe ſacred writings, in ſubordination to the Spirit from which they were given forth; and we hold with the apoſtle Paul, that they are able to make wiſe unto ſalvation, through faith which is in Chriſt Jeſus.

"We revere thoſe moſt excellent precepts, which are recorded in ſcripture to have been delivered by our great Lord, and we firmly believe that they are practicable and binding on every Chriſtian; and that in the life to come every man will be rewarded according to his works. And further it is our belief, that, in order to enable mankind to put in practice theſe ſacred precepts, many of which are contradictory to the unregenerate will of man, every man coming into the world, is endued with a meaſure of the light, grace, or good Spirit of Chriſt; by which, as it is attended to, he is enabled to diſtinguiſh good from evil, and to correct the diſorderly paſſions and corrupt propenſities of his fallen nature, which mere reaſon is altogether inſufficient to overcome. For all that belongs to man is fallible, and within the reach of temptation; but this divine grace, which comes by Him, who hath overcome the world, is, to thoſe who humbly and ſincerely ſeek it, an all-ſufficient and preſent help in time of need. By this, the ſnares of the enemy are detected, his allurements avoided, and deliverance is experienced through faith in its effectual operation: whereby the ſoul is tranſlated out of the kingdom of darkneſs, and from under the power of Satan, into the marvellous light and kingdom of the Son of God.

"Being thus perſuaded that man, without the ſpirit of Chriſt inwardly revealed, can do nothing to the glory of God, or to effect his own ſalvation; we think this influence eſpecially neceſſary to the performance of the higheſt act of which the human mind is capable; even the worſhip of the Father of lights and of ſpirits, in ſpirit and in truth: therefore we conſider as obſtructions to pure worſhip, all forms which divert the attention of the mind from the ſecret influence of this unction from the Holy One. Yet, although true worſhip is not confined to time and place, we think it incumbent on Chriſtians to meet often together, in teſtimony of their dependence on the heavenly Father, and for a renewal of their ſpiritual ſtrength: thus, 'Each not only partakes of the particular refreſhment and ſtrength which comes from the good in himſelf, but is a ſharer of the whole body, as being a living member of the body, having a joint fellowſhip and communion with all.' Barclay.

"Nevertheleſs, in the performance of worſhip, we dare not depend, for our acceptance, on a formal repetition of the words and experiences of others; but we believe it to be our duty to lay aſide the activity of the imagination, and to wait in ſilence to have a true ſight of our condition beſtowed upon us; believing even a ſingle ſigh, ariſing from ſuch a ſenſe of our infirmities, and of the need we have of divine help, to be more acceptable to God, than any performances, however ſpecious, which originate in the will of man. If any ſhould object the difficulty of laying aſide the activity of the imagination, let ſuch conſider the following ſtatement—That it is our duty to maintain a watch over our thoughts, by endeavouring to preſerve our attention from being carried away by ſuch as manifeſtly originate in our own natural will or habits, and to wait patiently for the ariſing of the life of Chriſt; which by bringing every thought into ſubjection, produces a true inward ſilence, and therein affords a true ſenſe of our condition.

"From what has been ſaid reſpecting worſhip, it follows that the miniſtry we approve muſt have its origin from the ſame ſource; for that which is needful for a man's own direction, and for his acceptance with God, muſt be eminently ſo to enable him to be helpful to others. Accordingly we believe, that the renewed aſſiſtance of the light and power of Chriſt is indiſpenſably neceſſary for all true miniſtry; and that this holy influence is not at our command, or to be procured by ſtudy, but is the free gift of God to choſen and devoted ſervants.—Hence ariſes our teſtimony againſt preaching for hire, in contradiction to Chriſt's poſitive command, 'Freely ye have received, freely give;' and hence our conſcientious refuſal to ſupport ſuch miniſtry, by tithes or other means.

"As we dare not encourage any miniſtry, but that which we believe to ſpring from the influence of the Holy Spirit, ſo neither dare we attempt to reſtrain this miniſtry to perſons of any condition in life, or to the male ſex alone; but,

as male and female are one in Chriſt, we hold it proper that ſuch of the female ſex as we believe to be endued with a right qualification for the miniſtry, ſhould exerciſe their gifts for the general edification of the church; and this liberty we eſteem a peculiar mark of the goſpel diſpenſation, as foretold by the prophet Joel, and noticed by the apoſtle Peter.

"Three are two ceremonies in uſe among moſt profeſſors of the Chriſtian name, water-baptiſm, and what is termed the Lord's ſupper. The firſt of theſe is generally eſteemed the eſſential means of initiation into the church of Chriſt; and the latter, of maintaining communion with him. But as we have been convinced that nothing ſhort of his redeeming power, inwardly revealed, can ſet the ſoul free from the thraldom of ſin; by this power alone we believe ſalvation to be effected. We hold that as there is one Lord and one faith, ſo his baptiſm is one, in nature and operation; that nothing ſhort of it can make us living members of his myſtical body; and that the baptiſm with water, adminiſtered by his fore-runner John, belonged, as the latter confeſſed, to an inferior and decreaſing diſpenſation.

"With reſpect to the other rite, we believe that communion between Chriſt and his church is not maintained by that, or by any other external performance, but only by a real participation of his divine nature through faith; that this is the ſupper alluded to in the Revelation, 'Behold I ſtand at the door and knock: if any man hear my voice, and open the door, I will come in to him, and will ſup with him, and he with me,' and that where the ſubſtance is attained, it is unneceſſary to attend to the ſhadow: which doth not confer grace, and concerning which, opinions ſo different, and animoſities ſo violent, have ariſen.

"Now, as we thus believe that the grace of God, which comes by Jeſus Chriſt, is alone ſufficient for ſalvation, we can neither admit that it is conferred on a few only, whilſt others are left without it; nor, thus aſſerting its univerſality, can we limit its operation to a partial cleanſing of the ſoul from ſin, even in this life. We entertain worthier notions both of the power and goodneſs of our heavenly Father, and believe that he doth vouchſafe to aſſiſt the obedient to experience a total ſurrender of the natural will, to the guidance of his pure unerring Spirit; through whoſe renewed aſſiſtance they are enabled to bring forth fruits unto holineſs, and to ſtand perfect in their preſent rank.

"There are not many of our tenets more generally known than our teſtimony againſt oaths, and againſt war. With reſpect to the former of theſe, we abide literally by Chriſt's poſitive injunction, delivered in his ſermon on the mount, 'Swear not at all.' From the ſame ſacred collection of the moſt excellent precepts of moral and religious duty, from the example of our Lord himſelf, and from the correſpondent convictions of his Spirit in our hearts, we are confirmed in the belief that wars and fightings are, in their origin and effects, utterly repugnant to the goſpel; which ſtill breathes peace and good-will to men. We alſo are clearly of the judgment, that if the benevolence of the goſpel were generally prevalent in the minds of men, it would effectually prevent them from oppreſſing, much more from enſlaving, their brethren (of whatever colour or complexion), for whom, as for themſelves, Chriſt died; and would even influence their conduct in their treatment of the brute creation, which would no longer groan, the victims of their avarice, or of their falſe ideas of pleaſure.

"Some of our tenets have in former times, as hath been ſhewn, ſubjected our Friends to much ſuffering from government; though to the ſalutary purpoſes of government, our principles are a ſecurity. They inculcate ſubmiſſion to the laws, in all caſes wherein conſcience is not violated. But we hold, that as Chriſt's kingdom is not of this world, it is not the buſineſs of the civil magiſtrate to interfere in matters of religion, but to maintain the external peace and good order of the community. We therefore think perſecution, even in the ſmalleſt degree, unwarrantable. We are careful in requiring our members not to be concerned in illicit trade, nor in any manner to defraud the revenue.

"It is well known that the ſociety, from its firſt appearance, has diſuſed thoſe names of the months and days, which having been given in honour of the heroes or falſe gods of the heathen, originated in their flattery or ſuperſtition; and alſo the cuſtom of ſpeaking to a ſingle perſon in the plural number, as having likewiſe ariſen from motives of adulation. Compliments, ſuperfluity of apparel, of furniture, and of proviſion for the table, outward ſhows of rejoicing and mourning, and the obſervation of days and times, we eſteem to be incompatible with the ſimplicity of a Chriſtian life; and public diverſions, gaming, and other vain amuſements of the world, we cannot but condemn. They are a waſte of that time which is given us for nobler purpoſes; and divert the attention of the mind from the ſober duties of life, and from the reproofs of inſtruction, by which we are guided to an everlaſting inheritance.

"To conclude, although we have exhibited the ſeveral tenets which diſtinguiſh our religious ſociety, as objects of our belief; yet we are ſenſible that a true and living faith is not produced in the mind of man by his own effort; but is the free gift of God in Chriſt Jeſus, nouriſhed and increaſed by the progreſſive operation of his Spirit in our hearts, and our proportionate obedience. Therefore, although for the preſervation of the teſtimonies given us to bear, and for the peace and good order of the ſociety, we deem it neceſſary that thoſe who are admitted into membership with us, ſhould be previouſly convinced of thoſe doctrines which we eſteem eſſential; yet we require no formal ſubſcription to any articles, either as a condition of membership, or a qualification for the ſervice of the church. We prefer judging of men by their fruits, and depending on the aid of Him, who, by his prophet, hath promiſed to be 'for a ſpirit of judgment to him that ſitteth in judgment.' Without this, there is a danger of receiving numbers into outward communion, without any addition to that ſpiritual ſheep-fold, whereof our bleſſed Lord declared himſelf to be both the door and the ſhepherd; that is, ſuch as know his voice, and follow him in the paths of obedience."

To this ſtatement may be added the following extracts, the firſt of which is from a declaration iſſued on behalf of the ſociety in 1693.

"We ſincerely profeſs faith in God by his only-begotten Son Jeſus Chriſt, as being our light and life, our only way to the Father, and alſo our only Mediator and Advocate with the Father;—that God created all things, he made the worlds, by his Son Jeſus Chriſt, he being that powerful and living Word of God by whom all things were made; and that the Father, the Word, and the Holy Spirit, are One, in divine Being inſeparable; One true, living, and eternal God bleſſed for ever;—yet that this Word or Son of God, in the fulneſs of time, took fleſh, became perfect Man, according to the fleſh deſcended and came of the ſeed of Abraham and David, but was miraculouſly conceived by the Holy Ghoſt, and born of the Virgin Mary, and alſo, farther, declared powerfully to be the Son of God, according to the Spirit of ſanctification, by the reſurrection from the dead;—that, as Man, Chriſt died for our ſins, roſe again, and was received up into glory in the heavens; he having, in his dying for all, been that one, great, univerſal offering and ſacrifice for peace, atonement, and reconciliation between God and man; and he is the propitiation

tion not for our ſins only, but for the ſins of the whole world; we were reconciled by his death, but ſaved by his life;—that divine honour and worſhip is due to the Son of God; and that he is in true faith to be prayed unto, and the name of the Lord Jeſus Chriſt called upon, (as the primitive Chriſtians did,) becauſe of the glorious union or oneneſs of the Father and the Son." Sewel's Hiſtory, p. 643.

"The doctrine of the reſurrection of the dead is ſo connected with the Chriſtian religion, that it will be alſo proper to ſay ſomething on this ſubject. In explaining our belief of this doctrine, we refer to the 15th chapter of the 1ſt Epiſtle to the Corinthians. In this chapter (verſes 40. 42. 44. 50.) is clearly laid down the reſurrection of a body, though not of the ſame body that dies. Here we reſt our belief in this 'myſtery,' without deſiring to pry into it beyond what is revealed to us; remembering that 'ſecret things belong unto the Lord our God, but thoſe things which are revealed belong unto us and to our children.' Principles of Religion, as profeſſed by the Quakers, by Henry Tuke.

Diſcipline: from the "Summary," with ſome abridgment.—"The purpoſes which our diſcipline hath chiefly in view, are, the relief of the poor, the maintenance of good order, the ſupport of the teſtimonies which we believe it is our duty to bear to the world, and the help and recovery of ſuch as are overtaken in faults: in a few words, the promotion of piety and charity.

"In the practice of diſcipline, we think it indiſpenſable that the order recommended by Chriſt himſelf be invariably obſerved. 'If thy brother ſhall treſpaſs againſt thee, go and tell him his fault between thee and him alone: if he ſhall hear thee, thou haſt gained thy brother; but if he will not hear thee, then take with thee one or two more, that in the mouth of two or three witneſſes, every word may be eſtabliſhed; and if he ſhall neglect to hear them, tell it unto the church.'

"To effect the ſalutary purpoſes of diſcipline, meetings were appointed, at an early period of the ſociety, which, from the times of their being held, were called quarterly meetings. It was afterwards found expedient to divide the diſtricts of thoſe meetings, and to meet more frequently; from whence aroſe monthly meetings, ſubordinate to thoſe held quarterly. At length, in 1669, a Yearly Meeting was eſtabliſhed, to ſuperintend, aſſiſt, and provide rules for, the whole: previouſly to which, general meetings had been occaſionally held.

"A monthly meeting is uſually compoſed of ſeveral particular congregations, ſituated within a convenient diſtance from each other. Its buſineſs is to provide for the ſubſiſtence of the poor, and for the education of their offſpring; to judge of the ſincerity and fitneſs of perſons appearing to be convinced of the religious principles of the ſociety, and deſiring to be admitted into membership; to excite due attention to the diſcharge of religious and moral duty; and to deal with diſorderly members. Monthly meetings alſo grant to ſuch of their members as remove into other monthly meetings, certificates of their membership and conduct; without which they cannot gain membership in ſuch meetings. Each monthly meeting is required to appoint certain perſons, under the name of overſeers, who are to take care that the rules of our diſcipline be put in practice; and when any caſe of complaint, or diſorderly conduct, comes to their knowledge, to ſee that private admonition, agreeably to the goſpel rule before mentioned, be given, previouſly to its being laid before the monthly meeting.

"When a caſe is introduced, it is uſual for a ſmall committee to be appointed, to viſit the offender, to endeavour to convince him of his error, and to induce him to forſake and condemn it. If they ſucceed, the perſon is by minute declared to have made ſatisfaction for the offence; if not, he is diſowned as a member of the ſociety.

"In diſputes between individuals, it has long been the decided judgment of the ſociety, that its members ſhould not ſue each other at law. It therefore enjoins all to end their differences by ſpeedy and impartial arbitration, agreeably to rules laid down. If any refuſe to adopt this mode, or, having adopted it, to ſubmit to the award, it is the direction of the yearly meeting that ſuch be diſowned.

"To monthly meetings alſo belongs the allowing of marriages; for our ſociety hath always ſcrupled to acknowledge the excluſive authority of the prieſts in the ſolemnization of marriage. Thoſe who intend to marry, appear together, and propoſe their intention to the monthly meeting; and if not attended by their parents or guardians, produce a written certificate of their conſent, ſigned in the preſence of witneſſes. The meeting then appoints a committee to inquire whether they be clear of other engagements reſpecting marriage; and if, at a ſubſequent meeting, no objections be reported, they have the meeting's conſent to ſolemnize their intended marriage. This is done in a public meeting for worſhip, towards the cloſe whereof the parties ſtand up, and ſolemnly take each other for huſband and wife. A certificate of the proceedings is then publicly read, and ſigned by the parties, and afterwards by the relations, and others as witneſſes. Of ſuch marriages the monthly meeting keeps a record: as alſo of the births and burials of its members. A certificate of the date, of the name of the infant, and of its parents, ſigned by thoſe preſent at the birth, is the ſubject of one of theſe laſt mentioned records; and an order for the interment, counterſigned by the grave-maker, of the other. The naming of children is without ceremony. Burials are alſo conducted in a ſimple manner. The body, followed by the relations and friends, is ſometimes, previouſly to interment, carried to a meeting; and at the grave a pauſe is generally made; on both which occaſions it frequently falls out, that one or more friends preſent have ſomewhat to expreſs for the edification of thoſe who attend; but no religious rite is conſidered as an eſſential part of burial.

"Several monthly meetings compoſe a quarterly meeting. At the quarterly meeting are produced written anſwers from the monthly meetings, to certain queries reſpecting the conduct of their members, and the meeting's care over them. The accounts thus received, are digeſted into one, which is ſent, alſo in the form of anſwers to queries, by repreſentatives, to the yearly meeting. Appeals from the judgment of monthly meetings are brought to the quarterly meetings; whoſe buſineſs alſo it is to aſſiſt in any difficult caſe, or where remiſſneſs appears in the care of the monthly meetings over the individuals who compoſe them.

"The yearly meeting has the general ſuperintendence of the ſociety in the country in which it is eſtabliſhed: and therefore, as the accounts which it receives diſcover the ſtate of inferior meetings, as particular exigencies require, or as the meeting is impreſſed with a ſenſe of duty, it gives forth its advice, makes ſuch regulations as appear to be requiſite, or excites to the obſervance of thoſe already made; and ſometimes appoints committees to viſit thoſe quarterly meetings which appear to be in need of immediate advice. Appeals from the judgment of quarterly meetings are here finally determined, and a brotherly correſpondence, by epiſtles, is maintained with other yearly meetings.

"There are eight yearly meetings, *viz.* 1. London, to which come repreſentatives from Ireland; 2. New England; 3. New York; 4. Pennſylvania and New Jerſey; 5. Maryland; 6. Virginia; 7. The Carolinas and Georgia; 8. Ohio.

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"In this place it is proper to add, that, as we believe women may be rightly called to the work of the miniſtry, we alſo think that to them belongs a ſhare in the ſupport of our Chriſtian diſcipline; and that ſome parts of it wherein their own ſex is concerned, devolve on them with peculiar propriety. Accordingly they have monthly, quarterly, and yearly meetings of their own ſex, held at the ſame time with thoſe of the men; but ſeparately, and without the power of making rules.

"In order that thoſe who are in the ſituation of miniſters may have the tender ſympathy and counſel of thoſe of either ſex, who, by their experience in the work of religion, are qualified for that ſervice, the monthly meetings are adviſed to ſelect ſuch, under the denomination of elders. Theſe, and miniſters approved by their monthly meetings, have meetings peculiar to themſelves, called meetings of miniſters and elders; in which they have an opportunity of exciting each other to a diſcharge of their ſeveral duties, and of extending advice to thoſe who may appear to be weak, without any needleſs expoſure. Such, it may be here obſerved, as believe themſelves required to ſpeak in meetings for worſhip, are not immediately acknowledged as miniſters by their monthly meetings; but time is taken for judgment, that the meeting may be ſatisfied of their call and qualification. It will alſo ſometimes happen, that ſuch as are not approved will obtrude themſelves as miniſters, to the grief of their brethren; but much forbearance is uſed towards theſe, before the diſapprobation of the meeting is publicly teſtified. Theſe meetings of miniſters and elders are generally held in the compaſs of each monthly, quarterly, and yearly meeting. They are conducted by rules preſcribed by the yearly meeting, and have no authority to make any alteration or addition to them. The members of them unite with their brethren in the meetings for diſcipline, and are equally accountable to the latter for their conduct.

"It is to a meeting of this kind in London, called the ſecond-day's morning meeting, that the reviſal of manuſcripts concerning our principles, previouſly to publication, is intruſted by the yearly meeting held in London: and alſo the granting, in the intervals of the yearly meeting, of certificates of approbation to ſuch miniſters as are concerned to travel in the work of the miniſtry in foreign parts; in addition to thoſe granted by their monthly and quarterly meetings.

"The yearly meeting of London, in the year 1675, appointed a meeting to be held in that city, for the purpoſe of adviſing and aſſiſting in caſes of ſuffering for conſcience-ſake, which hath continued with great uſe to the ſociety to this day. It is compoſed of friends under the name of correſpondents, choſen by the ſeveral quarterly meetings, and who reſide in or near the city. The ſame meetings alſo appoint members of their own in the country as correſpondents, who are to join their brethren in London on emergency. The names of all theſe correſpondents, previouſly to their being recorded, are ſubmitted to the approbation of the yearly meeting. Such men as are approved miniſters are alſo members of this meeting, which is called the Meeting for Sufferings; a name ariſing from its original purpoſe, and which is not yet become entirely obſolete.

"The yearly meeting has intruſted the meeting for ſufferings with the care of printing and diſtributing books, and with the management of its ſtock; and, conſidered as a ſtanding committee of the yearly meeting, it hath a general care of whatever may ariſe, during the intervals of that meeting, affecting the ſociety, and requiring immediate attention: particularly of thoſe circumſtances which may occaſion an application to government. The ſtock of the yearly meeting, juſt mentioned, is an occaſional voluntary contribution, expended in printing books,—ſalary of a clerk for keeping records,—the paſſage of miniſters who viſit their brethren beyond ſea,—and ſome ſmall incidental charges: but not, as has been falſely ſuppoſed, the reimburſement of thoſe who ſuffer diſtraint for tithes and other demands with which they ſcruple to comply." G. Fox's Journal. Sewel's Hiſtory of the Quakers. Gough's Hiſtory of the Quakers. Beſſe's Sufferings of the Quakers. Barclay's Apology. Clarkſon's Portraiture of Quakeriſm.

The editor is indebted for the hiſtorical part of the preceding article to a reſpectable member of the ſociety of Friends. Mr. Clarkſon's work, which was compoſed in conſequence of his intimate perſonal acquaintance with many of its leading members, produced by his labours for the abolition of the ſlave trade, may be conſulted for a more ample account of the manners, practices, and opinions of this ſociety.

QUAKER-TOWN, in *Geography*, a poſt-town of America, in Bucks county, Pennſylvania; 184 miles from Waſhington.

QUAKING-Bog, in *Agriculture*, a name uſually given to a ſort of ſoft pulpy, flexible, earthy depoſitions, which are formed in hollow moiſt ſituations, in conſequence of the ſtagnation of water in them in ſome manner or other. Bogs of this kind differ much in their nature, qualities, and properties, according to the difference of circumſtances and ſituations, but they have all a tremulous motion under the foot, when capable of being trodden upon. See Bog and Quagmire.

Draining is here equally neceſſary, as in all other caſes of a ſimilar kind, and may moſtly be carried into execution without any great difficulty.

Quaking-*Graſs*, in *Botany*, ſo called from the trembling of the little pendulous ſpikelets, occaſioned by their capillary zigzag ſtalks. See Briza.

Quaking-*Graſs*, in *Agriculture*, the common name of a ſort of graſs, which is ſaid to thrive and flouriſh well on moſt kinds of poor cold land, and which cattle eat in a greedy manner; but which is not much adopted for cultivation in graſs grounds, though it makes tolerably good hay. See Briza.

QUAKU, or Quaqua, in *Geography*, a diſtrict of Africa, on the Gold Coaſt.

QUALATCHE, a town of the ſtate of Georgia; 40 miles W.N.W. of Tugeloo.

QUALE Jus, in *Law*, was an ancient writ judicial, which lay where a religious perſon had judgment to recover land; before execution was made of the judgment.

This writ was iſſued forth to the eſcheator between judgment and execution, to enquire whether the religious perſon had right to recover, or whether the judgment were obtained by colluſion between the demandant and tenant; to the intent that the true lord might not be defrauded.

QUALEA, in *Botany*, a Caribbean name, uſed by Aublet, and inadvertently adopted by Schreber; poſſibly becauſe, as it appears, he ſuſpected the genus not to be ſufficiently diſtinct from *Vochy* of the ſame author, his own Cucullaria; ſee that article. Willdenow, however, has followed him; and thus one name more is added to dunghill, which ſome future botanical Hercules muſt ſweep away.—Aubl. Guian. v. 1. 5. Schreb. 7. Willd. Sp. Pl. v. 1. 18. Mart. Mill. Dict. v. 4. Juſſ. 424. Lamarck Illuſtr. t. 4. —Claſs and order, *Monandria Monogynia*. Nat. Ord. perhaps *Guttiferæ*, Juſſ.

Gen. Ch. *Cal.* Perianth inferior, of one leaf, in four very deep ovate, coriaceous, concave, unequal ſegments; the two lowermoſt largeſt, ſpreading widely. *Cor.* Petals two, unequal, inſerted into the calyx; the uppermoſt erect, roundiſh, emarginate, terminating at the baſe behind, in a ſhort, obtuſe, horn-like nectary, projecting between the upper ſegments

ments of the calyx; lowermoſt largeſt, ſloping downward. *Stam.* Filament ſolitary, ſhort, aſcending, inſerted betwixt the lower petal and the germen; anther oblong, furrowed, recurved. *Piſt.* Germen ſuperior, globoſe; ſtyle thread-ſhaped, aſcending, the length of the ſtamen; ſtigma obtuſe. *Peric.* Berry? of one cell. *Seeds* numerous, imbedded in pulp.

Obſ. The corolla is, as it were, two-lipped. This genus is akin to *Cucullaria*. *Schreb.*

Eſſ. Ch. Calyx inferior, in four deep unequal ſegments. Petals two, unequal. Berry? with many ſeeds.

1. Q. *roſea*. Aubl. Guian. t. 1. Willd. n. 1.—Lower petal undivided. Leaves elongated at the point.—Native of the woods of Guiana, flowering in September. The inhabitants call this ſpecies *Laba-laba*. A *tree*, whoſe *trunk* is ſixty feet or more in height, terminating in large ſpreading *branches*. *Wood* red, compact. *Leaves* oppoſite, in pairs croſſing each other, on ſhortiſh ſtalks, elliptical, three or four inches long, entire, ſmooth, with an elongated blunt point; their tranſverſe veins very numerous, ſtraight and parallel. *Stipulas* deciduous. *Panicles* terminal. *Flowers* numerous, two inches long, powerfully and agreeably ſcented, white on the outſide, roſe-coloured, and finally yelloviſh, within.

2. Q. *cærulea*. Aubl. Guian. t. 2. Willd. n. 2.—Petals two-lobed. Leaves with a ſhort point.—Native of the Guiana foreſts. This ſpecies flowers in October, and is known by the name of Qualé. It differs from the former in having ſmaller *flowers*, of a grey or blueiſh colour, but fragrant like thoſe of *Q. roſea*. Their *petals* are emarginate, or almoſt obcordate. Points of the *leaves* leſs elongated.

QUALIFICATION for *killing game*, for *jurors*, *juſtices*, *members of parliament*, and *electors of members*. See GAME, JURY, JUSTICES, and PARLIAMENT.

QUALIFICATIONS *for a complete muſician*, required by Zarlino. This venerable theoriſt had very exalted ideas of a perfect muſician, and tells us (Inſtit. vol. ii. part iv. p. 342, et ſeq.) that it is neceſſary he ſhould have a knowledge in arithmetic, for the calculation of muſical proportions; of geometry, to meaſure them; of the monochord and harpſichord, to try experiments and effects; that he ſhould be able to tune inſtruments, in order to accuſtom the ear to diſtinguiſh and judge of intervals; that he ſhould ſing with truth and taſte, and perfectly underſtand counterpoint; that he ſhould be a grammarian, in order to write correctly, and ſet words with propriety; that he ſhould read hiſtory, to know the progreſs of his art; be a maſter of logic, to reaſon upon, and inveſtigate the more abſtruſe parts of it; and of rhetoric, to expreſs his thoughts with preciſion; and, further, that he would do well to add to theſe ſciences ſome acquaintance with natural philoſophy, and the philoſophy of ſound; that his ears being perfectly exerciſed and purified, may not be eaſily deceived. And adds, that he who aſpires at the title of perfect muſician, has occaſion for all theſe qualifications, as a deficiency in any one of them will frequently render the reſt uſeleſs. An additional qualification is now become neceſſary to be added to thoſe enumerated by Zarlino, which is a perfect knowledge of the genius and powers of all the inſtruments for which a muſician writes; otherwiſe he will not only embarraſs a performer by uſeleſs and unmeaning difficulties, but loſe opportunities of producing effects by the bow of a violin, the *coup de langue* of flutes, and a ſelection of the pureſt and beſt tones on other wind inſtruments.

QUALIFICATIONS *of Land-managers*, &c. the requiſite acquirements which are proper and eſſential to them in order to the due and full performance of all the different ſorts of buſineſs in which they may be engaged or employed. In this view, a conſiderable knowledge of the principles and practices of different ſorts of farming and farm-management, ſome acquaintance and experience in ſurveying land, in mechanics, in rural architecture, and in the buſineſs of planting, are indiſpenſibly neceſſary, as well as a notion of the various mineral and other ſubſtances contained in the bowels of the earth, and a ready facility in arranging the management of different ſorts of accounts.

They ſhould at the ſame time poſſeſs mild, conciliatory diſpoſitions, exact upright principles, and ſtrict moral characters. See LAND-*Reeve*, LAND-*Steward*, and OFFICE *of Eſtate*.

The duties and uſes of theſe ſorts of managers, beſides thoſe of regulating and directing the huſbandry, management, and other matters, are, the preventing all ſorts of encroachments from taking place; the ſeeing that a proper and right method of ſtocking is purſued on the commonable lands; the guarding againſt the turf or ſoil being injured by being broken up or pared off; the looking after the public and private roads, lanes, and driftways, to ſee that the fences on the ſides of them are properly cut and pruned as occaſion may require, the travellable parts of them kept free from obſtructions, and in a ſuitable ſtate of repair, and that the farm-ways are well calculated to the uſes and intentions for which they were deſigned; the duly attending to the open drains, water courſes, and common ſewers, to take care that they are kept clear and free at all times, without doing injury to any one; the conſidering the ſtate of the natural ſtreams and running waters as fit for the purpoſes of watering live ſtock at home or in other places, thoſe of irrigating land, the turning of mills, &c.; the examining the borders of rivers, brooks, &c. to ſee that they are not carried away, or their courſes altered in any injurious manner; the taking care of plantations, and all ſorts of woodlands, as well as timber-trees and young plants, by ſeeing that they are preſerved in a proper manner, and no damages committed by cutting them down, or in any other ways; the attending to the ſituation of the fences, gateways, &c. to ſee that the live hedges, with their banks, be duly cut, weeded, pruned, and kept up, as well as the gates, ſtiles, pales, and other dead fences properly preſerved and in repair; the keeping the home buildings, farm cottages, and garden grounds, belonging to them, in proper condition, with their tenants in a full ſtate of induſtry; and laſtly, the regulating the order of the different occupiers, by preventing improper meetings of all kinds, the repreſſing of bad houſes, and all ſorts of irregularities that have a tendency to leſſen induſtry and frugality.

Beſides theſe, there are many other duties which properly belong to them, but which need not be mentioned in this place. See BAILIFF.

QUALIFICATIONS *of Tenants*, the neceſſary properties and circumſtances which render them fit for holding lands as farms. The importance of having perſons perfectly qualified as tenants, is very great, in the ſuperintendance and management of all landed property, being, in a great meaſure, the baſis, or principal bearing, on which its uniform and laſting proſperity depends.

The proper qualifications of a good tenant, according to the author of the "Treatiſe on Landed Property," are the having capital, ſkill, induſtry, and character. And he contends, that without a ſufficient capital, the reſt are unavailing; but that, at the ſame time, an induſtrious, frugal, good farmer will ſtrive with difficulties, and get on with leſs money than a man of contrary qualifications. But if he has not ſufficient ſtrength to work his lands, nor a ſufficiency of live-ſtock to raiſe manure, or money wherewith to purchaſe it, he muſt, under ordinary circumſtances, live in a ſtate of poverty and hard labour; and, on the firſt attack of misfortunes, or the firſt failing ſeaſon of crops, he will probably

ſink

ſink under the weight of his accumulated burden, and be ruined.

Further, that in regard to the proper ratio or proportion between the rent and capital, it depends on the exiſting ſtate and circumſtances of the farms, and the ſtyle of management in which they are intended to be conducted; as well as on the number and ſtrength of the occupiers' families, and their induſtry and frugality. However, in order to afford ſome general notions on the matter, it may be ſaid that, for farms of ſize, as thoſe of from one to five hundred pounds a year, the occupiers ſhould have at their commands from five hundred to a thouſand pounds of capital, for every hundred pounds of rent which they may pay. Yet ſtill, on the greater number of farms, the firſt proportion is too ſmall to manage them with full advantage and profit. And, if they be farmed with ſpirit, and the higher order of improvements be attempted, particularly the introduction of the beſt breeds of live-ſtock adopted by modern farmers, the laſt will not be found too large for the purpoſe.

It may be remarked, that it is conſtantly the beſt way for tenants to farm ſomewhat within their capitals, as a few pounds kept in their pockets enables them to embrace and take the advantage of every favourable opportunity that may offer, and to ſell or buy with the greateſt benefit. While ſuch as are ſtraightened for money, are forced to take the chance of markets, and liable to make bargains of a loſing and diſadvantageous nature, as well as experience many other inconveniencies of different kinds.

Notwithſtanding, where there is a want of ſufficient experience and ſkill in the art, and different branches of practical huſbandry, tenants cannot farm or manage their lands with the moſt profit, either to themſelves, or the proprietors of them. Where, however, their capitals and exertions are great, they may, by obſervation and practice, acquire ſkill; and by this means be enabled to perform the buſineſs in a tolerable manner, and in ſome meaſure do juſtice to their farms, whatever they may do for their families in the way of getting money for their benefit. But where, with a want of ſkill, ſcanty capitals are joined, it is not all the exertion, induſtry, and frugality in the power of man, that can ſave or preſerve the families or the farms from injury and inconvenience.

However, without induſtry, capital and ſkill may be ſaid to be thrown away. In the management of rural buſineſs, in which ſo much depends on the nature of ſeaſons and weather, idleneſs is a vice of the darkeſt caſt. Every inſtance of negligence is not only injurious in itſelf, but operates as a dangerous and bad example; ſerving as an apology or excuſe for the half induſtrious, with whom every farm or eſtate is incumbered in a greater or leſs degree.

In conſequence of the intimate connection which neceſſarily ſubſiſts between the proprietors and the occupiers of land, and ſeeing how advantageous and profitable it is to preſerve good order and regularity upon farm lands, as giving thereby full liberty and freedom to the exertions of their tenantry, it becomes a matter of ſome importance, in the ſelection of farm-tenants, to make proper and neceſſary inquiries into their characters for morality, and particularly as they relate to habits of ſobriety or extravagance, as well as to a peacefulneſs or quarrelſomeneſs of diſpoſition.

And it is farther to be remarked, in reſpect to the proper ſelecting of tenants for farms, that nothing of intereſt, or any other conſideration whatever, that is not intimately connected with the above qualifications, can properly warrant the choice: unleſs in particular caſes and circumſtances, as in providing for the widows and orphans of deceaſed tenants, &c. A farm-manager ſhould not ſuffer himſelf to be influenced by any ſort of family connection, favour, fee or reward. Superintendants of this kind, merely as ſuch, cannot have any true intereſts ſeparate and diſtinct from thoſe of the farms or lands they may overlook. It, therefore, becomes a diſhoneſt act in any agent of this ſort, to put an inferior tenant into the poſſeſſion of a farm, through his own intereſt, even at a fair rent for the ſame.

Laſtly, it may be noticed, that in a diſtrict which ſtands forward in a prominent manner in the ranks of rural improvements, merit ſhould be looked for and encouraged near home. But to advance or bring up a farm or eſtate which remains in the rear of modern practices, two or more tenants of the higher claſſes ſhould be ſought for, at a diſtance, in ſuch diſtricts as are of a kindred nature, but in which the more modern and profitable management of farming prevails, in order to lead and direct the native tenantry of the ſituation.

Theſe are ſome of the principal and leading qualifications which ought in all caſes to direct and regulate the choice of farm-tenants; there are, however, many others which ſhould have an influence in certain circumſtances, and particular methods of farm-management, otherwiſe the full intereſts and advantages of the proprietors of the lands may be overlooked and neglected.

QUALIFICATOR, in the *Canon Law*, a divine appointed to qualify, or declare the quality of, a propoſition brought before an eccleſiaſtical tribunal; chiefly before the inquiſition.

The qualificators of the office are not judges; they only give their ſentiments on the propoſitions preſented to them. They are the inquiſitors that judge.

QUALITY, Qualitas, that affection of a thing, whence it is denominated ſuch; or that which occaſions a thing to affect our ſenſes in this or that manner, and gives it this or that denomination. Accordingly quality is ſaid to be an attribute, from which no ſubſtance is exempt. See Mode.

Thus, that power in fire, whatever it be, by which it excites in us the ſenſation of heat, ſince it is that whence the fire is denominated hot, is called the quality of fire.

The word quality, *qualitas*, is ſaid to have been firſt introduced into the Latin by Cicero: till his time the Romans ſtudiouſly avoided uſing a term which denoted an abſtract; and in lieu of it only conſidered concrete, ſignified by *quale*. The like is obſerved of the ancient Greeks, who did not uſe ποιοτης, but ποιον.

Quality, it is to be obſerved, is an ambiguous term; and has been applied to ſome things which ought rather to have been looked upon as ſtates of matter, or aſſemblages of ſeveral qualities; as life, health, beauty, &c.

There are, alſo, other attributes, as ſize, ſhape, motion, and reſt, uſually reckoned among qualities, which might more conveniently be ranked among the primary modes of the parts of matter; ſince, from theſe ſimple attributes, all the qualities are derived.

The ancient ſchool-philoſophers diſtinguiſh quality in the general, which they call *metaphyſical* and *predicamental* quality, into *eſſential* and *accidental*. The moderns more uſually divide it into *ſpiritual* and *corporeal*.

Qualiteis, *Spiritual*, or *Qualities of the Soul*, are affections of the mind, conſidered as in this or that habitude or diſpoſition. Of theſe they make two kinds; the one belonging to the underſtanding, the other to the will: of the former kind are knowledge, opinion, certainty, doubting, &c. Of the latter are all the moral virtues and vices.

QUALITIES, *Corporeal* or *Phyſical*, are what we chiefly conſider under this denomination, and to which the definition above laid down is accommodated.

Philoſophers are divided as to the nature of theſe qualities, or what they are in the body. The general language of the Peripatetic ſchool is, that they are things diſtinct from the bodies themſelves; and are ſuperadded to them, or flow from their ſubſtantial forms: on which principle, they hold qualities to be real, and denominate them *accidents;* ſuppoſing them to be inherent in ſubſtances, though not in the relation of parts, but to be ſuſtained by them as in a ſubject, and incapable of ſubſiſting without them. In effect, the Thomiſts define qualities to be accidents following or ariſing from the form; in the ſame manner as quality is an accident following or ariſing from the ſubſtance.

The moderns abſolutely explode the notion of qualities diſtinct from the body; and inſiſt, that the powers by which bodies excite in us the ideas of ſuch qualities, are no other than the mechanical affections of the bodies themſelves, *viz.* the figure, magnitude, motion, &c. of the parts of which they conſiſt.

The principal conſiderations inſiſted on by the retainers to real qualities are, that theſe powers may be actually ſeparated from the ſubſtances they inhere in; as we ſee in light, heat, &c. That from theſe very qualities, conſidered as ſo many determinations, there ariſes a very great diverſity in bodies; and that bodies, according to the diverſity of their qualities, affect our ſenſes very differently.

The adherents to the experimental way, on the contrary, account for all the qualities of bodies from mechanical cauſes. Thus all the phenomena of a clock, the motion of its wheels, its hands, &c. by which it ſtrikes the hour, points the minute; day, moon's age, &c. do all evidently ariſe from the ſingle ſpring; which we never imagine to have any particular powers by which it ſhould be enabled to make ſuch diſcoveries; nor any other principle but that one of elaſticity. Why, then, may we not conceive, as to ſenſible qualities, that though, by virtue of a certain congruity or incongruity in point of figure, texture, or other mechanical properties, the portions of matter they modify are enabled to produce various effects, on account of which the bodies are ſaid to be endowed with qualities; yet theſe are not, in the bodies endowed with them, any real or diſtinct entities, or differing from the matter itſelf of ſuch a determinate bigneſs, ſhape, and other mechanical modifications? Thus, though the modern goldſmiths and refiners reckon it among the moſt diſtinguiſhed qualities of gold that it is diſſoluble in aqua regia, whilſt aqua fortis will not work upon it; yet theſe attributes are not in the gold any thing diſtinct from its peculiar texture; nor is the gold we have now of any other nature than it was in Pliny's time, when aqua fortis and aqua regia were unknown.

We all know that the ſun hath a power to harden clay, ſoften wax, melt butter, thaw ice, turn water into vapour, make air expand itſelf in weather-glaſſes, contribute to blanch linen, render the white ſkin of the face ſwarthy, and mowed graſs yellow, ripen fruit, hatch the eggs of ſilk-worms, caterpillars, &c. and perform many other things, ſome of which ſeem contrary to others; yet theſe are not diſtinct powers, or faculties in the ſun, but only the production of its heat, diverſified by the different textures of the body it chances to work on, and the condition of the other ſubſtances concerned in the operation. And, therefore, whether or not the ſun, in ſome caſes, has any influence at all diſtinct from its light and heat, we ſee that all the phenomena mentioned are producible by the heat of common fire, duly applied and regulated. Some of the ancients, and particularly the Peripatetics, have diſtinguiſhed qualities into *ſenſible* and *occult*.

QUALITIES, *Senſible*, or *Manifeſt*, are thoſe ariſing from certain modifications of matter, and which become immediately the objects of our ſenſes. Such are all thoſe abovementioned.

Though, in ſtrictneſs, thoſe only are ſaid to be ſenſible qualities which affect ſome one ſenſe alone; as colour does the eye, ſound the ear, &c.

Theſe are ſometimes, alſo, called *tangible* qualities, becauſe they only produce their effect, *i. e.* excite their idea in us, when contiguous, or in contact with the organ.

QUALITIES, *Occult*, are certain latent powers ariſing from the ſpecific forms of things, of which no rational ſolution can be given on any principles of phyſics.

Senſible qualities are uſually ſubdivided into *primary* and *ſecondary*. See IDEAS.

QUALITIES, *Primary*, or *General*, are ſuch as are found in all bodies; or which agree to all matter, conſidered as matter, and therefore to the elements themſelves. Such are extenſion, figure, motion, reſt, ſolidity, impenetrability, and number.

QUALITIES, *Secondary*, or *Particular*, are ſuch as reſult from a compoſition or mixture of elements, and do not agree to body as body, but as a mixt. Such are light, heat, cold, colour, ſound, taſte, ſmell, hardneſs, ſoftneſs, fluidity, firmneſs, roughneſs, ſmoothneſs, opacity, tranſparency, &c.

According to Ariſtotle, and the Peripatetics, the primary, or elementary qualities, are thoſe of the four elements themſelves; *viz.* heat, cold, moiſture, and dryneſs.

The ſecondary qualities, according to the ſame, are all the reſt; which are combinations or aſſemblages of the former elementary ones; as colour, odour, taſte, &c.

To give an idea of Ariſtotle's method of accounting for theſe ſecondary qualities from theſe primary ones, we ſhall inſtance in his account of colour. All colours, then, ſays he, are generated of a mixture of the four elementary qualities: white, *e. gr.* is produced when the humidity ſurmounts the heat, as in old men, whoſe hair grows grey; black is produced when the humidity dries off, as in walls, ciſterns, &c. red, &c.

Among the ſchool-philoſophers we meet with other diviſions of qualities; as *active*, and *paſſive; real*, and *intentional*.

QUALITIES, *Active*, are thoſe by virtue of which effects and operations are actually produced on other bodies duly diſpoſed with reſpect to them. Such are the heat of fire, the moiſture of water, &c.

QUALITIES, *Paſſive*, are thoſe by which bodies are diſpoſed to receive the action of others. Such are inflammability in oil, &c.

QUALITIES, *Real*, are thoſe which remain in the ſubject, and only act on things adjacent to it. As fire in a piece of iron not ignited, &c.

QUALITIES, *Intentional*, are thoſe which iſſue from the ſubject, and operate at a diſtance. Such is the light emitted from the ſun, &c.

But the moderns are agreed, that either all qualities are real, or all alike intentional. So that the diſtinction is impertinent. See on the ſubject of quality, its various ſpecies, and its different properties, Harris's Philoſophical Arrangements, chap. viii.

However ignorant we may be of the nature of qualities, or of the manner of their operation, yet we know the laws of their intention and remiſſion. Dr. Keil demonſtrates, that every quality which is propagated *in orbem*, ſuch as light,

light, heat, cold, odour, &c. has its efficacy increaſed, or abated, in a duplicate ratio of the diſtances from the centre of radiation, or exertion of the quality, reciprocally.

Thus, let A (*Plate* XII. *Geometry*, *fig.* 1.) be a centre from whence any quality exerts itſelf round about, according to the right lines, A *e*, A *f*, &c. The efficacy of the quality, be it heat, cold, odour, &c. will be (at equal diſtances from A) as the ſpiſſitude or denſity of the rays, A *b*, A *c*, A *d*. But the rays within the inner circle, or rather ſpherical ſuperficies, *b c d* H, when they come to be extended to the other ſpherical ſurface, *e f g* K, will be much leſs cloſe than they were before, and that in the reciprocal proportion of the ſpaces they take up; that is, if the outer ſurface be the double of the inner, the rays there will be but half as thick; but ſince ſpherical ſuperficies are as the ſquares of their radii, therefore the efficacy of the quality in the inner ſurface will be to that of the outer, as A *e* ſquare to A *b* ſquare. *Q. E. D.*

Sir Iſaac Newton lays it down as one of the rules of philoſophizing, that thoſe qualities of bodies which are incapable of being intended and remitted, and which are found to obtain in all bodies in which the experiment could ever be tried, are to be eſteemed univerſal qualities of all bodies. See PHILOSOPHIZING.

QUALITIES, *Coſmical.* See COSMICAL *Qualities.*

QUALITY is alſo uſed for a kind of title, or degree of eminence given to certain perſons, in regard of their territories, ſignories, or other pretenſions.

Thus the king of Great Britain uſed to take the quality of king of France; the king of Poland that of king of Sweden; the king of Sardinia that of king of Cyprus and Jeruſalem; the czars of Ruſſia, and kings of Spain, have whole pages of qualities. The emperor of China aſſumes the quality of ſon of the ſun.

QUALITY *of Curvature*, in *Geometry*, is uſed to ſignify its form, as it is more or leſs inequable, or as it is varied more or leſs in its progreſs through different parts of the curve. Newton's Meth. of Flux. and Inf. Ser. p. 75. Maclaur. Flux. art. 369. See CURVATURE.

QUALITIES *of Trees and Plants*, in *Agriculture* and *Gardening*, are the properties which are peculiar to them, in relation to their magnitude, modes of growth, textures or conſiſtences, forms, colours, taſtes, ſmells, means of propagation, culture, uſes, and values.

In regard to the firſt, as ſoon as the ſimple conſtituent fibres of plants are evolved and increaſed, as far as the nature of them and the arrangement of the primary nutrient ſubſtances will permit, they ceaſe to receive any more for their farther increaſe; the primary matters merely replacing the loſs which is occaſioned by the performance of the natural functions of the plants; conſequently they have each a particular preſcribed increaſe or meaſure of growth. Some are very large, others extremely ſmall. The Indian fig, in conſequence of ramifications being ſent off, which concrete with the primitive trunk, by inſenſible degrees acquires a very conſiderable bulk or thickneſs, being frequently twenty, or even thirty cubic feet in its diametric ſection. And there are accounts given of particular plants, which are ſcarcely viſible to the naked eye; and of ſome trees, which are ſo large as to cover with their branches two hundred perſons, or more.

In this country, ſome trees and ſhrubs of the ornamental ſort are either very high, or very low: of the former kind are the horſe-cheſnut, larch, cornelian cherry, ſnowdrop-tree, and many others; and of the latter, the mountain-aſh, hemlock, fir, Scotch roſe, butchers' broom, and many more. There are ſome trees which are very broad, in proportion to their height, as the oak, Spaniſh cheſnut, &c.; others which are very narrow, as the larch, ſpruce fir, &c. And there are ſtill ſome others, in which there is a medium between theſe extremes, preſerved and kept up, as in the aſh-leaved maple, the evergreen oak, the Virginian raſpberry, the Guelder roſe, and a number of others.

The modes or habits of growth in trees and ſhrubs are alſo extremely different: ſome ſending out their branches in a horizontal manner, as in the oak; in others they have an upward direction, as in the Huntingdon willow; while in a few they fall downwards, as in the lime, acacia, and others. Again, there are ſome which have an oblique inclination, as may be ſeen in the Scotch fir; or they recline, and then riſe up again, as in the larch kind; and there are ſtill others, in which they hang directly downwards, as in the weeping aſh, weeping willow, &c. There are likewiſe ſome ſhrubby plants, which creep along the ſurface of the ground, as the periwinkle; others which claſp themſelves to trees, as the paſſion-flower; and a few which fix and attach themſelves to buildings, walls, &c. as the ivy. Farther, there are ſome trees that, in whatever way they may be placed, cut, or pruned, conſtantly aſſume and take on one principal ſtem, from which all the different branches proceed or go off, as rays from a centre, as in the fir tribe; while in others, the trunks divide themſelves into arms, or large branches, which ſend out boughs or ſmaller branches in an irregular manner, as in the oak and others. Some kinds of ſhrubs have merely one ſingle ſtem, as the althæa; while other ſorts invariably ſpread and extend along the ſurface of the ground, throwing or ſending up a greater number, as the hypericum, and ſome others.

The texture or conſiſtence of plants of different kinds is likewiſe very different, as hard, ſoft, membranous, carneous, ſmooth, downy, thorny, &c. which are moſtly obvious to the feel. Plants of the young kind are commonly mucilaginous, becoming hard as they advance in growth; though many luxuriate in the ſtate of continual ſoftneſs, as the tremella; yet ſome are ſo hard as to ſink in water, as the iron wood of the iſland of Ceylon, &c. Thus among trees and ſhrubs, ſome have a ſoft ſmooth appearance, as the lime, the ſcorpion ſenna, &c.; while others have a hard, rough, firm appearance, as the evergreen oak, the holly, &c. There are ſome alſo which have a ſmooth, ſilky appearance, as the tamariſk, &c.; while others have a downy, woolly appearance, as the hoary poplar, &c. And ſome appear wholly beſet and covered with thorns or prickles, as the furze, hedgehog holly, &c.; while others, again, appear wholly compoſed of thready ſhoots, as the Portugal broom, &c. Beſides theſe, there are many other ſorts, which furniſh different appearances from any of theſe.

The forms in the different ſorts and varieties are ſtill equally, if not more, various; ſome being apparently ſolid and compact, from being thick ſet with branches and foliage, as in the horſe-cheſnut, the Engliſh elm, the lilac, the ſyringa, &c.; while others are of a more light, airy, elegant form, being thin of boughs, branches, and leaves, as the aſh, the hoary poplar, the bird cherry, the Canadian meſpilus, &c.; and there is a middle degree between theſe extremes, in the broad-leaved euonymus, the aſh-leaved maple, and ſome others. They may alſo be further diſtinguiſhed into thoſe whoſe branches begin from nearly the ſurface of the ground, as in the fir tribe of trees, and moſt ſhrubs; and into thoſe which ſhoot up into a ſtem before their branches are begun to be ſent off, as in the mountain-aſh, the althæa frutex, &c. It may likewiſe be noticed in reſpect to thoſe whoſe branches begin from the ground, that ſome of them riſe in an elegant cone, as the larch, the

holly, &c.; others in a cone, whoſe baſe is very broad, as in the cedar; or whoſe baſe is very ſmall, as in the upright cypreſs. There are ſome which ſwell out in the middle of their growth, and diminiſh or contract at both ends, as in the Weymouth pine, &c.; while others are broadeſt at the top, as in the raſpberry, the alpine honeyſuckle, &c.; and ſome few irregular and buſhy throughout, as in the evergreen oak, the ſnowball tree, &c. Among thoſe which ſhoot up into a ſtem before their branches are ſent off, there are ſome which are in the ſhape of ſlender cones, as in the deciduous cypreſs; others in thoſe of broad cones, as in the balſam poplar. Still others aſſume a globular form, as in the mountain-aſh; while many are irregular throughout, as in the Scotch elm, the acacia, and ſeveral others.

As to colour, it appears to depend upon the colouring principle, the proportion of vital air and light which is contained, and is proper to different parts of the ſame tree or plant: hence, when exhalation is prevented, and light intercepted, the green colour is changed into white. In trees and ſhrubs it is either accidental or permanent: the latter including all the different ſhades of green in the ſummer months; the former, the different tints of red and yellow, which are peculiar to the autumnal and vernal ſeaſons.

There are ſome of the permanent kinds of colour, which are of a dark green, as thoſe in the horſe-cheſnut, the yew, &c.; while others are of a light green, as thoſe in the aſh, the common laurel, &c.; and others, again, which are of a blueiſh-green, as thoſe in the Scotch fir, the bladder ſenna, &c. Some trees have a green tinged with brown, as the Virginian cedar; others a green tinged with white, as the abele and the Lapland willow. Alſo, in ſome trees the greens are tinged with yellow, as in the aſh-leaved maple, the Chineſe arbor vitæ, &c.; in others with red, as in the ſcarlet maple, &c.; and in a few with purple, as in the purple beech. There are ſome greens which are ſpotted with white, yellow, and red, as that in the variegated holly, privet, ſycamore, box, and various others. The colours which ariſe from accident are almoſt infinite in number, each kind of which is liable to great variation: moſtly, however, it will be found that in autumn the wild cherry aſſumes a bright red, the birch a deep red, the beech a browniſh-red, the ſcarlet oak a deep ſcarlet, the hornbeam a ruſſet colour, the ſugar maple a rich yellow, the common oak a reddiſh-yellow, the lime and aſh a ſtraw colour, the balſam poplar a black, the ſycamore a dark brown, and others different ſorts of other colours.

In regard to taſte and ſmell, the former depends upon the different principles which compoſe and conſtitute the juices or humours of the different kinds, and varies as well in the different ſorts, as in the different parts of the ſame ſort of trees or plants. The latter depends on the volatile principle, or principles, which iſſue or exhale from them, and differs in its nature, according to the kinds of plants, or the parts of them, in which it chiefly reſides or is preſent. There are ſome trees and ſhrubs which have ſcarcely any ſmell, as the evergreen oak, platanus, &c.; others have a moſt grateful rich fragrance, as the birch, ſweetbriar, honeyſuckle, &c.; ſome again have a luſcious, powerful ſmell, as the mezereon, the ſyringa, &c.; others a diſagreeable nauſeous ſmell, as the elder, &c.; in ſome the ſmell is very ſweet, as in the flowering lime; in others it is deleterious, as in thoſe of the walnut, the artemiſia, &c. There is alſo the greateſt fragrance in ſome while they are in bloſſom, as in the hawthorn, and in ſome it is ſolely confined to it, as in the lilac; while in others it is equally diffuſed over or throughout the whole plant, as in the ſweetbriar, and many others.

Theſe may be conſidered as ſome of the moſt general characteriſtic qualities of trees and ſhrubs; but various other peculiarities incident to them preſent themſelves, on a more minute inveſtigation, which equally intereſt and deſerve the attention of the ornamental planter and gardener, as well as the cultivator of all ſorts of wood and timber; and which principally relate to differences in the barks, the buds, the leaves, the flowers, and the fruits. The appearance of the bark is very different in many different ſorts of trees and ſhrubs, as red, white, black, brown, and green, as in the dogwood, birch, oak, Guelder roſe, and holly. It differs alſo in its properties, as in ſome it is firm, in others ſpongy, in ſome thin, in others thick, brittle, glutinous, or thready, as in the oak, the cork-tree, the beech, the Scotch fir, the hornbeam, the holly, the lime, and the elm. It varies likewiſe in its duration, the outer bark or coat in ſome trees being thrown off annually, as in the arbutus, the birch, &c.; while in others, for the moſt part, it is conſtantly retained or kept on. It differs equally in reſpect to its properties of taſte, being in ſome aſtringent in its nature, in others ſweet, bitter, reſinous, &c., as in the oak and bramble, lime, abele, fir, &c. In regard to buds, ſome trees have none at all, as the pine and evergreen ſorts; in ſome they are very large, in others very ſmall, as in the horſe-cheſnut, and the willow. In ſome they are coated over with a covering of glutinous or reſinous matter, as in the horſe-cheſnut, &c.; in others they are overſpread with a dry film or tegument, as in the beech, &c. There are likewiſe ſome buds which are of a red colour; others which are yellow, black, brown, or red and greeniſh; as thoſe in the lime, the willow, the aſh, the beech, and the common ſycamore, in the order in which they occur.

The variety in the leaves is ſtill much greater; ſome being very broad, as thoſe of the common laurel; others very narrow, as thoſe of the larch. And there is a medium between theſe extremes, in thoſe of the willow and the almond. In ſome they are entire, as in the bay; in others ſerrated, as in the cherry; and pinnatifid, as in the acacia, &c. In ſome again they are covered with down, as in the ſea buckthorn; in others with wool, as in the hoary poplar; with prickles, as in the holly; with a glutinous matter, as in the gum ciſtus, &c. They are of all the different ſhades of green in the ſummer ſeaſon; and of all the different tints of red and yellow, in the autumnal and vernal ſeaſons.

There are ſome which retain their leaves and colours during or throughout the whole year, as the pine tribe, &c.; others which loſe their green colour in the autumn; but retain their leaves all the winter, as the beech, hornbeam, &c. in particular circumſtances. A great number of trees, among which are the elm and the aſh, drop their leaves in the autumn, and are naked all the winter. In general, the leaves have the ſame properties as the barks, but in a fainter and leſs perfect degree; which are of much importance in ſome points of view. Thoſe of the alder, the box, &c. are refuſed by moſt ſorts of cattle; thoſe of the elm, the thorn, &c. greedily devoured by them; while thoſe of the fir tribe are offenſive to many ſorts of inſects, which are liable to infeſt hot-houſes, and other ſimilar places.

And the flowers are much leſs various than the leaves. Thoſe of ſome trees being large and ſhowy, as of the roſe, the honeyſuckle, &c.; while thoſe of others are ſmall and obſcure, as of the alaternus, &c. In ſome they cover the whole plant, and quickly fade away, as thoſe of the hawthorn; while in others they are but thinly diſtributed, yet continue a conſiderable length of time, as thoſe of the paſſion-flower, &c. There are ſome, which come into bloſſom at an early period, as thoſe of the mezereon, almond,

&c.; others that are very late, as thoſe of the ſweet cheſnut, the althæa frutex, &c. And there are ſome trees and ſhrubs which ceaſe flowering before their leaves expand, as the almond; and others in which the bloſſom makes its appearance only when the leaves fall off, as that of the hazel.

In the fruits or ſeeds of trees and plants the variety is likewiſe conſiderable. There are ſome, in which they are brilliantly coloured and ſhowy in their appearance, as in the cluſtered berries of the mountain-aſh; while in others, the ſeed is very much hidden and obſcure, as in the willow. On ſome trees they remain two or more years, as the cones on the fir tribe; on others but a few weeks, as the capſules of the elm. The fruits and ſeeds of ſome are uſed for culinary purpoſes, and contribute to increaſe and enrich the deſerts of the table, as the apple, pear, walnut, &c.; while others are appropriated to and have the properties of fattening the inferior ſorts of animals, as the acorn, the beech maſt, &c.; and others again are poiſonous, as the berries of the deadly nightſhade, and thoſe of the mezereon, &c.

Further, along with their characteriſtic diſtinctions, ſome trees and plants combine and compriſe what may be conſidered particular properties.

In the roots, they are as much varied underneath the ground, as the trunks, ſtems, and branches are above the ſurface of it. There are ſome which ſpread themſelves in a horizontal manner, as thoſe of the pine, and fir tribes; others which ſend down perpendicular roots to a great depth, as thoſe of the oak, the cheſnut, &c.; and there are thoſe which form a medium between theſe extremes, as in thoſe of the lime, the beech, &c.

In the modes or means of propagation in trees and plants there is equal or more variety. There are ſome which are raiſed from ſeeds, as the moſt part of foreſt-trees, ſuch as the oak, elm, aſh, larch, &c.; others from layers, as the lime, platanus, roſe, and many ſorts of ſhrubs; ſtill others from ſuckers, as the abele, gale, ſpirea, &c. And ſome are propagated by ingrafting, as the weeping aſh, apple, &c.; others by inoculation, as the double-bloſſomed almond, the weeping cherry, &c. And ſome kinds, again, by the roots, as the thorn, mezereon, and others.

In reſpect to culture they require different kinds of ſoils, ſituations, and management; ſome delight in a deep, ſtrong ſoil, as the oak; ſome in a dry gravelly one, as the beech; ſome in a deep moiſt one, as the poplar; others in a ſoil of the peat-earthy kind, as the erica, and various other ſorts; ſtill others are natural to a rather moiſt ſoil, as the alder, &c. And there are ſome trees which will grow in a ſoil of almoſt any ſort, as the Scotch fir tribe; while others will ſcarcely grow in any, but that of their natural one, as the rhododendron, the andromeda, &c. There are ſome again which hardly ſtand in need of the aid or aſſiſtance of any ſort of ſoil, as the ivy, &c.; while others are of the paraſite kind, as the miſletoe, &c.

There is likewiſe much variety in the ſituations and expoſures which trees and plants naturally affect. Some kinds will endure almoſt every ſort of expoſure, with the exception of that of ſtrong powerful ſea breezes, as the larch, the Scotch fir, the mountain-aſh, &c.: while ſome again endure and withſtand the ſea breezes in a much better and far ſuperior manner to others, as the ſycamore, aſh, ſervice, elder, &c.; others will not proſper except in low, or ſheltered ſituations, as the black ſpruce, moſt ſorts of American plants, &c.; while others will riſe and grow under the drip and ſhade of others, as the Scotch elm, the Norway maple, hemlock, ſpruce, dogwood, box, &c.; but others again die in ſuch ſituations, as the larch, the pine, the willow, and many other ſorts.

In their more young growths trees and plants not only demand ſoils, ſituations, and aſpects ſuited to their particular natures and habits, but alſo ſuch methods of culture as are adapted to them. Some kinds requiring the earth and mould about their roots to be repeatedly dug up and ſtirred, as the lime, the lilac, &c.; others advance with equal rapidity, where the ground on the ſurface is preſerved free and clean from other injurious vegetable productions, as the oak, the cheſnut, &c.; while others again ſucceed in the beſt manner, where the ſurface of the land is covered with moſſy matter, as the rhododendron, the erica, &c.

In regard to cutting and pruning, there are ſome trees which will not bear the knife, as the cherry, &c.; the wood in others is many times hurt by it, as in the pine and the fir tribes. Some again are capable of bearing it to any extent, as the hawthorn, the crab-apple, &c. However, theſe peculiarities are moſtly applicable to trees of conſiderable height; as moſt ſorts when very young endure cutting in, and pruning very well, many kinds requiring theſe operations to train and bring them to ſingle ſtems. For inſtance, the ſilver fir, while in the nurſery ſtate, requires the ſide ſhoots of it to be cut and ſhortened; and young oak plants, ſome time after they have been finally planted out, are often cut over juſt above the ſurface of the ground, and ſuppoſed to grow up ſtronger by it.

A great many ſorts of trees and plants ſtand in need of being removed or tranſplanted the firſt or ſecond year of their growth from the ſeed, while in the nurſery ground; and to be ſet out from that ſituation into plantations of different kinds, while under the height of four feet, or in their more early growth. There are ſome ſorts which are little or not at all hurt by ſuch removals, as the elm; while others are liable to die after it, as the ſpruce fir, the Weymouth pine, &c.; ſome kinds are alſo apt to die on being tranſplanted, after they are eight, ten, or more feet in height, as the pine, the fir tribes, &c.; while other ſorts may be ſafely tranſplanted at nearly double ſuch ages and ſizes, as the lime, the elm, the ſycamore, and various other deciduous kinds; however, a year or more before their removal is to take place, they ſhould have their roots cut in, and their tops thinned by the pruning knife, or other means, as ſuch precautions are highly important and neceſſary, and ſhould never be omitted, in removing trees of the latter of the above heights.

In reſpect to the uſes of trees and ſhrubby plants, though the latter ſort are commonly ſet out for the purpoſe of ornament, variety, &c., and the former for that of timber, as well as theſe and other uſes; there are ſtill ſome other ways in which they occaſionally contribute, and become of utility and importance to the planter. There are different products of ſome of them, which are uſeful in different arts and profeſſions. For inſtance, the bark of ſome is uſeful in chemiſtry, for the making of bird-lime, as that of the holly; that of others, as of the lime, the elm, &c. for the manufacturers of mats. The leaves of ſome, as thoſe of the mulberry, for the growers and raiſers of ſilk. The bloſſoms of others, as thoſe of the roſe, for the apothecary, and thoſe of the ſyringa for the confectioner. Thoſe parts of the ſeeds of the beech which are proper, are converted into bread. And the fruits of others, as thoſe of the pear, apple, plum, &c. are of very general utility and value. Some kinds of wood are of particular uſe and value for particular purpoſes, as the oak to ſhip-builders; and others might be trained for this application, as the larch, by bending down the ſtem when about twenty feet in height, ſecuring it in that poſition, and then re-bending it again ſome conſider-

able

able time afterwards, leaving the bole or trunk in a differently crooked ſtate. The woody parts of the fir and pine are employed by houſe-carpenters, of the crab-tree by mill-wrights, of the aſh by plough-wrights, of the beech, the walnut, the cherry, the plum, the box, the holly, the yew, and others, by the cabinet-makers. The lime is particularly uſeful to the carver, the ſycamore to the turner, the box and holly to the mathematical inſtrument-maker, and the alder and the birch to the laſt and the heel-maker. Charcoal of any of the kinds is valuable for the iron-founders; that of the dog-wood, ſallow, alder, hazel, &c. for the gunpowder manufacturers. The larch, the ſilver fir, &c. afford the coarſe turpentine and its ſpirit; the ſpruce and pine tribes, reſin, tar, pitch, lamp-black, &c. Moſt woods, but eſpecially the beech, aſh, elm, &c. afford potaſh. The ſap-juice of ſome trees, as the birch, &c. yields a vinous liquor; and that of others, as of the ſugar-maple, &c. affords ſugar.

The value of wood as timber, and for other purpoſes, differs much according to local ſituation, and other circumſtances; when near a dry-dock or ſhip-yard, oak, elm, &c. ſuited to ſhip-building, are of much higher value than when at a great diſtance in the country. The undergrowths of ſeveral ſorts of trees, as dog-wood, ſallow, willow, alder, &c. are of the moſt value when near large manufactories of gunpowder, being of little utility, except as fuel, when at a diſtance. Some ſorts of wood, however, from the generality of their application and employment, are of great value in all ſituations, as thoſe of the oak, the elm, the aſh, the beech, and perhaps the larch has ſtill more value than any of them. Others, on account of their ſcarcity, are alſo valuable in all places, as the box, the holly, the yew, &c. All the lighter products of ſome ſorts of trees, as thoſe of bird-lime, potaſh, turpentine, tar, pitch, &c. may likewiſe be conſidered of equal value in all ſituations. But a tree which would be of the greateſt value in a particular ſituation or place, may not find in it that ſort of ſoil that is ſuitable to its nature or habits of growth; in which circumſtances that which will come to the moſt perfection in it, will commonly be found of the moſt value. Such woods as may not be valuable in conſequence of local circumſtances, may be rendered a great deal more high in their value, by having them manufactured in the places where they are met with, thus leſſening the expences of conveyance, &c. In conſequence of the great improvements in roads, canals, &c. and the general promotion of them, woods and plantations for timber, muſt, in almoſt all places, be valuable, and there can be few in which the other ſorts of products will not be of great importance. In the meaſuring of ſtandard trees for the purpoſe of aſcertaining their value, though many think themſelves fully qualified by being ſimply able to meaſure them; it is only by the perfect knowledge of the uſe and application of the different ſhapes, bends, and woods of them, that a correct eſtimate can be given; as a ſmall portion of wood may be of little conſequence in one ſort of buſineſs, while it is of much in another, which is a ſecret of great intereſt and importance to the purchaſers of timber of the ſtanding kind.

In addition to theſe qualities, almoſt every tree and plant is poſſeſſed of various others, which excite emotions that have a relation to them, and which give their characters or expreſſions. For inſtance, the cypreſs is of a regular, invariable ſhape, or form, and always, in colour, of a dark green, having a ſtill, ſolemn appearance; hence it has acquired the character of melancholy. A ſimilar, but ſomewhat fainter, train of emotions, is produced in the mind by the falling branches, drooping ſpray, and yellow greeniſh colour of the weeping willow; hence it ſuits with ſcenes of ſolitude, and induces meditation. In the light, airy form of the aſh, and the bright white of the variegated holly, there are ſome traits of certain degrees of the cheerful kind; in the feſtoons of the virgin's bower, eaſe and gracefulneſs; in the myrtle, delicacy and neatneſs; and in the ſweep of the ſtem, the curve of the branches, &c. of the larch, a peculiar elegance. In the oak and the cheſnut are forms which have long given the notions of grandeur and ſublimity. Both theſe and other trees are particularly expreſſive of peculiar known characters, ariſing, in ſome degree, from their own nature, and in part from aſſociations in the mind. Thoſe of the cypreſs and yew kinds have been planted in burying grounds, and other ſimilar places; the weeping willow, as the ſhade of urns; the laurel uſed as the crown of warriors; and the cheſnut introduced in landſcapes.

Some accidental characters and expreſſions of plants are produced by novelty and ſingularity either in their natures, forms, or appearances; hence exotics are at firſt diſtinguiſhed from thoſe of the indigenous kind, and called beautiful, elegant, fanciful, ſtrange, rare, &c. according to circumſtances. The creeping aſh, the ſtone pine, &c. derive and retain their characters from their comparative ſcarcity and unuſual ſhape; while others have that of elegance and novelty in a much leſs degree, as the cedar of Libanus and the cypreſs; the hemlock ſpruce, and the ſcarlet oak, &c. Some trees and plants are common, and thought nothing of in one diſtrict or country, while, in others, they are uncommon, and thought highly of; thus, the weeping willow, the narrow-leaved elm, the acacia, &c., which abound, and are little valued, in the ſouthern parts of the iſland; are ſcarce, highly eſteemed, and termed elegant in thoſe of the north; while the arbutus, the uva urſi, the erica alba, and even the mountain-aſh, which are plentiful, unnoticed, and common in the north, are held in eſtimation, and thought highly elegant in the ſouth.

Theſe are ſome of the more particular qualities of trees and plants, which are concerned in the claſſification and arrangement of them, as the materials by which the objects of planting and ornamental gardening are to be accompliſhed, but there are others which are peculiar to them in other points of view, that it is quite unneceſſary to notice in this place, as they are fully explained in ſpeaking of them individually under their proper heads.

More ample information on the above ſubject may, however, be obtained by conſulting Mr. Loudon's work "On Forming, Improving, and Managing Country Reſidences," in which will be ſeen their particular utility, and their moſt appropriate modes of application in the buſineſs of planting and ornamenting different kinds of pleaſure grounds, under all the various circumſtances which may occur in ſo far as their nature, ſituation, ſoil, and other ſimilar particulars are concerned, as well as the picturesque effect which will be produced.

QUALITIES *of Seeds, Sets, and Produce*, the properties which are eſſential to them for the production of full and beneficial crops of the ſeveral different kinds, and the moſt perfect and advantageous ſtates of growth and maturation of ſuch crops, for their being conſumed, either as food or otherwiſe. In all ſorts of ſeeds of the grain kind, thoſe which are the moſt fully bodied, bright, thinneſt in the ſkin, and the moſt ſound, without being too long kept, are the moſt ſuitable for making uſe of as ſeed. Such as are ſmall, lean, ill fed, and ſhrunk in their ſkins, or which have been in any way heated in the mow or ſtack, are moſtly quite improper for this purpoſe. Some have, however, ſuppoſed the contrary to be the caſe, but they have hitherto adduced no proofs whatever, of the fact, while the former opinion is ſupported

ſupported by the daily experience of the beſt farmers in the country. There is another circumſtance which is of ſome importance in this buſineſs, which is that of the grain for this uſe being conſtantly newly threſhed out from the ſtraw, as ſuch, for the moſt part, ſprouts and grows more expeditiouſly, and is leſs liable to rot and periſh in unfavourable ſeaſons and ſituations.

All ſorts of diſeaſed grain, and ſuch as is not perfectly free from the mixture of the ſeeds of weeds with it, ſhould always be, as much as poſſible, avoided in this intention.

In regard to the ſmaller ſorts of ſeeds for raiſing all kinds of plant-crops in the field, as well as thoſe of the graſs ſort, both natural and artificial, the principal neceſſary qualities, in each, are thoſe of their being of a bright, lively, ſhining colour, perfectly ſound, and freſh, or lately collected from the plants. Such as are old, or kept more than a few months, are moſtly improper for this application. The beſt ſorts commonly ſlide freely over each other, without ſticking or being heavy in the hand, and have a brilliant bloomy appearance.

In gardening, moſt ſorts of ſeeds alſo are the beſt, and require to have theſe properties and qualities as much as poſſible; but there are a few which are apt to grow too luxuriantly for fruiting well, as ſome of the cucumber, melon, kidney-bean, and other kinds, which are better for being kept for ſome length of time, as this property is thereby in ſome meaſure corrected and reſtrained. Moſt ſorts of nuts and ſtones, when uſed as ſeed, ſhould, however, be employed in as freſh a ſtate as poſſible.

Sets are different in their nature, being of the root or plant kinds. In the former, the ſets or cuttings ſhould have the eyes or buds in a perfect ſtate, and be of a middling ſize, as both thoſe which are very large and very ſmall are objectionable. This is the caſe with the potatoe and ſome other ſorts. In the latter, the plants ſhould not have too large growths, but be in a fine young ſtate of vegetation, ſo that they can be ſet out with facility, and readily take root again, having their heads or upper parts, for the production of the produce, wholly in an uninjured condition. They ſhould alſo be quite newly drawn up, cut or ſlipped from the ſtalks of the old plants, without any ſort of clubbing near the roots in thoſe which are drawn. Such as have riſen the moſt quickly from the ſeed, are, in general, the beſt. They ſhould none of them ever be kept any great length of time after being drawn, before they are re-planted. This is equally applicable to the field and garden kinds. See SEED, SET, and SOWING.

The produce in all the white or grain crops, which are employed either for the purpoſe of mealing or malting, ſhould conſtantly be well ripened; but where the ſtraw is to be made uſe of as cattle food, the crops are better to be cut before they have reached the ſtate of full maturity, as this purpoſe is thereby more completely anſwered. There is much loſs in the produce of moſt ſorts of field plant-crops, by taking them before they have formed their bulbs or heads in a perfect manner. But many of ſuch like products, in the garden, are the beſt and moſt advantageouſly taken in ſuch imperfect ſtates, being tough and coarſe when full grown, and without the neceſſary tenderneſs. Others require to be cut or drawn early in order to have the proper degrees of ſweetneſs and flavour. The fruit kind of produce is taken both before and when nearly ripe, according to the uſes for which it is intended. Some ſorts of vegetable produce are uſed quite in their green ſtate, as food; while others are beſt in a ſomewhat more advanced ſtate: and others, again, in both theſe ſtates. And there are thoſe which require to be well ripened, and kept for ſome length of time before they are uſed in this way.

All ſorts of produce of the graſs-kind, are cut and uſed to the moſt benefit, when they are taken a little before they become perfectly ripe, as they go the fartheſt, whether they are to be conſumed in the green ſtate, or in that of hay. This is equally the caſe with the more luxuriant artificial ſorts, as with thoſe of leſs growth, of the natural kind. This is explained more fully in ſpeaking of the different plants and crops individually, and in the article HAY; which ſee.

QUALO, in *Geography*, a town on the N.E. coaſt of Sumatra. N. lat. 2° 45′. E. long. 99° 40′.

QUALUGA, a town of Africa, in the country of Whidah; 18 miles N.W. of Sabi.

QUAM, a town of Norway, in the dioceſe of Drontheim; 68 miles N. of Drontheim.

QUAM *diu ſe bene geſſerit*, a clauſe frequent in letters patent, or grants of offices, to ſecure them ſo long as the perſon they are granted to ſhall not be guilty of abuſing the ſame.

Thus, *e. gr.* we find it in thoſe given to the barons of the exchequer: where it intimates, that they ſhall hold the ſame as long as they ſhall behave themſelves well; which is to be reſtrained to matters of their offices; and ſignifies no more than the law would have implied, had the office been granted expreſsly for life. See JUDGE.

A grant therefore, with this clauſe, is equivalent to a grant for life.

QUAMASH, in *Botany*, a name given, by the North American Indians, to a plant called *Phalangium Quamaſh*, by Mr. Purſh, in his *Flora*, v. 1. 226; who nevertheleſs mentions an irregularity in the petals, that might poſſibly eſtabliſh it as a new genus. See PHALANGIUM.

This plant was obſerved by governor Lewis, about the upper part of the Miſſouri, near the Rocky-mountains, flowering in June. The *bulb* is roundiſh, tunicated. *Stem* none. *Leaves* radical, few, long, and linear, half an inch broad, ſmooth; keeled underneath. *Flower-ſtalk* ſolitary, naked, erect, round, ſmooth, unbranched, a foot or more in height, terminating in a *ſpike*, or rather *cluſter*, of large, pale-blue *flowers*, each accompanied by a linear, membranous, withering *bractea*, longer than the partial ſtalk. *Petals* linear-lanceolate, nearly equal in length; five of them aſcending; the ſixth deflexed.

The bulbs are carefully collected by the natives, and cooked between heated ſtones, when they aſſume the appearance of baked pears, and have an agreeable ſweet taſte. They form a great part of the winter ſtores of theſe Indians. Though governor Lewis's party found them a pleaſant ſort of food, they could not be eaten, in any quantity, without cauſing bowel complaints.

QUAMOCLIT, an Indian name, retained by Plumier and Tournefort as generic; but by Linnæus uſed only as the ſpecific appellation of a beautiful ſpecies of IPOMÆA; ſee that article.

QUAMPEAGAN FALLS, in *Geography*, falls in America at the head of the tide on Newichwanock river, which joins Piſcataqua river, 10 miles from the ſea; ſo called by the natives, becauſe fiſh were there taken with nets. At theſe falls are a ſet of ſaw-mills and others, and alſo a landing-place, where great quantities of lumber are rafted. Here the river has the Engliſh name of Salmon Falls river, from the number of ſalmon caught there. On many places from Quampeagan to the pond, from which it iſſues, there are mills for boards and corn.

QUAM-TOM, a town of China, of the third rank,

in the province of Yun-nan; 15 miles N.E. of Tchou-hiong.

QUAN, a town of China, of the third rank, in Chan-tong; 22 miles W. of Tong-tchang.

QUAN, or *Guan*, in *Ornithology*. See PENELOPE *Criſtata*.

QUANAMORA, in *Geography*, a town of Africa, in Upper Guinea, on the banks of the Scherbro', ſaid to contain 5000 families. N. lat. 7° 45'. W. long. 10° 15'.

QUANDROS, a name given by writers of the middle ages to a ſtone to which they attribute great virtues, and which, they ſay, is found in the head of a vulture.

QUANG-LING, in *Geography*, a town of China, of the third rank, in Chan-ſi; 15 miles W.S.W. of Ouei.

QUANG-NING, a town of China, of the third rank, in Quang-tong; 35 miles N. of Tchao-king.

QUANG-PING, a city of China, of the firſt rank, ſituated in the northern part of the province of Pe-tche-li, between the provinces of Chang-tong and Ho-nan, which has nine towns of the third claſs dependent upon it. All its plains are well watered by rivers. Among its temples, one is dedicated to thoſe men, who, as the Chineſe pretend, diſcovered the ſecret of rendering themſelves immortal; 212 miles S.S.W. of Peking. N. lat. 36° 47'. E. long. 114° 29'.

QUANG-PUNG, a town of China, of the third rank, in Pe-tche-li; 17 miles N.W. of Tay-ming.

QUANG-SI, a province of China, ſituated between thoſe of Quang-tong, Hou-quang, Koei-tcheou, Yun-nan, and the kingdom of Tong-king; about 360 miles from E. to W., and 230 from N. to S. In commerce, as well as extent, it is not equal to that of the other provinces; and yet it ſo abounds with rice, as to ſupply, for ſix months in the year, the province of Quang-tong, without which the inhabitants of this province could not ſubſiſt. The mountains with which it is covered, abound with mines of gold, ſilver, copper, and tin, and in this province is a ſingular kind of tree, containing a ſoft pulp, which yields a ſort of flour, and of this flour they make a very good bread. Beſides parroquets, hedge-hogs, and the rhinoceros, wild animals, curious birds, and uncommon inſects are found here in great number. This province contains twelve towns of the firſt claſs, and eighty of the ſecond and third. Its capital is Quei-ling. Groſſier's China, vol. i.

The population of this province is eſtimated by ſir George Staunton at 10,000,000; its extent is ſaid to comprehend 78,250 ſquare miles, or 50,080,000 acres. The revenue transferred from it to the treaſury at Peking, compriſing land, ſalt, and taxes, is ſtated at 500,000 tahels, or ounces of ſilver.

QUANG-TCHANG, a town of China, of the third rank, in the province of Chan-ſi; 28 miles S. of Ouei.

QUANG-TCHEOU, or QUANG-CHOU-FOU, a city of China, of the firſt rank, in the province of *Quang-tong*, uſually called by the Europeans *Canton*; which ſee.

QUANG-TONG, the moſt conſiderable of the ſouthern provinces of China; bounded on the N.E. by Fokien, on the N. by Kiang-ſi, on the W. by Quang-ſi, and the kingdom of Tong-king; the reſt is waſhed by the ſea. The country is diverſified with plains and mountains, and the land is ſo fertile that it produces two crops every year. Trade and the fecundity of the ſoil ſupply this province with every thing that can contribute to the pleaſures of life; it furniſhes gold, precious ſtones, ſilk, pearls, eagle-wood, tin, quickſilver, ſugar, copper, iron, ſteel, ſaltpetre, ebony, and abundance of aromatic woods, which are much valued. Beſides European and Indian fruits, it produces ſeveral that are peculiar to itſelf. All the coaſts abound with fiſh, and furniſh great quantities of oyſters, crabs, and tortoiſes of an immenſe ſize: of the ſhells of theſe the Chineſe make ſeveral pretty toys. Tame ducks are reared in this province in great numbers: the Chineſe are induſtrious in breeding them, and they hatch their eggs in ovens or dunghills, though they do not ſeem to have derived this mode of breeding them from Egypt, where it is practiſed. They carry them on barks in large flocks to feed on the ſea-ſhore, where, at low water, they find ſhrimps, oyſters, and other kinds of ſhell-fiſh. At the approach of night they are collected together by only beating on a baſin, upon which they immediately form themſelves into different flocks, and each returns to the veſſel to which it belongs. The Chineſe have a method of ſalting their meat without injuring its flavour, and they ſalt their eggs by encloſing them in a coat of clay mixed with ſalt. Theſe ſalted eggs are ſaid to be very wholeſome, and even ſick perſons are permitted to eat them. Although the climate of this province is warm, the air is pure, and the people are robuſt and healthy. They are noted for their induſtry, and for a talent of imitation, which they poſſeſs in an eminent degree. As this province is at a great diſtance from court, its government is one of the moſt important, and it is alſo one of the moſt flouriſhing in the empire. Its viceroy has alſo the command of Quang-ſi, and reſides at Cheo-king, for the convenience of expediting his orders to either of theſe provinces. This governor always has a number of troops ready, properly poſted, to check the incurſions of robbers and pirates, who might otherwiſe interrupt and injure trade: for the ſame purpoſe, a great number of fortreſſes (moſt of them being cities provided with numerous garriſons) have been built along the coaſts and in the interior parts of the country. This province is divided into 10 diſtricts, which contain 10 cities of the firſt claſs, and 84 of the ſecond and third. Groſſier.

The number of inhabitants, according to ſir George Staunton's eſtimate, is 21,000,000; its area comprehends 79,456 ſquare miles, or 50,851,840 acres. The revenue remitted to the imperial treaſury at Peking, and raiſed from land, ſalt, and taxes, amounts to 1,340,000 tahels, or ounces of ſilver. The military force is ſaid to amount to 50,000 men. Its capital is *Canton*; which ſee.

QUANG-YANG, a town of China, of the third rank, in the province of Quang-ſi; 30 miles S. of Tſuen.

QUANG-YUEN, a town of China, of the third rank, in the province of Se-tchuen, ſeated on the Kialing; 50 miles N. of Pao-king.

QUANNEFIORD, a bay on the W. coaſt of Weſt Greenland. N. lat. 62° 10'. W. long. 48° 5'.

QUANO, a town of Japan, on the iſland of Niphon, on the S. coaſt, 70 miles E. of Meaco. N. lat. 35° 58'. E. long. 136° 14'.

QUANTALLA, an iſland of Africa, at the mouth of the Zaire, celebrated for a ſilver idol, to which the neighbouring kings ſend preſents and offer ſacrifices.

QUAN-TAO, a town of China, of the third rank, in Chan-tong; 25 miles W.N.W. of Tong-tchang.

QUAN-TCHANG, a town of China, in Chan-tong; 13 miles N. of Po.

QUANTITE', Fr. This word in muſic, like proſody, does not fix the number of notes or of ſyllables, but their relative duration. Quantity produces the rhythm, as accent produces intonation. Rhythm and intonation generate melody. Rouſſeau. See MELODY.

QUANTITY, QUANTITAS, any thing capable of eſtimation or menſuration; or, which being compared with another

other thing of the ſame kind, may be ſaid to be greater or leſs than it; equal, or unequal, to it.

Mathematics is the ſcience or doctrine of quantity.

Quantity is a general attribute, applied in a very different manner to things of very different nature; whence it is impoſſible to give any univerſal definition of it.

Quantity is applied both to things and to modes; and this either ſingularly to one; or plurally, to ſeveral. In the firſt caſe it is called *magnitude*, in the latter *multitude*.

Quantity may be reduced to four claſſes; *viz.*

Quantity, *Moral*, which depends on the manners of men, and the free determination of their wills. As the prices and value of things; degrees of dignity and power, good and evil, merit and demerit, rewards and puniſhments, &c.

Quantity, *Notional*, ariſing from the operation of the underſtanding only. Such as the largeneſs or narrowneſs of the capacity of the mind, and its conceptions. In *Logic*, univerſals, predicaments, &c. In *Grammar*, the quantity or meaſure of ſyllables, accents, tones, &c.

Quantity, *Phyſical*, or *Natural*, which is of two kinds: 1. That which nature furniſhes us with in matter, and its extenſion. And, 2. In the powers and properties of natural bodies: as gravity, motion, light, heat, cold, rarity, denſity, &c.

Quantity, *Tranſcendental*, as duration, the continuation of any being, exiſtence, time, &c.

Quantity is alſo popularly diſtinguiſhed into *continued* and *diſcrete*.

Quantity, *Continued*, or *Continuous*, is when the parts are connected together, and is commonly called *magnitude*. This, again, is of two kinds; either *ſucceſſive*, or *improper*, as time.

Quantity, *Diſcrete*, is when the parts of which it conſiſts exiſt diſtinctly, and unconnected together; which makes what we call *number* or *multitude*.

The notion of continued quantity, and its difference from diſcrete, appears to ſome without foundation. Mr. Machin conſiders all mathematical quantity, or that for which any ſymbol is put, as nothing elſe but number, with regard to ſome meaſure, which is conſidered as one; for that we cannot know preciſely how much any thing is, but by means of number. The notion of continued quantity, without regard to any meaſure, is indiſtinct and confuſed; and though ſome ſpecies of ſuch quantity, conſidered phyſically, may be deſcribed by motion, as lines by the motion of points, and ſurfaces by the motion of lines; yet the magnitudes, or mathematical quantities, are not made by the motion, but by numbering according to a meaſure. Vide Phil. Tranſ. N° 447. p. 228.

Permanent quantity is farther diſtinguiſhable into length, breadth, and depth.

Wolfius ſeems to give us a more preciſe notion of mathematical quantity, and its two ſpecies of diſcrete and continued. Whatever is referred to unity in the ſame manner as one right line to another, is what we call quantity; or number in general.

If, now, the thing be referred to a given unit, as 3, it is called a determinate number: if to unity in the general, or at large, it is called a quantity; which, on this principle, is the ſame with indeterminate number.

Thus, *e. gr.* the breadth of a river is accounted a quantity: if, then, it be enquired how great it is; to conceive its quantity, we take ſome unit at pleaſure, and ſee the relation of the breadth to it; and according to the different unit aſſumed, we expreſs the breadth of the river in a different determinate number.

The breadth of the river, therefore, is quantity conſidered as referred to a vague unit, or to unity at large; but the unit being determined, the thing is underſtood by a determinate number.

In this ſenſe, algebra is the arithmetic of quantities. See on the ſubject of quantity, Harris's Philoſophical Arrangements, chap. ix.

Quantity *of Action*. See Action.

Quantity, *Impoſſible*, and *Imaginary*. See Root.

Quantity *of Curvature* at any point of a curve is determined by the circle of curvature at that point, and is reciprocally proportional to its radius. Newton's Meth. of Flux. and Inf. Series, p. 60. Maclaurin's Fluxions, b. i. c. xi. See Curvature and Evolute.

Quantity *of Motion*, in *Mechanics*, is of two kinds; *viz.* of momentary motion, and of entire motion.

Quantity *of entire motion*. The Carteſians define the entire motion as the momentary one, by the factum of the maſs, or quantity of matter, into the velocity; but ſince motion is a ſucceſſive being, and has no parts co-exiſting together, its quantity ought to be eſtimated by the aggregate of the ſeveral parts exiſting ſucceſſively; and is therefore equal to the factum of the momenta into the time.

Quantity *of momentary motion* is the factum of the velocity into the maſs; or it is a meaſure ariſing from the joint conſideration of the quantity of matter, and the velocity of the motion of the body; the motion of any whole being the ſum or aggregate of the motion in all its ſeveral parts.

Hence, in a body twice as great as another, moved with an equal velocity, the quantity of motion is double; if the velocity be double alſo, the quantity of the motion will be quadruple. Hence, the quantity of momentary motion coincides with what we call the momentum, or impetus of a moving body. See Force.

In the colliſion of bodies, the quantity of momentary motion, which is found by taking the ſum of motions tending the ſame way, or their difference, if they tend towards contrary parts, is not at all changed by any actions of the bodies on one another. See Percussion.

Quantity *of Matter* in any body, is the product of the denſity into the bulk; or a quantity ariſing from the joint conſideration of its magnitude and denſity.

As, if a body be twice as denſe, and take up twice as much ſpace as another, it will be four times as great.

This quantity of matter is the beſt diſcoverable by the abſolute weight of bodies. See Matter.

Quantity, *Infinite*. See Infinite *Quantity*.

Quantities, in *Algebra*, are indeterminate numbers, or things referred to unity in general. See Number.

Quantities are properly the ſubject of algebra; which is wholly converſant in the computation of ſuch quantities.

Given quantities are uſed to be noted by the firſt letters of the alphabet *a*, *b*, *c*, *d*, &c. the quantities ſought by the laſt, *z*, *y*, *x*, &c. See Characters.

Algebraical quantities are chiefly of two kinds; *poſitive*, and *negative*.

Quantities, *Poſitive*, or *Affirmative*, are thoſe which are greater than nothing, and which are affected with the ſign + prefixed; or ſuppoſed to be ſo.

Quantities, *Negative*, or *Privative*, are thoſe leſs than nothing: which are affected with the ſign − prefixed.

Hence, 1. Since + is the ſign of addition, and − the ſign of ſubtraction; a poſitive quantity is produced by adding any real quantity to nothing: *e. gr.* $0 + 3 = +3$; and $0 + a = +a$. And a privative quantity is produced

in the province of Yun-nan; 15 miles N.E. of Tchou-hiong.

QUAN, a town of China, of the third rank, in Chan-tong; 22 miles W. of Tong-tchang.

Quan, or *Guan*, in *Ornithology*. See Penelope *Criſtata*.

QUANAMORA, in *Geography*, a town of Africa, in Upper Guinea, on the banks of the Scherbro', ſaid to contain 5000 families. N. lat. 7° 45'. W. long. 10° 15'.

QUANDROS, a name given by writers of the middle ages to a ſtone to which they attribute great virtues, and which, they ſay, is found in the head of a vulture.

QUANG-LING, in *Geography*, a town of China, of the third rank, in Chan-ſi; 15 miles W.S.W. of Ouei.

QUANG-NING, a town of China, of the third rank, in Quang-tong; 35 miles N. of Tchao-king.

QUANG-PING, a city of China, of the firſt rank, ſituated in the northern part of the province of Pe-tche-li, between the provinces of Chang-tong and Ho-nan, which has nine towns of the third claſs dependent upon it. All its plains are well watered by rivers. Among its temples, one is dedicated to thoſe men, who, as the Chineſe pretend, diſcovered the ſecret of rendering themſelves immortal; 212 miles S.S.W. of Peking. N. lat. 36° 47'. E. long. 114° 29'.

QUANG-PUNG, a town of China, of the third rank, in Pe-tche-li; 17 miles N.W. of Tay-ming.

QUANG-SI, a province of China, ſituated between thoſe of Quang-tong, Hou-quang, Koei-tcheou, Yun-nan, and the kingdom of Tong-king; about 360 miles from E. to W., and 230 from N. to S. In commerce, as well as extent, it is not equal to that of the other provinces; and yet it ſo abounds with rice, as to ſupply, for ſix months in the year, the province of Quang-tong, without which the inhabitants of this province could not ſubſiſt. The mountains with which it is covered, abound with mines of gold, ſilver, copper, and tin, and in this province is a ſingular kind of tree, containing a ſoft pulp, which yields a ſort of flour, and of this flour they make a very good bread. Beſides parroquets, hedge-hogs, and the rhinoceros, wild animals, curious birds, and uncommon inſects are found here in great number. This province contains twelve towns of the firſt claſs, and eighty of the ſecond and third. Its capital is Quei-ling. Groſſier's China, vol. i.

The population of this province is eſtimated by ſir George Staunton at 10,000,000; its extent is ſaid to comprehend 78,250 ſquare miles, or 50,080,000 acres. The revenue transferred from it to the treaſury at Peking, compriſing land, ſalt, and taxes, is ſtated at 500,000 tahels, or ounces of ſilver.

QUANG-TCHANG, a town of China, of the third rank, in the province of Chan-ſi; 28 miles S. of Ouei.

QUANG-TCHEOU, or Quang-chou-fou, a city of China, of the firſt rank, in the province of *Quang-tong*, uſually called by the Europeans *Canton*; which ſee.

QUANG-TONG, the moſt conſiderable of the ſouthern provinces of China; bounded on the N.E. by Fokien, on the N. by Kiang-ſi, on the W. by Quang-ſi, and the kingdom of Tong-king; the reſt is waſhed by the ſea. The country is diverſified with plains and mountains, and the land is ſo fertile that it produces two crops every year. Trade and the fecundity of the ſoil ſupply this province with every thing that can contribute to the pleaſures of life; it furniſhes gold, precious ſtones, ſilk, pearls, eagle-wood, tin, quickſilver, ſugar, copper, iron, ſteel, ſaltpetre, ebony, and abundance of aromatic woods, which are much valued. Beſides European and Indian fruits, it produces ſeveral that are peculiar to itſelf. All the coaſts abound with fiſh, and furniſh great quantities of oyſters, crabs, and tortoiſes of an immenſe ſize: of the ſhells of theſe the Chineſe make ſeveral pretty toys. Tame ducks are reared in this province in great numbers: the Chineſe are induſtrious in breeding them, and they hatch their eggs in ovens or dunghills, though they do not ſeem to have derived this mode of breeding them from Egypt, where it is practiſed. They carry them on barks in large flocks to feed on the ſea-ſhore, where, at low water, they find ſhrimps, oyſters, and other kinds of ſhell-fiſh. At the approach of night they are collected together by only beating on a baſin, upon which they immediately form themſelves into different flocks, and each returns to the veſſel to which it belongs. The Chineſe have a method of ſalting their meat without injuring its flavour, and they ſalt their eggs by encloſing them in a coat of clay mixed with ſalt. Theſe ſalted eggs are ſaid to be very wholeſome, and even ſick perſons are permitted to eat them. Although the climate of this province is warm, the air is pure, and the people are robuſt and healthy. They are noted for their induſtry, and for a talent of imitation, which they poſſeſs in an eminent degree. As this province is at a great diſtance from court, its government is one of the moſt important, and it is alſo one of the moſt flouriſhing in the empire. Its viceroy has alſo the command of Quang-ſi, and reſides at Cheo-king, for the convenience of expediting his orders to either of theſe provinces. This governor always has a number of troops ready, properly poſted, to check the incurſions of robbers and pirates, who might otherwiſe interrupt and injure trade: for the ſame purpoſe, a great number of fortreſſes (moſt of them being cities provided with numerous garriſons) have been built along the coaſts and in the interior parts of the country. This province is divided into 10 diſtricts, which contain 10 cities of the firſt claſs, and 84 of the ſecond and third. Groſſier.

The number of inhabitants, according to ſir George Staunton's eſtimate, is 21,000,000; its area comprehends 79,456 ſquare miles, or 50,851,840 acres. The revenue remitted to the imperial treaſury at Peking, and raiſed from land, ſalt, and taxes, amounts to 1,340,000 tahels, or ounces of ſilver. The military force is ſaid to amount to 50,000 men. Its capital is *Canton*; which ſee.

QUANG-YANG, a town of China, of the third rank, in the province of Quang-ſi; 30 miles S. of Tſuen.

QUANG-YUEN, a town of China, of the third rank, in the province of Se-tchuen, ſeated on the Kialing; 50 miles N. of Pao-king.

QUANNEFIORD, a bay on the W. coaſt of Weſt Greenland. N. lat. 62° 10'. W. long. 48° 5'.

QUANO, a town of Japan, on the iſland of Niphon, on the S. coaſt, 70 miles E. of Meaco. N. lat. 35° 58'. E. long. 136° 14'.

QUANTALLA, an iſland of Africa, at the mouth of the Zaire, celebrated for a ſilver idol, to which the neighbouring kings ſend preſents and offer ſacrifices.

QUAN-TAO, a town of China, of the third rank, in Chan-tong; 25 miles W.N.W. of Tong-tchang.

QUAN-TCHANG, a town of China, in Chan-tong; 13 miles N. of Po.

QUANTITE', Fr. This word in muſic, like proſody, does not fix the number of notes or of ſyllables, but their relative duration. Quantity produces the rhythm, as accent produces intonation. Rhythm and intonation generate melody. Rouſſeau. See Melody.

QUANTITY, Quantitas, any thing capable of eſtimation or menſuration; or, which being compared with another

other thing of the same kind, may be said to be greater or less than it; equal, or unequal, to it.

Mathematics is the science or doctrine of quantity.

Quantity is a general attribute, applied in a very different manner to things of very different nature; whence it is impossible to give any universal definition of it.

Quantity is applied both to things and to modes; and this either singularly to one; or plurally, to several. In the first case it is called *magnitude*, in the latter *multitude*.

Quantity may be reduced to four classes; *viz.*

Quantity, *Moral*, which depends on the manners of men, and the free determination of their wills. As the prices and value of things; degrees of dignity and power, good and evil, merit and demerit, rewards and punishments, &c.

Quantity, *Notional*, arising from the operation of the understanding only. Such as the largeness or narrowness of the capacity of the mind, and its conceptions. In *Logic*, universals, predicaments, &c. In *Grammar*, the quantity or measure of syllables, accents, tones, &c.

Quantity, *Physical*, or *Natural*, which is of two kinds: 1. That which nature furnishes us with in matter, and its extension. And, 2. In the powers and properties of natural bodies: as gravity, motion, light, heat, cold, rarity, density, &c.

Quantity, *Transcendental*, as duration, the continuation of any being, existence, time, &c.

Quantity is also popularly distinguished into *continued* and *discrete*.

Quantity, *Continued*, or *Continuous*, is when the parts are connected together, and is commonly called *magnitude*. This, again, is of two kinds; either *successive*, or *improper*, as time.

Quantity, *Discrete*, is when the parts of which it consists exist distinctly, and unconnected together; which makes what we call *number* or *multitude*.

The notion of continued quantity, and its difference from discrete, appears to some without foundation. Mr. Machin considers all mathematical quantity, or that for which any symbol is put, as nothing else but number, with regard to some measure, which is considered as one; for that we cannot know precisely how much any thing is, but by means of number. The notion of continued quantity, without regard to any measure, is indistinct and confused; and though some species of such quantity, considered physically, may be described by motion, as lines by the motion of points, and surfaces by the motion of lines; yet the magnitudes, or mathematical quantities, are not made by the motion, but by numbering according to a measure. Vide Phil. Trans. N° 447. p. 228.

Permanent quantity is farther distinguishable into length, breadth, and depth.

Wolfius seems to give us a more precise notion of mathematical quantity, and its two species of discrete and continued. Whatever is referred to unity in the same manner as one right line to another, is what we call quantity; or number in general.

If, now, the thing be referred to a given unit, as 3, it is called a determinate number: if to unity in the general, or at large, it is called a quantity; which, on this principle, is the same with indeterminate number.

Thus, *e. gr.* the breadth of a river is accounted a quantity: if, then, it be enquired how great it is; to conceive its quantity, we take some unit at pleasure, and see the relation of the breadth to it; and according to the different unit assumed, we express the breadth of the river in a different determinate number.

The breadth of the river, therefore, is quantity considered as referred to a vague unit, or to unity at large; but the unit being determined, the thing is understood by a determinate number.

In this sense, algebra is the arithmetic of quantities. See on the subject of quantity, Harris's Philosophical Arrangements, chap. ix.

Quantity *of Action*. See Action.

Quantity, *Impossible*, and *Imaginary*. See Root.

Quantity *of Curvature* at any point of a curve is determined by the circle of curvature at that point, and is reciprocally proportional to its radius. Newton's Meth. of Flux. and Inf. Series, p. 60. Maclaurin's Fluxions, b. i. c. xi. See Curvature and Evolute.

Quantity *of Motion*, in *Mechanics*, is of two kinds; *viz.* of momentary motion, and of entire motion.

Quantity *of entire motion*. The Cartesians define the entire motion as the momentary one, by the factum of the mass, or quantity of matter, into the velocity; but since motion is a successive being, and has no parts co-existing together, its quantity ought to be estimated by the aggregate of the several parts existing successively; and is therefore equal to the factum of the momenta into the time.

Quantity *of momentary motion* is the factum of the velocity into the mass; or it is a measure arising from the joint consideration of the quantity of matter, and the velocity of the motion of the body; the motion of any whole being the sum or aggregate of the motion in all its several parts.

Hence, in a body twice as great as another, moved with an equal velocity, the quantity of motion is double; if the velocity be double also, the quantity of the motion will be quadruple. Hence, the quantity of momentary motion coincides with what we call the momentum, or impetus of a moving body. See Force.

In the collision of bodies, the quantity of momentary motion, which is found by taking the sum of motions tending the same way, or their difference, if they tend towards contrary parts, is not at all changed by any actions of the bodies on one another. See Percussion.

Quantity *of Matter* in any body, is the product of the density into the bulk; or a quantity arising from the joint consideration of its magnitude and density.

As, if a body be twice as dense, and take up twice as much space as another, it will be four times as great.

This quantity of matter is the best discoverable by the absolute weight of bodies. See Matter.

Quantity, *Infinite*. See Infinite *Quantity*.

Quantities, in *Algebra*, are indeterminate numbers, or things referred to unity in general. See Number.

Quantities are properly the subject of algebra; which is wholly conversant in the computation of such quantities.

Given quantities are used to be noted by the first letters of the alphabet *a*, *b*, *c*, *d*, &c. the quantities sought by the last, *z*, *y*, *x*, &c. See Characters.

Algebraical quantities are chiefly of two kinds; *positive*, and *negative*.

Quantities, *Positive*, or *Affirmative*, are those which are greater than nothing, and which are affected with the sign + prefixed; or supposed to be so.

Quantities, *Negative*, or *Privative*, are those less than nothing: which are affected with the sign − prefixed.

Hence, 1. Since + is the sign of addition, and − the sign of subtraction; a positive quantity is produced by adding any real quantity to nothing: *e. gr.* $0 + 3 = +3$; and $0 + a = +a$. And a privative quantity is produced

by ſubtracting any real quantity out of nothing; *e. gr.* $0 - 3 = -3$; and $0 - a = -a$.

For an illuſtration. Suppoſe when you are quite deſtitute of money, ſomebody gives you a hundred pieces; you have then a hundred pieces more than nothing; which pieces conſtitute a poſitive quantity.

On the contrary, ſuppoſe you have no money, yet owe a hundred pieces; you have then a hundred pieces leſs than nothing; for you muſt pay a hundred pieces to have juſt nothing. This debt is a negative quantity.

Thus in local motion, progreſs may be called a poſitive quantity, and regreſs a negative one; becauſe the firſt increaſes, and the ſecond diminiſhes the ſpace paſſed over.

And in geometry, if a line drawn towards any part be accounted an affirmative quantity, another the contrary way will be a negative one.

Privative or negative quantities, therefore, are equally real with poſitive quantities, but oppoſite to each other, ſo as to take away each other's effect, in any operation, when they are equal as to quantity. Thus $3 - 3 = 0$, and $a - a = 0$. However, though $+ a$, and $- a$, are equal as to quantity, we do not ſuppoſe in algebra, that $+ a = - a$; becauſe to infer equality in this ſcience, they muſt not only be equal as to quantity, but of the ſame quality, that in every operation the one may have the ſame effect as the other. A negative quantity is ſaid to be leſs than nothing, becauſe it is oppoſite to the poſitive, and diminiſhes it when joined to it; whereas the addition of 0 has no effect. But a negative is to be conſidered no leſs as a real quantity than a poſitive. Quantities that have no ſign prefixed to them are underſtood to be poſitive. See NEGATIVE *Sign*.

QUANTITIES, *commenſurable*, *compound*, *exponential*, *heterogeneous*, *like*, *rational*, *ſimple*, *tranſcendental*, and *variable*. See the adjectives.

QUANTITIES, *Addition of*. 1. If the quantities denoted by the ſame letter be affected with the ſame ſign, the numbers prefixed to them are added as in common arithmetic.

2. If they be affected with different ſigns, the addition is changed into ſubtraction; and to the remainder is prefixed the ſign of the greater.

3. Quantities denoted by different letters, are added by means of the ſign +; as in the following example:

$$\begin{array}{l} 4a + 2b - 2c - 5d - g \\ 5a - 2b + 6c + 2d - 3g \\ \hline 9a + 4c - 3d \text{——} 4g \end{array} \qquad \begin{array}{r} a - b \\ c \\ \hline a - b + c \end{array}$$

See ADDITION.

QUANTITIES, *Subtraction of*. See SUBTRACTION.

QUANTITIES, *Multiplication and Diviſion of*. See MULTIPLICATION, and DIVISION.

QUANTITIES, *Combination of*. See COMBINATION.

1. If a poſitive quantity be multiplied or divided by another poſitive quantity, the reſult is alſo a poſitive quantity.

2. If a negative quantity be multiplied or divided by a poſitive, the reſult is a negative.

3. If a negative quantity be multiplied or divided by another negative, the reſult is a poſitive.

4. If a poſitive quantity be multiplied or divided by a negative, the reſult is a negative quantity. See MULTIPLICATION, in *Algebra*.

QUANTITY *of a Degree*. See DEGREE.

QUANTITY *of an Eclipſe*. See ECLIPSE.

QUANTITIES *of Seed, Sets, and Plants*, in *Agriculture*, the proportions of each, which are neceſſary for raiſing good crops of the different kinds. The aſcertaining of the moſt uſeful and beneficial quantities, in the ſeveral caſes, depends, in a material degree, upon a number of different circumſtances, ſuch as thoſe of the ſituation, the nature and quality of the ſoil, the period of ſowing, the ſtate of the ſeaſon, the manner of putting them into the earth, and ſeveral others.

A great deal more ſeed, ſets, and plants, are requiſite in late ſituations or backward ſeaſons, heavy, wet, ſtiff lands, and late ſowings; than where they are more forward, more light and dry, and put in early. And far leſs quantities made uſe of in the drill and dibble methods of putting in the crops, than in that of the broadcaſt, or by the hand.

In moſt ſorts of white, or grain crops, the quantities are from two to five buſhels *per* acre, being more in barley and oats, than in thoſe of the other kinds, as from three to five in general.

In thoſe of the pulſe kinds, uſually from ſix or ſeven pecks, to two, three and a half, and four buſhels, being commonly the latter, or more, in ſome ſorts of beans.

In thoſe of the ſmall ſeed deſcription, as the buck-wheat and turnip ſorts, from one to two and three pounds; but in the cabbage kind, only from ſix ounces to half a pound, and a quarter or half a peck.

In the tap-rooted crops, as the carrot, parſnip, mangle-wurzel, &c. from two to five pounds, and ſometimes ſix. In lettuce crops, in the field, from three to four pounds the acre.

In different ſorts of plantation crops, as thoſe of hemp, flax, woad, weld, teaſel, &c. from two to three up to five or ſix buſhels, in the three firſt; but only from two to four quarts, and from one to two pecks, in the two laſt.

The ſets in the hop, madder, liquorice, and lavender kinds, are from ſix to ſeven hundred, and a thouſand or more, in the firſt, and two laſt; but in the madder from fifteen to twenty thouſand *per* acre. In the cabbage ſort, from eight hundred to a thouſand and more plants or ſets to the acre. And in the potatoe the quantity of ſets vary from eight to twenty or more buſhels to the acre, according to the ſoil and manner of their being put into the ground.

The quantities of natural graſs ſeeds which are generally employed upon the acre, are from two to four buſhels and upwards. And thoſe of the artificial graſs kinds, in the clovers from ten to eighteen pounds; in ſaintfoin from three to four buſhels; in lucern from ſixteen to eighteen pounds; tares from two to three buſhels; trefoil, three pottles of cleaned ſeed, or two buſhels of the uncleaned ſort. And in chicory from eight to twelve pounds. See SEED, SET, PLANT, and SOWING.

The ſubject is more fully explained in ſpeaking of the culture of the different ſorts of crops, and the moſt ſuitable quantities under different circumſtances put down.

QUANTITY, in *Grammar*, denotes the meaſure and magnitude of the ſyllables; or that which determines them to be called long, or ſhort; or, it is the meaſure of time requiſite for the diſtinct pronunciation of a ſyllable.

This quantity is the object of proſody; and it is the regard to this that diſtinguiſhes verſe from proſe.

The economy and arrangement of the quantities, *i. e.* the diſtribution of long and ſhort ſyllables, make what we call the *number*.

The quantities are uſed to be diſtinguiſhed among grammarians by the characters ſhort and long.

The proportion between the long and ſhort ſyllables may be generally fixed the ſame as that between the crotchet and quaver in muſic; *viz.* as two to one. See TIME.

Syllables are long or ſhort, either by their nature, or by accident; that is, on account of the place where they are

put and the letters that follow them, which is called poſition.

In moſt languages, there are ſome ſyllables whoſe quantities vary, as the meaſure requires, which are called common; as in the Engliſh rēcōrd and rĕcōrd.

Some authors confound the quantity with the accent; but the difference is very evident; the former being the length or ſhortneſs of a ſyllable, the latter the raiſing or falling of the voice.

From two quantities, *viz.* long and ſhort ſyllables, ariſe all the varieties of poetic feet, which are very great. Horace alone uſes no leſs than twenty-eight. Yet the Greeks went vaſtly beyond the Romans in this reſpect. In effect, as many ways as two quantities may be varied by compoſition and tranſpoſition, from two to ſix ſyllables, ſo many different feet have the Greek poets contrived, and that under diſtinct names, to the number of 124. Though it is the opinion of ſome of the learned, that poetical numbers may be ſufficiently explained from the feet of two or three ſyllables, into which the reſt may be reſolved.

The feet, formed by the ancients of the long and ſhort ſyllables immediately, are the *ſpondee*, conſiſting of two long ſyllables; the *pyrrhic*, of two ſhort ones; the *trochee*, of a long and ſhort ſyllable; and the *iambic*, of a ſhort and long ſyllable.

Thoſe of three ſyllables are the *moloſſus*, conſiſting of three long ſyllables; the *tribrach*, of three ſhort ones; the *dactyl*, of one long and two ſhort ſyllables; and the *anapeſt*, of two ſhort and one long ſyllable.

The Engliſh tongue admits of no feet above two ſyllables, though both the Latin and Greek allow of ſix.

Our heroic verſes conſiſt of five long and five ſhort ſyllables intermixed alternately; though not ſo ſtrictly but that the order may be diſpenſed with. Dryden varies them with admirable beauty; frequently his heroic verſe begins with a long ſyllable followed by two ſhort ones.

The truth is, the quantity of the ſyllables is but little fixed in the modern tongues; and there is ſtill leſs regard had to it in the compoſition of modern verſes. The want of feet, or rather the ſhortneſs and uniformity of our feet, makes great difference between the numbers of the ancient and modern verſe. Our poets are fettered; and their fetters are ſo ſhort, conſiſting of but two poor links, that it is no wonder they can make no extraordinary motions.

The ancients ſubſiſted by their quantities alone; ſo well were they diſtinguiſhed, and ſuch a variety and harmony did they afford! Our quantities make ſuch poor muſic, that we are forced to call in the Gothic aid of rhyme to diſtinguiſh our verſe from proſe.

Yet have attempts been made to ſettle our verſe on the ancient and natural footing of quantities, in excluſion of rhyme, and with ſuch ſucceſs too (witneſs the immortal Paradiſe Loſt) as ſeems to leave the practice of rhyming inexcuſable. The French have likewiſe attempted the ſame in their tongue, particularly Jodelet, and after him Paſquier, Paſſerat, and Rapin; but they have all failed.

On Quantity in the Greek Language.

Rules for the determination of quantity in the Greek language, chiefly relate to the doubtful vowels α, ι, υ, ſince ε, ο, are, by *nature*, or not affected by *poſition*, ſhort; and η, ω, are, by *nature*, or not affected by *poſition*, long.

Poſition.

1. A ſyllable in which a ſhort or doubtful vowel precedes two conſonants or a double letter, is long in every ſituation; as δεινὴ δὲ κλαγγὴ, αὐτὰρ ἐμὲ Ζεὺς, κατὰ φρένα, πατρὸς, τέκνον. Hom.

1. Except that a *ſhort* vowel before two conſonants, whereof the *former* is a *mute* and the *latter* a *liquid*, is common; as

Ἀλλ' ἐπιλέκλιον ιων, ἄκρον δάκλυτον καταδακνω. Hom. Batrach. v. 45.

Μέτρα δετευχε θεοισι, το γαρ μέτρον εστιν αριστον. Phocyl. v. 92.

Note.—1. In paſtoral, elegiac, and epigrammatic verſe, the ſyllable is more frequently ſhort.

2. In dramatic poetry we may obſerve, 1ſt, that a ſhort vowel before a *ſhort* or *aſpirate* mute followed by a liquid, and before a *middle* mute followed by ϱ, remains ſhort. In tragedy the ſyllable, if not final, is often long. 2dly. A ſhort vowel before a *middle* mute followed by λ, μ, or ν, lengthens the ſyllable in all dramatic poetry.

3. When the ſyllable is lengthened before two conſonants, the vowel in pronunciation aſſumes one of them; as δἔκ-λαγγὴ, ἐμἔσ-Δεὺς, κατἄφ-ρένα, πὅτ-ρὸς, τἔκ-νον. Hom. When the ſyllable remains ſhort the vowel concludes it; as πὅ-τρος, τἔ-κνον.

2. A ſhort vowel is ſometimes made long before a ſingle conſonant, particularly before a liquid, as πολλᾶ λισσομένω, Hom.; παρᾶ ῥηγμῖνι, Hom.

Note.—It is generally long before ϱ, which with its aſpirate appears to have been doubled in pronunciation; as παρῥ̄ῥηγμῖνι. This licence is not confined to a liquid; as ἔπειδὴ, ὄφιν, &c. Hom.

3. A ſhort ſyllable is often made long when the next word begins with a digammated vowel, as ὅς οἱ, for Fοἱ. Hom. Μέλανος οἶνοιο for Fοινοιο. Hom. Οὐδὲ οὓς for Fους. Hom.

4. When three ſhort ſyllables come together, it is neceſſary, on account of the meaſure in heroic verſe, that one ſhould be made long; as ἀθέατος, Περιαμίδης.

Note.—This takes place even where the three ſyllables are in different words; as δἰὰ μὲν, Hom.; δρῦὸς ἔλυμα, Heſ.

5. A vowel before another does not ſuffer eliſion, as in Latin, at the end of a word, unleſs an apoſtrophe is ſubſtituted.

Note.—The eliſion of diphthongs takes place in verbs only: real inſtances of this are to be found only in the fragments of the new comedy.

6. A long vowel, or a diphthong, is generally ſhortened at the end, and ſometimes at the beginning, of a word, before a vowel; as οἵκῳ ἐν, Hom.; πὅιεῖ, ſoph.; ἢ ζῶϑ' εἰμὲς, Theocr.

Note.—A long vowel, or a diphthong, may be conſidered as conſiſting of two ſhort vowels. If the latter is ſuppoſed to ſuffer eliſion, the former will of courſe remain ſhort; as οἵκὸ ἐν.

Craſis, or Contraction.

7. A contracted ſyllable is always long; as ὄφιες, ὄφῖς; ἱερὸς, ἱρός.

8. Two ſucceſſive vowels, forming two ſyllables, even in different words, frequently coaleſce in poetry; thus θεὸς becomes a monoſyllable, κρυσέῳ a diſſyllable, and in ἢ λάθετ', ἢ οὐκ ἐνόησεν, Hom.; ἢ ουκ are pronounced as one ſyllable.

Compoſition and Derivation.

9. Compound and derivative words follow the quantity of their primitives; as ἄτῖμος from τῖμὴ, φῦγη from ἔφῦγον; νῖκαω from νῖκη.

Note.—Grammarians have ſometimes complained that "non ſemper huic regulæ fidendum." But Dr. S. Clarke affirms;—"Derivata pro eo, a quâ parte fluant penultimam ſimiliter vel perpetùo corripiunt, vel perpetùo producunt. Latini habent lĕgo, lēgi, quaſi contractum ex lĕlĕgi. Similiter sĕdeo, sēdi, indeque sēdes, sēdile. Conſimili quâdam ratione, apud Græcos fit. Verba nimirum innumera ſunt, quæ in præſentibus et imperfectis omnibus et in aoriſtis primis, activis et mediis, ſemper producantur: in futuris autem et aoriſtis ſecundis omnibus, ſemper corripiantur; ut φαίνω, ἔφαινον, ἐφηνα; φᾶνῶ, ἐφᾰνον, ἐφᾰνόμην, indeque φᾰ̀σις, φᾰ̀νερὸς, &c. Κρῖνω, ἐκρῖνον, ἐκρῖνα; κρῖνω, indeque κρῖσις, κρῖτὸς, κρῖτὴς, &c.

According to the ſame analogy, μαρτῦρομαι, ἐμαρτῡρόμην, and ἐμαρτῡράμην, always lengthen the antepenultimate; as in Eurip. Med. 22. 619. 1410; Ariſtoph. Acharn 926. Nub 495, &c. though μαρτῦρουμαι, and its derivative μαρτῦρεω, ſhorten that ſyllable; as in Ariſtoph. Eccl. 557, Sophocl. Antigon. 525. In the ſame manner, κῦρω fut κῦρω, gives riſe to κῦριος and κῦρεω, &c.

10. A, privative, is ſhort, as ἄτῑμος; but long in ᾱθανατος.

11. Ἀρι, ἐρι, βρι, δυς, ζα, in compoſition, are ſhort; as ζᾰθεος.

Of the Increments of Nouns and Adjectives.

12. The penultimate increaſe, A, of nouns and adjectives is ſhort; as σώμᾰτος.

1. Except nouns in αν-ᾱνος; as τιτὰν, τιτᾶνος.

2. And the Doric genitive; as Ατρείδᾱο, μουσᾶων for μουσαῶν.

3. Alſo, κέρας, κέρᾰτος; κρὰς, κρᾶτὸς; ψᾶρ, ψᾰρὸς; θώραξ, θώρᾰκος; ἴέραξ, ἱερᾰκος; κόρδαξ, κορδᾰκος; νέαξ, νέᾰκος; ῥᾶξ, ῥᾰγὸς; σύρφαξ, συρφᾰκος; Φαίαξ, Φαίᾰκος; φέναξ, φένᾰκος, are long.

13. The penultimate increaſe, I, of nouns and adjectives, is ſhort; as ἔρις, ἔρῐδος.

1. Except in words of two terminations; as δελφὶν, δελφῖς, δελφῖνος.

2. And monoſyllables; as θὶς, θῑνὸς; but Δὶς, Δῑὸς; θρὶξ, τρῐχὸς; στὶξ, στῖχὸς; τὶς, τῑνὸς, are ſhort.

3. Alſo nouns making ιδος or ιθος; as κνημὶς, κνημῖδος; ὄρνις, ὄρνῑθος.

4. Nouns in ιξ, ιγος, or ικος; as μάστιξ, μαστῑγος; Φοίνιξ, Φοίνῑκος.

5. Monoſyllables in ιψ, ιπος; as θρὶψ, θρῖπός.

14. The penultimate increaſe, Υ, of nouns and adjectives, is ſhort; as πῦρ, πῠρός.

1. Except in words of two terminations; as φόρκυν and φόρκυς, with κήρυξ, κήρῡκος.

2. Γρὺψ, γρυπὸς; γὺψ, γυπὸς; βεβρυξ, βεβρυκος; are common.

Increment of Verbs.

15. The quantity of all tenſes generally remains the ſame, as in the tenſe from which they are formed; as from κρῑνω are formed ἔκρῑνον, κρῑνομαι, ἐκρῑνόμην; from κρῐνῶ are formed κέκρῐκα, κέκρῐμαι, ἐκρῐθην.

16. The *perfect* follows the quantity of the firſt future; as φύω, φῡσω, πέφῡκα.

17. Verbs in πτω, except πίπτω, ῥίπτω, and thoſe in υπτω, ſhorten the penultima of the perfect.

18. In the Attic reduplication the penultima is ſhort; as ἐρίζω, ἤρικα, ἐρήρῐκα.

19. The *perfect middle* follows the quantity of the ſecond aoriſt: as ἔτῠπον, τέτῠπα; except βεβρῐθα, ἔρρῑγα, κέκρᾱγα, κέκρῑγα, μέμῡκα, πέπρᾱγα, πεφρῑκα, τέτρῑγα.

20. The doubtful vowels before σι are long; as τετύφᾶσι, δεικνῦσι.

21. In the *firſt aoriſt* participle, ασα is long.

22. In the *imperative* of verbs in μι, υ is ſhort in polyſyllables; as κέκλῠθι, but long in diſſyllables, as κλῦθι.

23. In the *firſt future*, α, ι, and υ followed by σω, are ſhort; as θαυμάζω, θαυμᾰσω; νομίζω, νομῐσω; κλύζω, κλῠσω.

24. But ασω is long before from verbs in αω preceded by a vowel, or in ραω, as θεάω, θεᾶσω; δράω, δρᾶσω. Ισω and υσω are long from verbs in ω pure; as τίω, τῖσω; ἰσχύω, ἰσχῡσω.

The Quantity of doubtful Vowels in the Firſt or Middle Syllables.

25. A, ι, υ, before vowels, are generally ſhort; as Ἡνίοχοι βεβᾰῶλες, ἐφίεσαν ὠκέας ἵππους. Heſiod.

1. Except A, the penultimate of nouns in ων increaſing by ο, and feminine proper names in ᾱϊς, are long; as Μαχᾱων, Θρᾱϊς. Alſo in ἄϊξ, ᾱνος, κρᾱας, λᾱος, χᾱος, πᾶος: likewiſe the antepenultimate of ᾱτος, ἀκρᾱνλος, ᾱισσω, Ἀκᾱϊκος, Ἀϊονες, Ἀᾱερτες, βιᾱομαι, βᾱγίαος, &c.

2. I, the penultimate of nouns in ιων, ονος, is long, (except comparatives); as βραχῖων, Ὠρῖων. Alſo in κρῖος, κῑαζω, ἴαομαι, ἴῑζω, ἴωχμος, παλίῑξις, πῖερις. But the penultimate of nouns in ια are accounted common; as σφια, καλια. Likewiſe ι is ſaid to be common in theſe: ἰκίνω, ἴεμαι, ἱερὸς, ἕρμαι, ἵερον, λιαν, μνιον, ὄῖν, ωιαινω, ωνιον.

3. Υ is long in ἐνῡω, ῥῡας, ἰγνῡη, μῡελος, μῡωψ, πλατῡάζω, ᾱῦτος, κῡανεος.

26. A, ι, υ, before final μα in neuter nouns, are long; as θεᾶμα, μηνῖμα, χῦμα.

Except κλιμα, κριμα, ἔρυμα, πλυμα, which ſometimes ſhorten the penultimate.

27. A before β, γ, δ, θ, κ, λ, μ, ν, π, ρ, σ, τ, φ, χ, is moſtly ſhort; as ἀλλὰ κᾰκως ἄφιεν, κρᾰτερὸν δ' ἐπι μυθον ἐτελλε. Hom. Il. α. 25.

1. Except polyſyllables in ᾱτος, if ρ or a vowel goes before; as ἀνιᾱτος, Ἀρᾱτος, ἄπλᾱτος: except ἐρᾰτης. Likewiſe nouns in ᾱτης, whether gentiles proper, or the names of ſtones, are uſually long; as Ἀσιᾱτης, ἀχᾱτης, Ἐυφρᾱτης, Γαγᾱτης, &c. Alſo numerals in ᾱκοσιος.

2. A is alſo long in Ἄβαλε, Ἄγγη, Ἀδολεσχος, Ἄκων, Ἀκέσιος, Ἄκις, Ἀλοσύνη, Ἀμαρακος, Ἄπις, Ἄπυω, Ἄτερος, Ἄτε, καβῆξ, δᾱγυς, δᾶλος, Δᾶμοιτας, Δᾶμων, δᾶνος, διᾱκονος, διᾱμελεῖσι, δρᾰπετης, θᾶτερος, Ἰᾰπυξ, Ἰᾰσων, Ἰθᾱγενὴς, κᾰναβινος, κᾰρι, κᾰρος, κλᾰδος, κοᾰλεμος, κοβᾰλος, κρᾱνιον, κρᾱνοω, κρᾰτης, κνᾰκος, λᾰδων, λᾰρος, νᾶνος, νᾰπυ, πᾰπεῖα, Ὀμφᾰλη, πᾰνίζω, πετρᾰκης, ῥᾰδιξ, σᾰπερδης, σπᾰδιξ, Στυμφᾰλος, σφρᾱγις, τᾰλις, τιᾰρα, τρᾱνης, φᾰλαινα, φᾶνος, φλυᾰρος, ψᾰρος, ὠρᾰκιαω, ἀᾰῖης, Ἀνᾰπος, Σαρδανᾰπᾰλος.

3. A is common in ἀμαω, Ἄρης, καραβος, ἑανὸς, καλος, κραχυς. More frequently ſhort in ἄλαὸς, ἀλίσκω, ἄριστον, prandium, ἄτάλλω, βαλσᾰμον, δᾰπεδον, Ζᾰκυνθος, ναυᾰγεω, ναυᾰγιον, τᾰῖος, τᾰπης, ἀπάλαμνος: and more frequently long in ἀρὰ, θᾶκος, φᾶρος.

4. In the nominative, α in Ἀπολλων is ſhort; in other caſes, common. Ἀνης in the nominative is common, in other caſes long.

28. I before β, γ, δ, θ, κ, λ, μ, ν, π, σ, τ, φ, χ, is ſhort. But ι before or after ρ is moſtly long; as Βρῖθυ μέγα, σῖδαρὸν, τῷ δάμνησι στῖχας ἀνδρων. Hom. Il. ε. 746.

1. Except nouns in ῑνη, ῑκη, ῑτη, ῑτης, ῑτος, which generally have their penultimate long; as δῖνη, νῖκη, Ἀφροδῖτη, Θερσῖτης, ἀδηρῖτος.

2. Alſo ι is long in theſe: Ἀγχῖσης, Ἀιγῖνα, ἀγῖνέω, ἀκῑνάκης, ἀκόνῖτον, ἀμνῖσος, ἀμφῖσος, Δῖδω, δῖφαω, ἐνιπὴ, Ἐνῖπευς, ἴσις, Ἴδη, Ἶδος, ἴθύς, Ἴκαρος, Ἴλη, Ἴλιγξ, Ἴλιον, Ἴλυς, Ἴλισσος, ἵμερος, Ἰνίον, Ἶνω, Ἴναχος, Ἴφῐλος, Ἰφθῖμος, ἰχὼρ, Καμῖνος, κῖκαμον, κῖκυς, κῖχορον, κλῖδανος, κλῖμαξ, κλῖτες, κνῖδη, κνῖπος, κονῖσαλος, κονῖλη, κοκλαμῖνος, κυμῖνον, λῖμος, μαρῖδα, Μιορῖγανον, παρθενοπῖπης, πεδῖλον, πῖδαξ, πῖδυω, πῖλεω, Πῖσα, σατῖνον, σελῖνον, σῖγη, Σῖδων, Σῖληνος, σῖσυμβριον, σῖσυφος, σῖμος, σῖφων, σκῖπων, σμῖλη, σμῖλαξ, στῖβη, στῖφος, τῖλυρος, τῖθυρις, τῖθωνος, τῖμαω, τῖτανος, τῖφυς, φῖμος, φῖνευς, φῖτυω, χαλῖνος, χελῖδων, χῖλιοι, χῖλος, χλῖδη, ψῖλος.

3. But ι in theſe is common: Ἀισχῖνης, ἴθύνω, ἴκελος, ἱκέτης, ἱκάνω, ἱμὰς, κινεω, κοφινος, κοτινος, λῖνος, μυρικη, πινακ-

ϖαιταξ, σιδη, φιλος; and ſometimes in λιſας, θαμινος, λιτταρης, ὀπωριν̀ος, ὀρθριν̀ος.

4. Though ι before and after ρ is generally long, yet in the compounds and derivatives of τρις it is ſhort, τρῐνακρις excepted. It is alſo ſhort in ἔριφος, θρῐδαξ, κρινον, κρισις, κριτης, κριτος, τρῐβος, θρῐξ, τρῐχος, with their compounds. And in materials in ινος; as κεδρινος, μυρρινος, &c.

29. Υ before β, δ, θ, κ, λ, ν, ϖ, ρ, τ, ϛ, is ſhort; but before γ, μ, σ, χ, moſtly long: as Ὑμεῖς μάρτῡρόι ἐστε, φῡλάσσετε δ' ὅρκια πιστά. Hom. Il. γ. 280.

1. Except verbals in υπης, υτης, υτος, υτως, are long; as λῡτης, μητῡιης, κωκῡτος, ῥῡτως: except a few in υτος ſometimes ſhort. Diſſyllables in υλη, υνη, υνος, are long; except μῠλη, γῠνη, ϖλῠνος. Adverbs in υδον are long; as βοτρῡδον, ϖρῡδον, except ῥῠδον.

2. Theſe alſo have υ long: Ἀβῡδος, ἄγκῡρα, ἀλιμῡρης, ἀτρακτῡλις, ἀῡτη, γεφῡρα, Γρῡνειος, γῡρος, ζῡθος, Θῡλακος, ἰσχῡρος, καρῡκη, κελῡφος, κινδῡνος, κογχῡλιον, κορκῡρα, κοβῡλις, κολῡρα, κῡριος, λαφῡρον, λεπῡρον, Λῡδος, λῡπη, μῡκαομαι, μῡραινα, μῡρος, μῡριοι, μῡλιαω, ὄλῡρα, ὀιζῡρος, ὀνογῡρις, ὀρκῡνος, ϖιτῡρον, ϖλημμῡρις, ϖῡραμις, ϖῡρος, ῥῡτη, σκῡτος, σῡριγξ, σφῡρα, τῡδευς, τῡρος, τρῡπαω, ὗος, χῡλος, χελῡνη.

3. But υ in theſe is common: βοθυνος, βυθος, κεκρυφαλος, ϖαπυρος, ῥυτις, σιῦνη, συλος, σφονδυλειος, τορυνη, τρυφαω, τυρσεις, ὕδως; and ſometimes in γῦλιος, κορῦνη, λαγῦνος, ξῦλον, φῦταω, φῦταλια, φῦταλμιος.

4. Though υ, before γ, μ, σ, χ, is generally long; yet it is ſhort in the terminations υμος and υμων; as in ἡδῠμος, διασῠμων; and alſo in δῠσις, ζῦνος, Ἠλῠσιος, θῠμαλις, θῠμον, κῠμινον, λῠγος, λῠσις, μαρμαρῠγη, μῠχος, ϖῠματος, τηῠσιος, τρῠγη, χῠσις: and υ is often ſhort in θῠσανος, ὑμήν, φῠσις, and θῠγατηρ.

Final Syllables.

30. Α, ι, υ, final are ſhort: as μασᾰ, τετυφᾰ, ινᾰ, ἱπποτᾰ; μελῐ, τιθημῐ, τυπτουσῐ, ιφῐ; σῠ, δακεῖν, γλυκῠ.

1. Except nouns in δα, θα, ρα, εα, ια, and polyſyllables in αια; as κεραϊᾱ; with ἐυλάκᾱ. Διᾶ, ἵα, μία, πότνια, however, are ſhort. So are ἄγκυρᾶ, ἄκανθᾰ, γέφυρᾶ, Κερκυρᾶ, ὄλυρᾰ, σκολόπενδρᾰ, σφῦρᾶ, τάναγρᾰ; compounds of μετρᾶ, as γεωμέτρᾰ; ρα preceded by a diphthong, as πεῖρᾰ; except ἄ῎υρᾱ, λαύρᾱ, πλευρᾱ, σαύρᾱ.

2. Duals of the firſt declenſion; as μούσᾱ.

3. Adjectives in α pure, and ρα from maſculines in ος; as δικαία, ἡμετέρα.

4. Nouns in εια from ευω; as δουλεία from δουλεύω.

5. Oxytons of the firſt declenſion; as χαρά.

6. Accuſatives in α from nouns in ευς, in the Attic dialect.

7. Vocatives from proper names in ας, as Αἰνεία, Πάλλα.

8. The Doric α, as ἀ παγὰ for ἡ πηγὴ, βοέα for βοέου.

9. Adverbs in τι as uſually long; in ιτι, ſhort; as ἀνιδρωτῑ, Ἑλληνιστῑ.

10. Τῦ Doric for συ is long; and adverbs in υ, as μεταξῠ: but ἀντικρυ is common.

11. The names of letters; as ξῖ, μῦ; to which add κρῖ, γρῦ.

12. The paragoge in pronouns and adverbs; as ὑμοῖσι, νωΐ; except the dative plural; as σοῖσι.

13. The Attic ι for α, ε, or ο; as ταυτὶ for ταῦτα, ὀδὶ for ὅδε, τουτὶ for τοῦτο.

14. The imperfect and ſecond aoriſt of verbs in υμι, as ἔφυ.

31. Αν, ιν, υν, final are ſhort; as ἄν, ὦ Ἀιᾶν; ϖαλᾶν, ἐσῖν; σῦν.

1. Except that αν is long in circumflexed words, and in oxytons maſculine; as ϖᾶν, Τιτᾶν.

2. Theſe adverbs, ἄγαν, ἔυαν, λίαν, πέραν: and the accuſative of the firſt declenſion, whoſe nominative is long; as Αἰνείαν, Φιλίαν.

3. Ιν is long in words of two terminations; as δελφῖν and δελφίς.

4. Ἡμῖν and ὑμῖν when circumflexed: τὶν Doric for σοί. Πρῖν is ſometimes long in Homer.

5. Nouns in ιν, ινος, as ῥηγμῖν, lengthen ιν final.

6. Υν is long in words of two terminations; as φόρκυν and φόρκυς.

7. Accuſatives from υς long; as ὀφρῦν, with νῦν; though νυν the enclitic is ſhort; as τοί νυν.

8. The imperfect and ſecond aoriſt of verbs in υμι; as ἐδείκνυν, ἔφυν.

32. Ας final is ſhort, υς final long; as Νεκτᾰρ, αυτᾰρ; ϕιθῦρ, ϖῦρ.

Except that γας and αυτας are ſometimes long in Homer.

33. Ας, ις, υς, final are ſhort; as λαμπᾰς, μεγᾰς, ϖολῐς, δῖς, βαθῠς.

1. Except that ας is long in the nominatives of participles; as τύψᾱς: in all caſes of the firſt declenſion; as Αἰνειας, ταμίας, φιλίας, μούσας, except the Doric accuſative; as νῦμφᾰς; in plural accuſatives in ας from the long α in the accuſative ſingular of nouns; in ευς; and in nouns in ας-αντος; as Αἴας; with ταλας.

2. Alſo ις is long in words of two terminations; as δελφῖς and δελφῖν; in nouns in ις increaſing long; as κνημῖς, ὄρνις, κῖς, &c.

3. And υς is long in words of two terminations; as φόρκυν and φόρκυς; in monoſyllables, as μῦς, with κώμυ; oxytons making the genitive in ος pure; as πληθύς: ἰχθῦς is common. And in verbs in υμι; as ἐδείκνυς, &c.

On Quantity in the Latin Language.

As the proſody of the Latin language is conſidered to form an eſſential part of a claſſical education, we ſhall, therefore, devote the more peculiar attention to this part of the ſubject. In the courſe of which ſome rules will be given on the quantity of ſyllables uſually ſaid to be long or ſhort by *authority*; which, we believe, have never yet been collected by any writer, ancient or modern. Perhaps, therefore, in particular for this, and for ſuch other reaſons as the candour of impartial diſcernment ſhall diſcover, we ſhall not incur the cenſure of having been too ſanguine, ſhould we have indulged the hope of being enabled to offer the moſt complete ſyſtem on Latin proſody that has hitherto been preſented to the public.

GENERAL RULES.

A Vowel before a Vowel.

1. One vowel preceding another, in the ſame word, is ſhort; as pŭer, egregĭæ.

O Melibœe, Deus nobis hæc otĭa fecit. Virg.

2. The ſame happens, though an *h* intervene; as nĭhil, ăhenus, dĕhiſco.

De *nĭhilo nĭhil*, in *nĭhilum* nil poſſe reverti. Perſ.

Note.—H is generally conſidered only as a note of aſpiration or breathing: though ſome ancient grammarians conſidered H as a conſonant, and ranked it with the ſemi-vowels. See Terentianus Maurus, de ſyll. 511.

1. Except

1. Except the *i* of fio is long, when it is not followed by *e* and *r*; as fīam, fīebam, fīat.

Omnia jam *fient*, *fieri* quæ poſſe negabam. Ovid.

2. The *e* of the genitive and dative of the fifth declenſion, when it comes between double *i*, is long; as faciēi; but it is ſhort in ſpĕi, and long and ſhort in rei and fidei.

Ventum erat ad Veſtæ quarta jam parte *diēi*. Hor.
Extingue flammas; neve te diræ *ſpĕi*. Seneca.
Ipſius *rēi* rationem reddere poſſis. Lucret.*
Curtæ neſcio quid ſemper abeſt *rĕi*. Hor.
Ille vir haud magna cum re, ſed plenu' *fidēi*. Enn.
Unum pectus habent, *fidĕique* immobile vinclum. Manil.

* Lucretius furniſhes five examples of rēi; Plautus two. Theſe caſes appear to have been anciently written both e-i and ei-i, which accounts for the variation in quantity.

3. Genitives in *ius* have the *i* long in proſe, though in poetry it is common: as unĭus or unīus, illĭus or illīus: except the *i* of alīus, which (formed by craſis from aliius) is always long, and the *i* of alterĭus, moſtly ſhort.

Navibus, infandum! amiſſīs, unīus ob iram. Virg.
Parſque meæ pænæ totĭus inſtar erīt. Ovid.
Tu potes *alterĭus* ſtudiis hærere Minervæ. Claud.
Mox dum *alterĭus** obligurrias bona. Enn.

* Alterĭus is three times long in Terentianus; de ſyllab. 1072, de metr. 32; and 464.

4. The penultimate is long in aurāi, aulāi, and other antique genitives of the firſt declenſion, and in ſuch vocatives as Pompēi, Caī; becauſe theſe were originally written with a double *i*; thus, Pompeii, Caii.

Æthereum ſenſum, atque aurāi ſimplicis ignem. Virg.
Accipe Pompēī, deductum carmen ab illo. Ovid.

5. In *ohe*, in *io* (whether interjection or proper name), and in Diana, the firſt ſyllable is common.

Ohe! jam fatis eſt, *ŏhe*, libelle! Mart.
Rurſus, *ĭo*, magnos clamat tibi Roma triumphos. Mart.
Quâque ferebatur ductor Sidonius, *ĭo*.—Conclamant. Sil. Ital.
Ĭo, verſa caput, primos mugiverat annos. Propert.
Quæ tibi cauſa fugæ? quid *Ĭo* freta longa pererras? Ovid.
Experta eſt numen moriens utriuſque *Dĭanæ*. Mart.
Juno, Veſta, Ceres, *Dĭana*, Minerva, Venus, Mars. Enn.

6. Āër, Dīus, ēheu, have the firſt ſyllable long.

Proximus eſt *āër* illi levitate, locoque. Ovid.
Italides: quas ipſa decus ſibi *dĭa* Camilla. Virg.
Ēheu, quid volui miſero mihi? floribus Auſtrum, &c. Virg.

7. In many Greek words a vowel is long, though immediately followed by another: as Achāia, Achelōus, Lāërtes, Laodice, and other words compounded with λαος; Latōus, Enyo, Panchāĭa, Thrēïcius, Tāygetus, Trōas, Trōius, Galatīa, &c.

Erubuit Mavors, averſaque riſit *Enyo*. Claud.

8. Thoſe words which are written in Greek with the diphthong ει, and in Latin with a ſingle *e* or *i*, have that *e* or *i* long; as Ænēas, Muſēum, Darīus, Thalīa, Clīo, Elegīa, Orēades, &c.

Et *panacēa* potens, et Theſſala *centaurēa*. Lucan.

9. Moſt adjectives in *eus*, formed from Greek proper names, have the *e* long; and it continues ſo, when reſolved into *ei*.

Oppida ſemoto Pelopēia marte vigerent. Claud.

Note.—1. Thoſe which contain a choree (⏑ ⏑) in the two ſyllables immediately preceding the penultimate, were more frequently formed, for the convenience of furniſhing a dactyl, with the penultimate ſhort; as Hēctŏrēus, Nēſtŏrēus, Agēnŏrēus, Antēnŏrēus, &c.

2. In imitation of the Greeks, we ſee in Statius, the adjective Tiberēius.

10. Names of towns, temples, or monuments in *ea*, *ia*, or *eum*, formed in the Greek manner, from the proper names of perſons, moſt commonly have the penultimate long; as Laodicēa, Apamēa, Cæſarēa, Alexandrīa, Antiochīa, Mauſolēum.

Terrarum mediis Apameæ mænia clara. Priſ.

11. Academia, Chorea, Platea, Malea, have the penultimate common.

In Latium ſpretis *Academĭa* migrat Athenis. Claud.
Atque *Academĭa* celebratum nomine villam. Laur. Tul.
Puræ ſunt *platĕæ*, nihil ut meditantibus obſtet. Hor.
Aſpice! per bifidas plebs Romula funditur *platēas*. Prudent.

12. Greek genitives and accuſatives from nominatives in *eus* have the penultimate ſhort, according to the common dialect, long according to the Ionic.

Tydĕos illa dies: illum fugiuntque tremuntque. Stat.
Ilionēa petit dextrâ, levâque Sereſtum. Virg.

Of Diphthongs.

3. A diphthong is long; as aūrum, fœnus, aūdio, ætas, pœnitet, Æneas, laūs, Graīus, Caīus, Pompēius, Proculeīus, &c.

Theſaūros, ignotum argenti pondus et *aūri*. Virg.

1. Except præ, immediately before a vowel in a compound word, is generally ſhort.

Nec tota tamen ille prior *præĕunte* carina. Virg.

Note.—Præ, originally being prai or prae, by the eliſion of the latter vowel before a following one, the words became prā'-uſtis, pra'-eunt, &c. Statius, however, (Theb. 6. 519.) and Sidonius Apollinarius (carm. 23.) preſerve the Æ long.

2. A diphthong is once ſhort in a line of Virgil, out of compoſition; thus,

Inſulă Ionio in magno, quas dira Celæno. Virg.

3. The *eu* of Greek proper names in *eus* (genitive *eos*) becomes a diphthong.

Parvo dilexit ſpatio Minoïda *Theſēus*. Propert.
Conditus Inarimes æternâ mole *Typhōēus*. Lucan.

4. *Yi* is alſo a diphthong in Greek names, ſuch as Orithyīa, Ilithyīa, Harpyia, Agyieus, &c.

Orīthyĭăn amans fulvis amplectitur alis. Ovid.
Et patrio inſontes *Harpyĭas* pellere regno. Virg.

A Vowel before two Conſonants.

4. A vowel is long by *poſition*, when it immediately precedes two conſonants, one or both of which being in the ſame word with it; as ārma, Errabāt sīlvâ īn magna.

Pāſcere *opŏrtet* oves, *dedŭctum* dicere cārmen. Virg.

5. Alſo, a vowel is long by *poſition*, when it immediately precedes a double conſonant (X or Z), or the letter J; as āxis, patrīzo, cūjus.

At nobis, *Pāx* alma, veni, ſpicamque teneto. Tibul.
It Sthenelus, qualem Mavortia vidit *Amāzon*. V. Flac.
Cauſa parricinio non bona *pējor* erit. Ovid.

Note.—In reality the J or I makes a diphthong with the preceding vowel; *viz.* major, pejor, are from maī-or, pēi-or:—and ſo in Maī-a, Maī-us, Bāi-æ, Troi-æ, Ai-ax, āi-unt, Caī-eta, Caī-us, and Graī-us, diſſyllables. Hujus and cujus were, like illius, originally triſyllables, of which the firſt two, by ſynæreſis, coaleſced into one.

Except the compounds of jugum, which have the *i* ſhort before *j*; as bĭjugus, quadrĭjugus.

Martis equi *bĭjuges*, et magni currus Achillis. Virg.

Note.—The word which in England we pronounce jugum, is in reality ĭ-ŭgum or yu-gum, as the Germans at this day pronounce it. And in the meeting of two vowels, the former is tacitly elided, leaving the words bĭŭgus, quadrĭŭgus.

6. If

6. If the former of two words end in a ſhort vowel, and the next begin with two conſonants or a double letter, the vowel often remains ſhort.

Tu poteras virides pennis *hebetarĕ ſmaragdos.* Ovid.
Jam medio apparet fluctu *nemorosă Zacynthus.* Virg.

Note.—Virgil, however, who has adopted ſuch licences as fultūs Hyacintho, and quĭ amant, has lengthened the ſhort ſyllable but in one line; 'Ferte citi ferrum, date *telā*, ſcandite muros.' Many of theſe vowels, which at the end of a word are found long before two conſonants beginning a following word, are lengthened by the cæſura; as 'Occultā ſpolia, et plures de pace triumphos.' Juven.

Of a Vowel before a Mute and a Liquid.

7. A vowel naturally ſhort, followed by a mute and a liquid, is common, though always pronounced ſhort in proſe: as ăgris, pharĕtra.

Natum ante ora *pătris, pātremque* obtruncat ad aras. Virg.
Nox *tenĕbras* profert, Phœbus fugat inde *tenēbras.* Ovid.

Note.—1. To produce this kind of poſition, three things are requiſite. 1. That the mute precede the liquid. 2. That the mute and the liquid be both in the following ſyllable; or otherwiſe this rule cannot take place; as in ab-luo, where the two conſonants cannot be founded in the latter ſyllable. 3. That the vowel preceding the mute and liquid be ſhort by nature. Hence the *a* in ācris and mātris is always long, becauſe the *a* in ăcer and măter is always long.

2. In Latin words, *l* and *r* are the only liquids preceded by a vowel and a mute; in Greek words, *l*, *r*, and alſo *m*, *n*, have the ſame effect as Cyclopes, Te-cmeſſa, Da-phne.

3. H is not, neither in this, nor the foregoing rule, to be deemed a conſonant. Joined with any of the conſonants, it has not the power of lengthening a preceding ſhort vowel; not even with two conſonants (*i. e.* a mute and a liquid,) in the next ſyllable; as

Illic Pellæi proles *veſană* Philippi. Lucan.
Cernitur egregius lapis hic, cui nomen *ăchates.* Priſ.
Hic *Păphias* myrtos, hic purpureas *amĕthyſtos.* Ovid.
Arbŏr habet frondes, pabula *ſempĕr* humus. Ovid.

Of Craſis, or Contraction.

8. Every ſyllable formed by the contraction of two ſyllables into one, is long; as cōgo for cŏ-ăgo, the genitive alīus for alĭĭus.

Tityre *cōge* pecus, tu poſt carecta latebas. Virg.
Obſcuræ ſortis patres *ambāgibus* errant. Ovid.

Note.—This is a rule of very extenſive application. We are told that the ancients expreſſed a long ſyllable by a reduplication of the vowel; thus vēēnit for the perfect vēnit. And it will be found that in many words the long ſyllable ariſes from the contraction of two vowels. Thus we write tibīcen for tibiĭcen; ambāges for ambĕăges; bīgæ, trīgæ, for bĭjŭgæ, trĭjŭgæ; jūnior for jŭvĕnior; bōbus for bŏvĭbus; īt for ĭĭt; mī for mihi; and mālo for măgis vŏlo.

Of Derivatives.

9. Derivatives uſually follow the quantity of their primitives; as ănĭmus, ănĭma, ănĭmal, ănĭmalis, ănĭmoſus, ănĭmare: from lĕgo; lĕgebam, lĕgerem, lĕgam, &c.: but from lēgi; lēgeram, lēgerim, lēgero, &c. tōtalis from tōtus, and tŏtus from tŏt.

Nec *tŏta* pars, homo terraï quota *tōtius* unus. Lucret.

1. Except deſiderative verbs in *urio*, which have the *u* ſhort, although formed from the participle in *urus*, that has *u* long; as nuptŭrio from nuptūrus.

2. Frequentative verbs, formed from the ſecond ſupine of the firſt conjugation, by changing *ātu* into *ĭto*, have the *i* ſhort; as clamĭto, volĭto.

Partŭriunt montes, naſcetur ridiculus mus. Hor.
Infelix ſua tecta ſuper *volĭtaverat* alis. Virg.

3. There are other long derivatives formed from ſhort primitives, and ſhort derivatives formed from long primitives.

Note.—1. Of the former, the following is nearly an accurate liſt: cōmo from cōma; fōmes and fōmentum from fŏveo; hūmanus from hŏmo; jūcundus and jūmentum from jŭvo; mōbilis from mŏveo; tēgula from tĕgo; rēgula from rĕgo; trāgula from trăho; vōmer from vŏmo; vox-vōcis from vŏco; dēni from dĕcem; ſuſpīcio from ſuſpĭcor; sēcius from sĕcus; pēnuria from pĕnus; hūmor from hūmus; jūgerum from jŭgum; mācero from măcer; plāco from plăceo.

2. Of the latter, the following are the principal; ārēna, ăriſta from āreo; dĭcax from dīco; dĭſſertus from dīſſero; dux-dūcis from dūco; fīdes from fīdo; frāgor and frāgilis from frāngo; lūcerna from lūceo; dītio from dis-dĭtis; mīco from mīca; nāto from nātu; nōto from nōtu; pronŭbus and pronŭba from nūbo; quăſillus from quālus; rōſa from ros-rōris; ſtābulis from ſtābam; sōpor from sōpio; ſtīpula and ſtĭpulor from ſtīpes; săgax from săgio; văbum from vădo; ăruſpex from āra; ambītus, ambĭtio, ambĭtioſus, from ambītu.

3. Some of theſe anomalies have, perhaps, ariſen from the influence of craſis and ſyncope. Thus mōbilis from mŏveo, may have been mŏvĭbilis; mōmentum, mŏvĭmentum; mōtum, mŏvĭtum; fōtum, fŏvĭtum from fŏveo; jūtum, jŭvātum; and jūmentum, jŭvamentum from jŭvo. Sometimes the derivative becomes ſhort by dropping one of the conſonants which rendered the word whence it is ſuppoſed to come, long by poſition; as dĭſertus from dīſſero; măмilla from māмma; vŏlutum from vōlvo; sŏlutum from sōlvo; tĭgillum from tīgnum; pŏtui from poſſum. When the primitive is neceſſarily ſhort, by one vowel's preceding another, as in hyems, the derivative ſometimes becomes long, by the inſertion of a conſonant; as in hīberna, hīberno, hībernacula. Liquidus is ſuppoſed to have its firſt common (as it may be derived from the deponent liquor, or from the neuter lĭqueo,) on the following authority.

Craſſaque conveniunt *lĭquidis*, et *lĭquida* craſſis. Lucret.

Compound Words.

10. Compound words have the ſame quantity as the ſimple words from which they are formed; as perlĕgo from lĕgo; perlēgi from lēgi; impŏbus from pŏbus; perjūrus from per and jus-jūris.

11. The quantity of the primitive word is generally preſerved in the compound, notwithſtanding the alteration of a vowel in the latter; thus accĭdo from cădo, accīdo from cædo, acquīro from quæro, inīquus, oblīquus, antīquus from æquus.

Multa renaſcentur, quæ jam *cecĭdere, cădentque.* Hor.

Except 1. The following are ſhort compounds from long primitives; nihĭlum from hīlum; dejĕro and pejĕro from jūro; cauſidĭcus, fatidĭcus, maledĭcus, veridĭcus, from dīco; ſemisŏpitus from sōpitus; cognĭtum and agnĭtum from nōtum; hŏdie from hōc die.

2. Imbēcillus from băcillus has the ſecond ſyllable long: connŭbium from nūbo has the *u* common.

Porto meis, nullo dextram ſubeunte *băcillo.* Juven.
Imbēcillus, iners, ſi quid vis? adde propino— Hor.
Connŭbio jungam ſtabili, propriamque dicabo. Virg.
Hectoris Andromache! Pyrrhin' *connŭbia* ſervas. Virg.

12. Prepoſitions, in compoſition, have generally the ſame quantity as out of it; thus āmitto and dēduco have the firſt long, becauſe *ā* and *dē*, as *a* final and monoſyllabic *e* are long. Ăboleo and pĕrimo have the firſt ſhort, becauſe *ăb* and *pĕr*, as *b* and *r* final, are ſhort.

Expediam, primâ repetens *ăb* origine, famam. Virg.
Nec poterit ferrum, nec edax *ăbolere* vetuſtas. Ovid.

Note.—1. A prepoſition ending in a vowel, although out of compoſition it may be long, becomes ſhort by the firſt general rule, if followed by another vowel; as dĕoſculor, prŏhibeo. And if a ſhort prepoſition end in a conſonant, and be followed by another conſonant, it becomes long, by the ſecond general rule; as ādmitto, pĕrcello.

2. Sometimes the prepoſition, inſtead of becoming long by poſition, loſes its final conſonant, and remains ſhort; as ŏmitto, ŏperio.

Except 1. *Di* is ſhort in dĭrimo and dĭſertus: as

Hanc Deus et melior litem natura *dĭremit.* Ovid.
Cauſas, inquis, agam Cicerone *dĭſertius* ipſo. Mart.

2. *Rĕ*

2. *Rĕ* is ſhort; as rĕmitto, rĕpello, rĕfero. But *rē* (which here is ſuppoſed to be the ablative of *res*) is long in the imperſonal verb rēfert, it *concerns*.

Propellit Boreas; æſtus et unda *rĕfert*. Ovid.
Præterea nec jam mutari pabula *rēfert*. Virg.

13. *Pro*, when uſed as a Greek prepoſition, for ante, is ſhort; as prŏpheta, prŏlogus, prŏpontis: but *pro*, a Latin prepoſition, is generally long; as prōdo, prōveho, prōmitto.

Miſit in has ſiquos longa *Prŏpontis* aquas. Ovid.
Quæ tam feſta dies, ut ceſſet *prōdere* furem. Juv.

Except prŏfundus, prŏfugio, prŏfugus, prŏnepos, prŏneptis, prŏfeſtus, prŏfari, prŏfiteor, prŏfanus, prŏfectò, prŏcella, prŏtervus, and prŏpago, ſignifying lineage; but prōpago, ſignifying a vine-ſtock, is long.

Note.—Notwithſtanding ſuch diſtinctions, propago, whoſe ſignification is always radically the ſame, may be conſidered among the doubtfuls; to which claſs procumbo is likewiſe added by ſome. But when the remarkable irregularity of *pro* is conſidered, without the ſlighteſt apparent reaſon to determine *why* it ſhould be *ſhort* in one word, *long* in another, and *common* in a third, it ſeems moſt probable, that it was in reality every where common, and that we ſhould, doubtleſs, find it ſo, had we enough of the ancient poetry extant. The word being evidently borrowed from the Greek, in which it was written with an *O-micron*, we might for that reaſon expect to find it invariably ſhort; but the Latin final *o* being in other caſes more generally long, we might, on this account, as naturally expect to find *pro* uſually made long, by thoſe at leaſt who were unacquainted with Greek. The poets ſeem to have availed themſelves of this convenient ambiguity by making *pro* long or ſhort, as proved moſt ſuitable to their purpoſe.

Of the final Vowels of firſt Words in Compoſition.

14. If the firſt member of a Latin compound word end in A, that vowel is long; as trādo, trāno, quāre, quāpropter, quātenus: but in Greek compounds the A is ſometimes ſhort; as ădipſos, ſometimes long, as Neāpolis.

Quāre agite ô proprios generatim diſcite cultus. Virg.
Extinguitque ſitim pomo, cui nomen *ădipſos*. Priſ.
Ambarum medio procera *Neāpolis* arcem. Avienus.

Except eădem, unleſs it be the ablative.

Non *eădem* arboribus pendet vindemia noſtris. Virg.

15. If the firſt member of a compound word terminate in *e*, that vowel is ſhort; as in the firſt ſyllables of nĕfas, nĕfandus, nĕque, trĕdecim, trĕcenti; in the ſecond of valĕdico, madĕfacio, ſtupĕfacio, tremĕfacio; and in the third of hujuſcĕmodi, ejuſcĕmodi.

Credebant hoc grande *nĕfas*, et morte piandum. Juven.

Except 1. The E is long in words compounded of *ſe* for *ſex* or for *ſemi*; as sēdecim, sēmeſtris, sēmodius; (but in ſelibra it is ſhort.)

Sēmihominis Caci facies, quam dira tegebat. Virg.
Argenti libram mittebas: *facta sĕlibra* eſt. Mart.

2. It is long alſo in nēquis, nēquicquam, nēquam, nēquitia, nēquando, videlicet, and venēficus.

Nēquicquam teros exercet noctua cantus. Virg.

3. Liquefacio, tepefacio, and patefacio, have the *e* of the ſecond ſyllable chiefly ſhort, though ſometimes long; rarefacio and rarefio have the *e* generally long.

Sic mea perpetuis *liquĕſiunt* pectora curis. Ovid.
Tibe *liquĕfactis*, tendens ad ſidera palmas. Ovid.
Et *rarēfecit* calido miſcente vapore. Lucret.
Intremuit, motuque ſinus *patēfecit* aquarum. Ovid.
Atque patēfecit, quas ante obſederat ater— Lucret.

Note.—Voſſius obſerves that Virgil ſhortens the *e* in ſuch words, and that Lucretius and Catullus lengthen it, the former without cæſura. Indeed it is probable that in theſe words it was generally conſidered common.

16. If the firſt member of a compound word terminate in *i*, that vowel is ſhort; as bĭvium, trĭvium, trĭceps, sĭquidem, fatĭdicus, agrĭcola, vatĭcinium, ſignĭfico, archĭtectus, dĭmeter, trĭmeter, Iphĭgenia, &c.

Jane *bĭceps!* anni tacite labentis origo. Ovid.

1. Except thoſe compounds in which the *i* is changed in declining; as quīdam, quīvis, quīlibet, quantīvis, quantīcunque, tantīdem, unicuīque, eīdem, reīpublicæ, qualīqunque.

Jure mihi invideat *quīvis*, ita te quoque amicum. Hor.

2. The final *i* is long in thoſe compounds which may be ſeparated without deſtroying the ſenſe; as ludīmagiſter, or ludī magiſter; parvīpendo, or parvī pendo; lucrīfacio, or lucrī facio; sīquis, or sī quis.

3. Thoſe words which in joining undergo a craſis or ſyncope, are long; as tibīcen for tibiicen; bigæ, trigæ, &c. for bĭjŭgæ, trĭjŭgæ, &c.; īlicet for īre licet; ſcīlicet for ſcīre licet; but tubĭcen, which has ſuffered neither, is ſhort by the general rule.

Īlicet ignis edax ſumma ad faſtigia vento. Virg.

4. Īdem maſculine is long; but in the neuter it is ſhort. Identĭdem has the penultimate ſhort.

Omnibus *īdem* animus, ſcelerata excedere terrâ. Virg.
Invitum qui ſervat, *īdem* facit occidenti. Hor.
Qui ſedens adverſus *identĭdem* te. Catul.

5. The final *i* of the former compounding word, is long in nīmirum, ubīque, utrobīque, ibīdem.

Dixi equidem et dico. Captes aſtutus *ubīque*. Hor.

6. As the *i* is common in *ubi*; ſo it is in ubicunque and ubivis.

Clamat: io matres audite *ubĭcunque* Latinæ. Virg.
Servor, *ubĭcunque* eſt: uni mea grudia ſervo? Ovid.

7. The compounds of *dies* have the final *i* of the firſt word long; as bīduum, trīduum, merīdies, prīdie, poſtrīdie.

Si ſolus tibi *trīduo* legatur. Mart.

Note.—1. Pridie and poſtridie are long by exception 3, being priori die, and poſteriori die.

2. Quotidie and quotidianus are ſaid to have the *i* ſometimes ſhort; but this is not ſatisfactorily aſcertained, ſince the lines adduced in proof may, by the figure ſynizeſis, be differently meaſured: thus

Conjugis in culpa flagravit *quŏttĭdiānā*.* Catul.

* Or quŏttid-yā-nā. It muſt be confeſſed, however, that thus read the line is harſh, and is unneceſſarily rendered ſpondaic.

3. Trīginta, trīgeſimus, trīceſimus, and trīceni, are not conſidered as compound words, in which the *trī* is ſhort, as it is in all the real compounds of *tris*, *viz.* trīceps, trīplex, trīformis, trīcuſpis, trīcenties, &c. &c. for triginta cannot with propriety be called a compound word, ſince *ginta* is only a termination. At all events the *trī* in triginta, &c. is ever long.

17. If the firſt member of a compound word terminate in *o*, it is ſhort; as Argŏnauta, Arctŏphylax, areŏpagus, bibliŏtheca, philŏſophus, ſacrŏſanctus, duŏdecim, hŏdie.

Non nautas puto vos, ſed *Argŏnautas*. Mart.
Non dices *hŏdie*, quorſum hæc tam putida tandem— Hor.

1. Except words compounded with *intro*, *retro*, *contro*, and *quando*; as introduco, intromitto, retrocedo, controverſus, quandoque, &c.; but quandŏquidem has the *o* ſhort.

Ipſe *retrŏverſus* ſqualentia protulit ora. Ovid.

2. Alſo aliōquin, utrōque, cæterōquin, utrōbique; and

and the compounds of *quō*; as quōmodo, quōcunque, quōminus, quōcirca, quōvis, and quōque the adjective; but quŏque, the particle, has the *o* short.

Mendoſa eſt natura, *alĭōqui* recta, velut ſi. Hor.

3. Thoſe words which in Greek are written with an *o-mega*, have the *o* long; as geōmetria, geōgraphia, minōtaurus, lagōpus.

Si meus auritâ gaudet *logōpode* Flaccus. Mart.

18. U and Y terminating the firſt member of a compound word, are ſhort; as in Thraſўbulus, Eurўpylus, Polўpus, dŭcenti, dŭpondium, quadrŭpes, centŭplex, Trojŭgena, cornŭpeta, Polўdorus, Polўphemus, &c.

Nam fuit hoc vitioſus: in horâ ſæpe *dŭcentos*— Hor.
Nam qualis quantuſque cavo *Polўphemus* in antro. Virg.

Except jūdico, which in its firſt ſyllable is, by ſyncope, long.

Et ſapit, et mecum facit, et Jove *jūdicat*, æquo. Hor.

Of the firſt Syllable of Diſſyllabic Preterites.

19. Preterites of two ſyllables have the firſt long; as vēni, vīdi, vīci.

Vēnit ſumma dies, et ineluctabile tempus. Virg.

Except bĭbi, tŭli, dĕdi, ſtĕti, ſtĭti, ſcĭdi from ſcindo, (for abſcīdi is long from abſcido, and abſcĭdi ſhort from abſcindo,) fĭdi from findo, (for fīdi and confīdi from fīdo are long.)

Aut *ſcĭdit*, et medias fecit ſibi littora terras. Lucan.

Of the two firſt Syllables of Reduplicated Preterites.

20. Preterites doubling their firſt ſyllable, have that ſyllable and the following both ſhort; as tĕtĭgi, pĕpŭli, pĕpĕri, dĭdĭci, tŭtŭdi, cĕcĭdi from cado.

Si *mĕmĭni* fuerant tibi quatuor, Ælia, dentes. Mart.
Littora, quæ cornu *pĕpŭlit* Saturnus equino. Val. Flac.

Except cecīdi from cædo has the ſecond ſyllable long; and likewiſe thoſe preterites, in which that ſyllable is followed by two conſonants; as fĕfēlli, mŏmōrdi, ſpŏpōndi.

Ebrius et petulans, qui nullum forte *cecīdit*. Juven.
..... Vatum *ſpŏpōndit*: nulla propter me ſacro. Senec.
Quæ Deus ipſe viris intermina fortibus *ſpŏpōndit*. Prud.

Note.—From the authorities here quoted, it is evident that *ſpŏpondi* is the claſſic orthography, not *ſpoſpondi*, which would have the firſt ſyllable long by poſition, before *ſp*, as we may invariably obſerve in compound words; as rēſpuo, rēſpicio, rēſpondeo, rēſpiro, rēſpergo, &c.

Of the firſt Syllable of Diſſyllabic Supines.

21. Supines of two ſyllables, and the perfect participle formed from them, have the firſt ſyllable long; as vīſum, mōtum, ēſum, flētum, vīſus, mōtus, &c.

Terribiles *vīſu* formæ, letumque, laborque. Virg.
Quos ego — ſed *mōtos* præſtat componere fluctus. Virg.

1. Except the firſt ſyllable is ſhort in dătum, rătum, ſătum, ĭtum, lĭtum, quĭtum, ſĭtum, rŭtum, and fŭtum, from the obſolete fuo, whence we have fŭturus.

Cui *dătus* hærebam cuſtos, curſuſque regebam. Virg.

2. Cĭtum from cieo of the ſecond conjugation has the *i* ſhort; but cītum from cio of the fourth conjugation has it long.

Corripuit ſeſe, et tectis *cĭtus* extulit altis. Virg.
Unde ruunt toto *concīta* pericula mundo. Lucan.

3. Statum is common: hence we find ſtāturus, conſtāturus, obſtāturus, ſtāmen, ſtātus-a-um, ſtātus-ûs, præſtĭtum, ſtătio, ſtătuo, ſtăbilis, ſtăbulum, ſtător, ſtătim, &c.: the former of which are ſaid to come from ſto, the latter from ſiſto.

Hic *ſtătus* in cœlo multos permanſit in annos. Ovid.
Damnavit multo *ſtāturum* ſanguine Martem. Mart.
Inſtĭtor imperii, caupo famoſus honorum. Claud.
Non *præſtăta* ſibi præſtat natura ſed unus. Prop.
Conſtātura fuit Megalenſis purpura centum. Mart.

Of the firſt Syllable of Polyſyllabic Preterites and Supines.

22. Preterites and ſupines of more than two ſyllables have the ſame quantity in their firſt ſyllable as the preſent; thus vŏcavi and vŏcatum have the firſt ſhort, becauſe the firſt of vŏco is ſhort: clāmavi and clāmatum have the firſt long, becauſe the firſt of clāmo is long.

Si *vŏcat* officium turbâ cedente vehetur. Juven.
Induit, implevitque mero, divoſque *vŏcavit*. Virg.

Except pŏſui, pŏſitum from pōno; gĕnui, gĕnitum from gīgno; pŏtui from poſſum; ſōlutum, vŏlutum from ſōlvo and vōlvo.

Sæcula? qui tanti talem *gĕnuêre* parentes. Virg.

Of the Penultimate of Polyſyllabic Supines.

23. Supines of more than two ſyllables, in *ātum*, *ētum*, and *ūtum*, lengthen the laſt ſyllable but one; as amātum, delētum, minūtum.

24. Supines in *itum*, from preterites in *ivi*, alſo have the penultimate long; as cupīvi, cupītum; petīvi, petītum; quæsīvi, quæsītum; polīvi, polītum; but the compounds of *eo*, ambio excepted, have the penultimate ſhort.

25. Supines in *itum*, from any other preterites, ſhorten the penultimate; as cubui, cubĭtum; monui, monĭtum; abolevi, obolĭtum; agnovi, agnĭtum; credidi, credĭtum: recenſītum of recenſeo is long, on account of its origin from the obſolete cenſio, cenſivi.

Namque ferunt luctu Cycnum Phaëthontis *amāti*. Virg.
Delētas Volſcorum acies, cecidiſſe Camillam. Virg.
Suſtulit *exūtas* vinclis ad ſidera palmas. Virg.
Sæpe *laceſsītus* probris, gladiiſque *petītus*. Claud.
Cedamus Phœbo, et *monĭti* meliora ſequamur. Virg.
Priſca *recenſĭtis* evolvite ſæcula faſtis. Claud.

Of the Penultimate of Participles in RUS.

26. Participles in *rus* always lengthen the laſt ſyllable but one; as amatūrus, habitūrus, lectūrus, auditūrus.

Tarda venit, ſeris *factūra* nepotibus umbram. Virg.

Increment of Nouns.

Note.—1. If the genitive caſe ſingular do not contain a greater number of ſyllables than the nominative, that noun has no increment, as penna, pennæ, caro, carnis. But if the genitive contains more ſyllables than the nominative, the penultimate of the genitive is the increment; and whether that ſyllable be long or ſhort, it preſerves the ſame quantity in all the oblique caſes ſingular and plural. If bōbus or būbus be an exception, we ſhould recollect, it is ſo by ſyncope and craſis from bŏvibus. Auſonius, contrary to the practice of better authors, has an example of bŏbus ſhort, as if it had been formed by ſimple ſyncope without craſis. See Auſon. Epig. 62.

2. Nouns ſeldom have more than one increaſe in the ſingular: iter, jecur, (when its genitive is jecinoris,) ſupellex, and the compounds of caput, ending in *ps*, have two increments. The dative and ablative of the third declenſion have two; of the aforementioned words, three increments. They are reckoned in the retrograde order, beginning with the penultimate, for the laſt ſyllable is never conſidered as an increment.

1 2	1 2 3
i-ti-ne-ris,	i-ti-ne-ri-bus.
je-ci-no-ris,	je-ci-no-ri-bus.
ſupel-lec-ti-lis,	ſupel-lec-ti-li-bus.
an-ci-pi-tis,	an-ci-pi-ti-bus.

Of the Increments of the Singular Number.

Of the firſt, ſecond, fourth, and fifth Declenſions.

27. In the firſt, fourth, and fifth declenſions, there is no increment in the ſingular; except the antique increment of the firſt declenſion, by the reſolution of the diphthong *æ* into *ai*, in which the *a* is long; as

Dives equâm, dives *pictāi* veſtis et auri. Virg.

28. The increments of the ſecond declenſion are ſhort: as puĕri, vīri, ſatŭri, tenĕri.

O *puĕri*! ne tanta animis aſſueſcite bella. Virg.

Except Iber, Ibēri, and its compounds Celtiber, Celtibēri, which lengthen the penultimate; as

Quique feros movit Sertorius exul *Ibēros*. Lucan.
Vir *Celtibēris* non tacende gentibus. Mart.

Increments of the third Declenſion.

29. Nouns in A ſhorten the genitive penultimate; as dogma-ătis.

Non quivis videt immodulata *poëmăta* judex. Hor.

30. Nouns in I, compounds of meli, ſhorten the genitive penultimate; as hydromeli, hydromelĭtis.

31. Nouns in O, increaſing in ĭnis, ſhorten the genitive penultimate; as cardo, cardĭnis; imago, imagĭnis.

32. Ēnis and ōnis, from *o*, are long; as anio, aniēnis; ſermo, ſermōnis.

1. Except gentiles in *o* generally ſhorten the increment; as Macedo, Macedŏnis; Saxo, Saxŏnis. To which add Lingŏnes, Seuŏnes, Teutŏnes, Vangiŏnes, Vaſcŏnes. Some lengthen the penultimate; as Sueſſiōnes, Vettōnes, Burgundiōnes, Eburōnes. Juvenal ſhortens Britones; Martial lengthens it.

2. Nouns in *on*, from the Greek ων, which ſometimes drop the *n*, preſerve in Latin the ſame quantity which they have in the original; as Agamemnon or Agamemno, Agamemnŏnis; Demiphon or Demipho, Demiphōnis.

Sanguine placâſtis ventos, et *virgĭne* cæſa. Virg.
Hæc tum multiplici populos *ſermōne* replebat. Virg.
Non longinqua docent domito quod *Saxŏne* Tethys. Claud.
Qua nec terribiles Cimbri, nec *Britŏnes* unquam— Juven.
Quam veteres braccæ *Britōnes* pauperis et quam— Mart.
Quo ferus injuſto petiit *Agamemnŏna* ferro— Ovid.

33. Nouns in EC lengthen the genitive penultimate; as halec-ēcis.

Halēcem ſed quam protinus ipſa voret. Mart.

34. Nouns in D ſhorten the genitive penultimate; as David, Davĭdis.

Erecto indulget *Davĭdis* origine lumen. Juven.

Note.—Eccleſiaſtical writers often lengthen the penultimate of David.

35. Maſculines in AL ſhorten the genitive penultimate; as Hannibal-ălis; ſal-ſālis (maſculine or neuter).

36. Neuters in AL lengthen ālis; as animal-ālis.

Vela dabant læti, et ſpumas *sălis* ære ruebant. Virg.
Pronaque cum ſpectent *animālia* cætera terram. Ovid.

37. SOL lengthens sōlis: and alſo Hebrew nouns in EL lengthen the genitive penultimate; as Daniel-ēlis.

Regia *sōlis* erat ſublimibus alta columnis. Ovid.

38. All other nouns in L ſhorten the genitive increment; as vigil-ĭlis, conſul-ŭlis, exul-ŭlis.

Aut urſum, aut *pugĭles*, his nam plebecula gaudet. Hor.

39. Nouns in EN ſhorten the genitive penultimate; as crimen-ĭnis, flumen-ĭnis.

Quodque magis mirum eſt, auctorem *crimĭnis* hujus— Mart.

40. No certain rule can be given for the quantity of the increment of nouns ending in ON. Many lengthen the genitive penultimate; as Chiron, Demiphon, Agon, Helicon, Lacon, Sicyon, Solon, Simon: many ſhorten it; as Actæon, Agamemnon, Amazon, Jaſon, Memnon, Philæmon, Orion, Sidon, Sindon: and Ægæon has the penultimate common.

Credit, et excludit ſanos *Helicōne* poëtas. Hor.
Et velut abſentem certatim *Actæŏna* clamant. Ovid.
Audiĕrat duros laxantem *Ægæŏna* nexus. Stat.
Ægæōna ſuis immania terga lacertis. Ovid.

41. All other nouns in N lengthen the genitive penultimate; thus Titan-ānis, Siren-ēnis, delphin-īnis, Phorcyn-ȳnis.

Concitat iratus validos *Titānos* in arma. Ovid.
Orpheus in ſylvis, inter *delphīnas* Arion. Virg.

42. Neuter nouns in AR lengthen the genitive in āris; as calcar-āris.

Seu ſpumantis equi foderet *calcāribus* armos. Virg.

But theſe neuters ſhorten ăris; bacchar, jubar, nectar-ăris. To which add par-păris, and its compounds; as impar-impăris; diſpar-diſpăris, &c.; alſo hepar-ătis.

Pugnavere *păreo*; ſuccubuere *păres*. Mart.

43. But maſculine nouns in AR ſhorten ăris; as Cæſar-ăris, Hamilcar-ăris, lar-lăris.

Ecce Dionæi proceſſit *Cæsăris* aſtrum. Virg.

Except Car and Nar; as,

Laudibus immodicis *Cāres* in aſtra ferant. Mart.
Sulfureas poſuit ſpiramina *Nāris* ad undas. Enn.

44. Greek nouns in TER lengthen the increment; as crater-ēris, character-ēris, ſpinther-ēris; except æther-ĕris.

Indulgent vino, et vertunt *cratēras* ahenos. Virg.
Quâcumque illa levem fugiens fecat *æthĕra* pennis. Virg.

45. Nouns in OR lengthen ōris; as amor-ōris; timor-ōris.

1. Except neuter nouns; as marmor, æquor-ŏris.
2. Greek nouns in OR; as Hector, rhetor-ōris.
3. Arbor-ŏris, and memor-memŏris.
4. Ador forms adŏris or adōris, whence adōreus in Virgil, Horace, and Claudian.

Inter ſpem curamque, *timōres* inter et iras. Hor.
Præterea fuit in tectis de *marmŏre* templum. Virg.
Ingemit et dulci frater cum *Caſtŏre* Pollux. Val. Flac.
Finiet, ante gravem quæ legerit *arbŏre* ſolem— Hor.
Mox ador, atque *adŏris* de polline pultificum far. Auſon.
Emicat in nubes ardor *adōris*. Priſ.

46. The following nouns lengthen the increment; furfūris, ver-vēris, Recimer-Recimēris, Byzer-Byzēris, Ser-Sēris, Iber-Ibēris, (as well as Iber of the ſecond declenſion.)

Velleraque ut foliis depectant tenuia *Sēres*. Virg.

47. Other nouns in R, not mentioned, ſhorten the penultimate; as aer, aĕris; mulier, ĕris; cadaver-ēris; iter, itinĕris; verber, verbĕris; vultur, ŭris; murmur, ŭris; femur, robur, jecur, ebur-ŏris; martyr-ȳris.

Si nigrum obſcuro comprênderit *aĕra* cornu. Virg.
Aſpice, ventoſi ceciderunt *murmŭris* auræ. Virg.

48. Latin nouns in AS lengthen the increment; as pietas-ātis; Mæcenas-ātis; vas, vāſis, a veſſel.

Inſignem *pietāte* virum tot adire labores. Virg.

Except anas, anătis; mas, măris; and vas, vădis, a ſecurity.

Tyrtæuſque *măres* animos in martia bella. Hor.

49. Greek nouns in AS ſhorten ădis, ătis, and ănis; as Pallas, lampas, ădis; artocreas, ătis; Melas, ănis.

Inſtar montis equum divina *Pallădis* arte. Virg.

50. Nouns in ES ſhorten the increment; as miles, milĭtis; ſeges, ſegĕtis; præſes, præsĭdis; obſes, obsĭdis; Ceres, Cerĕris; pes, pĕdis.

Metiri ſe quemque ſuo modulo ac *pĕde*, verum eſt. Hor.

Except locuples, quies, manſues, ētis; hæres, merces, ēdis: alſo Greek nouns which have ētis; as lebes, Thales, tapes, magnes, ētis.

Aſcanium ſurgentem, et ſpes *hærēdis* Iuli. Virg.
Viginti fulvos operoſo ex ære *lebētes*. Ovid.

51. Nouns in IS ſhorten the increment; as lapis, Phyllis, ĭdis; cinis, ĕris; ſanguis, ĭnis.

Immolat et pœnam ſcelerato ex *ſanguĭne* ſumit. Virg.

1. Except glis, glīris, and vīres the plural of vis, which lengthen the increment.

Somniculoſos ille porrigit *glīres*. Mart.
Sic fatus validis ingentem *vīribus* haſtam— Virg.

2. Latin nouns which have itis, as dis, dītis; lis, lītis; Quiris, Samnis, ītis; but Charis, a Greek noun, has Charĭtis ſhort.

Inſequeris tamen hunc, et *līte* moraris iniqua. Hor.
Tres fuerant *Charĭtes*, ſed dum mea Leſbia vixit— Auſon.

3. Crenis, Crenīdis; Neſis, Nesīdis; Pſophis, Pſophīdis, lengthen the penultimate; but Pſophis ſhortens it once in Statius.

Sylvaque, quæ fixam pelago *Nesīda* coronat. Stat.
Æpytios idem arbor agros, et *Pſophĭda* celſam. Stat.
Uſque ſub Orchomenon, *Pſophīdaque* Cyllenenque. Ovid.

4. Greek nouns in *is*, which have alſo the termination *in*; as Salamis, or Salamin-īnis.

Tiburis umbra tui, Teucer *Salamīna* patremque. Hor.

52. Nouns in OS lengthen the increment; as nepos, ōtis; flos, flōris; os, ōris; cuſtos, cuſtōdis; rhinoceros, ōtis; Tros, ōis; heros, ōis.

Qui legitis *flōres*, et humi naſcentia fraga. Virg.
Egreſſi optatâ potiuntur *Trōes* arenâ. Virg.

Except bos, bŏvis; compos, impos, ŏtis; which increaſe ſhort.

Perpetui tergo *bŏvis*, et luſtralibus extis. Virg.

53. Nouns in US ſhorten the increment; as lepus, corpus, ŏris; vellus, ĕris; tripus, ŏdis.

Ut canis in vacuo *lepŏrem* cum Gallicus arvo. Ovid.

1. Except thoſe nouns which have *udis*, *uris*, or *utis*; as incus, incūdis; tellus, tellūris; ſalus, ſalūtis. But theſe are ſhort; Ligŭris, from Ligur or Ligus; pecŭdis, from the obſolete pecus; and intercŭtis, from intercus.

In medio: ſacri *tripŏdes* viridesque coronæ— Virg.
Pas et *jūra* ſinunt: rivos deducere nulla— Virg.
Non ego te *Ligŭrum* ductor fortiſſime bello— Virg.

2. Comparatives in *us* lengthen the genitive penultimate; as melius, meliōris.

Perge, decet, forſan miſeros *meliōra* ſequentur. Virg.

54. Nouns in YS ſhorten the increment ȳdis and ȳdos, and lengthens ȳnis; as chlamys, ȳdis or ȳdos; Trachys, ȳnis.

In medio, *chlamȳde*, et pictis conſpectus in armis. Virg.
Herculeâ *Trachȳne* jube, ſub imagine regis. Ovid.

55. Nouns in S, preceded by a conſonant, ſhorten their increment; as cœlebs, ĭbis; ſtips, ſtĭpis; Lælaps, ăpis; Cecrops, Dolops, ŏpis; auceps, cŭpis; hiems, ĕmis; alſo anceps, biceps, cĭpĭtis, and ſimilar compounds of caput, in which both increments are ſhort.

Ad matres primo *ancĭpites*, oculiſque malignis— Virg.
Hic *Dolŏpum* manus, hic ſævus tendebat Achilles. Virg.

Except Cyclops, ōpis; ſeps, ſēpis; gryps, ȳphis; Cecrops, ōpis; plebs, plēbis; hydrops, ōpis; and genitives long by poſition; as excors, excordis; pars, partis.

Fortunam, et mores antiquæ *plēbis*, et idem— Hor.
Antiphatæ memores immanſuetique *Cyclōpis*. Ovid.

56. Nouns in T ſhorten the penultimate of *ĭtis*; as caput, ĭtis; ſinciput, ſincipĭtis; occiput, occipĭtis.

Magna fuit quondam *capĭtis* reverentia cani. Ovid.

57. A noun in X ſhortens the vowel before *gis*; as harpax, ăgis; grex, grĕgis; aquilex, lĕgis; biturix, ĭgis; Styx, ȳgis; Allobrox, ŏgis; conjux, ŭgis; Phryx, ȳgis.

Quinque *grĕges* illi balantum, quina redibant. Virg.
Ad *Stȳga* Tænariâ eſt auſus deſcendere portâ. Ovid.

Except lex, lēgis; illex, exlex, lēgis; rex, rēgis; coccyx, ȳgis; maſtix, īgis; and frūgis, from the obſolete frux.

Omnia ſub *lēges* mors vocat atra ſuas. Ovid.

58. A noun in EX ſhortens *ĭcis*; as vertex, ĭcis; pontifex, ĭcis: vibex (rather vibix), īcis excepted.

Qualem virgineo demeſſum *pollĭce* florem— Virg.

59. But EX having *ecis*, lengthens the increment; as vervex, ēcis.

Vervēcum in patria, craſſoque ſub aëre naſci. Juven.

Except nex, nĕcis, vĭcis, and prĕcis, wanting nominatives; alſo fœnifex; reſex, ĕcis; and ſupellex, ectĭlis.

Quam *nĕcis* artifices arte perire ſua. Ovid.

60. And all other nouns in X generally lengthen the increment; thus nouns in *ax*; as pax, pācis; fornax, ācis.

Except abax, ſmilax, Atrax, dropax, fax, Atax, climax, panax, opoponax, ſtyrax, colax; the compounds of phylax and corax; as Arctophylax, Nomophylax, nycticorax, phalacrocorax, ăcis.

Fraternæque fidem *pācis* petiitque deditque. Ovid.
Dicite *felīces* animæ tuque, optime vates. Virg.

61. Thus words in IX; as radix, ſelix, cicatrix, nutrix, victrix, altrix, perdix, coturnix, pernix, lodix, īcis.

1. Except appendix, chœnix, coxendix, cilix, calix, fornix, filix, hiſtrix, larix, pix, ſalix; varix, ĭcis, and ſtrix, ſtrigis.

2. Nix, nĭvis; maſtix, ĭchis, a gum.

Ecce *coturnīces* inter ſua prælia vivunt. Ovid.
Et *filīcem* curvis inviſam paſcit aratris. Virg.
Et *ſtrīgis* inventæ per buſta jacentia plumæ. Propert.
Jam ſatis terris *nĭvis* atque diræ. Hor.
Contritumque ſimul cum *maſtiche* confer anethum. Seren. Samon.

62. And words in OX; as vox, vōcis; velox, ōcis. Except Cappadox; præcox, ŏcis.

Condimus et magna ſupremum *vōce* ciemus. Virg.
Mancipiis locuples, eget æris *Cappadŏcum* rex. Hor.

63. In UX; as lux, lūcis; Pollux, lūcis. Except dux, crux, nux, trux-ŭcis.

Reſtitit Æneas, claraque in *lūce* refulſit. Virg.
Conſedere *dŭces*, et vulgi ſtante corona. Ovid.

64. In YX; as bombyx, ȳcis. Except onyx, ȳchis; Eryx, ȳcis; calyx, ȳcis; Naryx, ȳcis. But Sandyx and Bebryx have the increment common.

Nec ſiqua Arabio lucet *bombȳce* puella. Propert.
Illaque plebeio, vel ſit *ſandȳcis* amictu. Propert.
Interdum Libyco fucantur *ſandȳce* pinnæ. Gratius.
Bebrȳcis et Scythici procul inclementia facri. Val. Flac.

Of the Increments of the Plural Number.

65. The plural increments, A, E, O, are long; as musārum, ambābus, animābas; rērum, rēbus, hōrum, quōrum, regnōrum.

Tuque, *hārum* interpres *curārum*, et conſcia, Juno. Virg.
Scilicet in nobis *rērum* natura novata eſt. Ovid.
Rēbus in anguſtis facile eſt contemnere vitam. Mart.
Projicis? O Latio caput *hōrum* et cauſa *malōrum*. Virg.

66. The plural increments I and U are ſhort; as quĭbus, trĭbus, montĭbus, verŭbus, lacŭbus.

Except būbus or bōbus, which, on account of its contraction from bŏvĭbus, as already explained, is long.

Nec*te* *trĭbus* nodis ternos, Amarylli, colores. Virg.
Non *opĭbus* mentes hominum curæque levantur. Tibul.
Pars in fruſta ſecant, *verŭbuſque* trementia figunt. Virg.
Cum faber eduxit, *lacŭbus* demittit: at illud —— Ovid.
Et totum luſtret curvatis *arcŭbus* orbem. Manil.
Et Tiberis noſtris advena *būbus* erat. Propert.

Increment of Verbs.

Note.—1. When any part of a verb exceeds, in the number of ſyllables, the ſecond perſon ſingular of the indicative preſent, active, the exceſs is conſidered as the increment. As in nouns, the laſt ſyllable is never reckoned the increment; ſo alſo in verbs; and, therefore, when there is only one increaſe, it muſt be the penultimate.

2. Thus amat, amant, ama, amem, amans, containing, like amas, only two ſyllables, have no increment. A-ma-mus, a-ma-tis, fle-tis, ſci-res, da-mus, have one increment, becauſe they exceed, by one ſyllable, amas, fles, ſcis, and das. A-ma-ba-mus, a-ma-bi-mus, have two increments, becauſe they exceed amas by two ſyllables. A-ma-ve-ri-tis has three increments. Audi-e-ba-mi-ni has four, becauſe it has four ſyllables more than audis. In determining the increments of deponent verbs, an active voice may be ſuppoſed; thus, co-na-tur has one increment; co-na-ba-tur, two; co-na-re-mi-ni, three; becauſe conas of the fictitious active voice has but two ſyllables. Or their increments may alſo be regulated by other verbs of the ſame conjugation and number of ſyllables, which have an active voice.

67. A is long in the increments of verbs; as ſtābam, ſtāres, properāmus, docebāmur, audiebāmini.

Serius aut citius ſedem *properāmus* ad unam. Ovid.
Pugnābant armis, quæ poſt *fabricāverat* uſus. Hor.
Et *cantāre* pares, et reſpondere *parāti*. Virg.
Contemplātor item, cum ſe nux plurima ſilvis. Virg.

Except that *do*, and its compounds of the firſt conjugation, have *a* ſhort in their firſt increment; as dămus, dăbunt, dăre; ſo circundămus, venundăbo, &c. But in any other increment *do*, like its compounds of the third conjugation, is long; as dābāmus, dederātis, circundābāmus, credāmus.

Hic lacrymis vitam *dāmus*, et miſereſcimus ultro. Virg.
Taurino quantum poſſent *circumdăre* tergo. Virg.
Nam quod conſilium, aut quæ jam fortuna *dabātur?* Virg.

68. E is long in the increments of verbs; as flēbam, rēbar, amēris, docērem, legērunt, amēmus, amarēmus, amaviſsētis, regēbat, audiēbar, &c.

Sic equidem *ducēbam* animo, *rēbarque* futurum. Virg.
Neu juvenes celebret multo ſermone, *cavēto*. Tibul.

Except 1. E before R is ſhort in the firſt increment of all the preſent and imperfect tenſes of the third conjugation: as legĕres or legere, the indicative preſent paſſive; legĕre, the infinitive preſent active, and imperative paſſive; legĕrem and legĕrer, the imperfect ſubjunctive active and paſſive. But rēris and rēre are long; as amarēris, amarēre; docerēris, docerēre; regerēris, regerēre; audirēris, audirēre.

Parcĕre perſonis, *dicĕre* de vitiis. Mart.
Sic flendus Peleus, ſi morerētur, erat. Ovid.
Cum conſternatis *diripĕrēris* equis. Ovid.
Noſtra, neque ad fedes victor *veherēre*. Virg.

2. Bĕris and bĕre are every where ſhort; as amabĕris, amabĕre; monebĕris, monebĕre: and among the ancients, largibĕris, experibĕre of the fourth. Excepting where the *b* belongs to the termination of the preſent; as ſcribēris and ſcribēre of the future paſſive being long by the general rule.

Sanguine Trojano et Rutulo *dotalĕre*, virgo. Virg.
Scribēris Vario fortis, et hoſtium— Hor.

3. E, before *ram*, *rim*, *ro*, and the perſons formed from them, is ſhort; as amavĕram, amavĕrim, amavĕro; monuĕram, monuĕrim, monuĕro; rexĕram, rexĕrim, rexĕro; ĕram, fuĕram; potĕro, potuĕro, &c.

Vincere, nec duro *potĕris* convellere ferro. Virg.

4. By ſyſtole, the poets ſometimes ſhorten *e* before *runt*; as

Obſtupui *ſteterŭntque* comæ, et vox faucibus hæſit. Virg.
Dî tibi divitias *dedĕrunt*, artemque fruendi. Hor.

69. In every increment, (whether the firſt, ſecond, third, or fourth,) I is ſhort; as amabĭmus, docebĭmĭni, regĭtur, regĭmus, audĭmĭni, audiebamĭni.

Mora tarda mente cedat: ſimul ite; *ſequĭmĭni*. Catul.
Venīmus; et latos indagine *cīnxĭmus* agros. Ovid.

Note.—In ſuch verbs of the fourth conjugation as have in the firſt perſon plural of their preſent and perfect indicative, the ſame words, in regard to ſpelling, there is a diſtinction by the quantity; the penultimate of the former being long, as venīmus, reperīmus; and that of the latter ſhort, as venĭmus, reperĭmus.

Except 1. Theſe have *i* long; sīmus, velīmus, nolīmus, with the other perſons coming from them and their compounds; as sītis, velītis, nolītis, nolīte, nolītote; malīmus, malītis; poſsīmus, poſsītis, &c.

Ne nimium *sīmus*, ſtultorum more, moleſti. Mart.

2. I before *vi* in preterites is always long; as petīvi, quæsīvi, audīvi, and in its derivative perſons; as petīviſti, quæsīvit, audīvimus, &c.

Ceſſi et ſublato montem genitore *petīvi*. Virg.

3. The firſt increment of the fourth conjugation is long; as audīmus, audītis, audītur, audīto, audīrem, ſcīmus, ſcīre; and in audībam, as it is ſometimes contracted;

tracted; and in ĭbam and ĭbo, from eo. But when a vowel follows, *i* is short by position, as audĭebam.

Nutrĭbat teneris immulgens ubera labris. Virg.
Lenĭbunt tacito vulnera noſtra ſinu. Propert.
Tu ne cede malis; ſed contra audentior ĭto. Virg.
Jungimus hoſpitio dextras, et tecta *ſubĭmus*. Virg.
Qui non ediſtis, faturi *fĭte* fabulis. Plaut.

Note.—Imus in every preterite, and in that of the fourth conjugation alſo, is ſhort; as juvĭmus, vidĭmus, fecĭmus, venĭmus, amavĭmus, adolevĭmus, pepercĭmus, munivĭmus.

4. Rĭmus and rĭtis in the ſubjunctive preterite are ſhort.

Egerĭmus noſti; et primium meminiſſe neceſſe eſt. Virg.

5. Rimus and rĭtis in the perfect future ſubjunctive are common.

Quas ob res, ubi *viderĭmus* nil poſſe creari. Lucret.
Nec mî aurum poſco, nec mî pretium *dedcrĭtis*. Enn.
Viderĭtis ſtellas illic, ubi circulus axem. Ovid.
Dein cum millia multa *fecerĭmus*. Catul.
Oderĭmus magis in culpam pœnaſque creatos. Manil.
Cum maris Ionii tranſierĭtis aquas. Ovid.

Note—We have innumerable examples to prove that *rimis* and *ritis* in the perfect future ſubjunctive is common; but concerning the quantity of *rimus* and *ritis* in the preterite ſubjunctive, grammarians are not agreed. A difficulty in this inveſtigation ariſes from the ſimilarity of the two tenſes; the latter having not unfrequently been miſtaken for the former, and *vice verſâ*: ſince "the perfect of the potential ſeems to be both paſt-perfect contingent, and future-perfect contingent. The perfect future has alſo ſo great an affinity to the preterperfect potential, that often a word may, conſiſtently with the ſenſe, be ſuppoſed to belong to either. As theſe tenſes are uſually interpreted in Engliſh, there is a great reſemblance in their ſtructure, as well as in the ideas which they expreſs. Both are compoſed of verbs in preſent time, the one a verb of preſent liberty, or the like, the other of preſent intention or obligation; of an infinitive denoting ſubſequent or dependent poſſeſſion; and a participle ſignificant of the perfection of the action denoted by the verb: thus, *I may have written*, *I ſhall have written*." We find by A. Gellius, 18, 2, that it was a ſubject of diſpute at Rome, whether the tenſe in *rim* ought to be conſidered as *paſt* or *future*, or both. Such diſputes may, perhaps, have ariſen from the acceſſory circumſtances which are implied, beſides the immediate action of the verb; in the ſame manner as, in Engliſh, two forms, preciſely the ſame in their ſtructure and reference, are characteriſed by certain grammarians under different times, *viz. I may write*, and *I ſhall write*, the former being named, from the acceſſory idea, a preſent, and the latter, from the depending action, a future, while, in reality, if we apply the ſame criterion to them, they are both preſent, or both future. Indeed it has been contended that the future had the termination *rim*, as well as *ro*; ſo that it is reckoned not improbable that both may originally have been but one tenſe, which had both a paſt and future reference. It is evident that this is a conſideration by no means irrelevant, but indiſpenſably neceſſary, before we can, with certainty, determine the quantity of *rimus* and *ritis* in the ſubjunctive preterite. In addition to the authorities for reckoning *rimus* and *ritis* common, there is likewiſe ſufficient example from Horace, Martial, Ovid, Seneca, Tibullus, and Plautus, to conſider *ris* of the future, at leaſt as common; and this is an argument founded on the analogy of other tenſes between the quantity of the final ſyllable of the ſecond perſon ſingular, and the penultimate of the firſt and ſecond perſons plural, for conſidering the following *rimus* and *ritis* alſo common.—*Ris*, *rimus*, and *ritis*, are uſually accounted ſhort; but it is exceedingly probable that, whether referred to the preterite or perfect future, they ſtill might be uſed as common.

70. O, in the increment of verbs, is always long; as amatōte, facitōte, itōte.

Cumque loqui poterit, matrem *facitōte* falutet. Ovid.

71. U, in the increment of verbs, is ſhort; as sŭmus, poſsŭmus, volŭmus, malŭmus.

Dicite, Pierides: non omnia *poſsŭmus* omnes. Virg.

Note.—For U in the penultimate of the future in *rus*, ſee the rule.

SECTION II.—*On the quantity of the penultimate and antepenultimate ſyllables, and on the quantity of ſuch as are uſually ſaid to be long or ſhort by authority.*

Note.—It is very well known that the proſodial rules, hitherto extant, determine not the quantity of every ſyllable of the Latin language; but of ſuch only as are more commonly aſcertained from the circumſtances of *poſition*, *derivation*, *preterites*, *ſupines*, *increment*, and *final ſyllables*. Conſequently, in the greater number of inſtances, the inquiries of the ſtudent are at a ſtand until he can appeal to that *obſervation*, which would be more happily employed in confirming his previous acquiſitions. And thus with but partial inſtead of complete information, he arrives at but mere intimation, the firſt ſtage of his progreſs, at the time when he unqueſtionably might achieve the ſecond, the ſatisfactory and practical illuſtration of his previous attainments. If we depend on practice for the *firſt principles* of our knowledge, we loſe its beſt and happieſt effect. Practice will always evince its moſt prevalent efficacy, when its office is alone to rear the ſuperſtructure on the baſis of regular ſyſtem and theory, and not to attempt the caſual and fortuitous taſk of laying a tranſitory foundation, and that too on a vacuum, the baſeleſs texture of ignorance, not admitting that analogy and arrangement, that reciprocal and corroborative illuſtration, which ſo eſſentially aid the intellectual faculty with effectual and permanent impreſſion. The part which follows is an attempt to ſupply this *deſideratum*. It was obtained by four conſecutive analyſes of the language, in which every word and ſyllable paſſed under minute and deciſive conſideration. This inveſtigation was undertaken in conſequence of its being ſuſpected, that ſince it is a general rule in the proſody of the Latin language, that a vowel before two conſonants, &c. is long, that a law exiſts, directly the reverſe of this, and of not leſs extenſive influence; *viz.* that a vowel before a ſingle conſonant is ſhort: though each of theſe general and very extenſive rules, may have, in ſpecial caſes, their exceptions. The reſult juſtified the expectation, and proved, that principally with the addition of another general rule, the proſodial ſyſtem might become ſo comprehenſive, as to include and provide for the whole language; and conſequently, for all thoſe ſyllables uſually ſaid to be long or ſhort only by authority. The exceptions to this general principle are chiefly included in the rules for the penultimate and antepenultimate ſyllables. And though ſome of theſe have appeared in former treatiſes, yet from their enlargement, the addition of others, the general rule, and its more ſpecial exceptions, which have ariſen from the repeated analyſis we have undertaken, it will be eaſy to perceive, that we have in this part ſome claim to originality. In the preceding rules, and in ſuch as ſhall follow on final ſyllables, in juſtice to the ſubject and our readers, we have felt it indiſpenſably incumbent on us to avail ourſelves of the valuable reſearches of preceding and contemporary proſodians. And the originality of this ſection places us under the obligation of devoting peculiar attention, eſpecially to the demonſtrative part, that every rule and exception, which we now firſt offer, might not appear to reſt on our bare aſſertion, but on the only legitimate warrant, poetic ſanction. And thus, perhaps, we have now the opportunity, for the firſt time, of offering the only complete collection or ſyſtem which determines the quantity of every ſyllable, at leaſt of pure and Auguſtan Latin, that has hitherto been preſented to the public.

1. Maſculine patronymics in *ades* or *ides* uſually ſhorten the penultimate; as Priamĭdes, Atlantĭades.

Atque hîc *priamĭdem* laniatum corpore toto. Virg. Æn. 6. 494.

1. Except thoſe formed from nouns in *eus*; as [1]Pelĭdes.

2. Alſo [2]Amphiaraĭdes, [3]Belĭdes, [4]Japetionĭdes, [5]Lycurgĭdes.

1. Par ſibi Pelĭdes: nec inania Tartara ſentit. Ovid. Met. 12. 619.
2. *Amphiaraĭdes* Naupactoo Acheloo. Ovid. Faſ. 2. 43.
3. *Belĭdæ* nomen Palamedis et inclyta fama. Virg. Æn. 2. 82.
4. *Japetionĭdes* Atlas fuit. Ultima tellus. Ovid. Met. 4. 632.
5. Quique *Lycurgĭden* lethavit, et arbore natum. Ovid. in Ib. 505.

2. Patronymics and ſimilar words in *ais*, *eis*, and *ois*, lengthen the penultimate; as Achāis, Ptolemāis, Chryſēis, Ænēis, Minōis, and Latōis.

Protinus Ægides, raptâ *Mĭnōĭde*, Dian. Ovid. Met. 8. 174.

Except [1]Thebăis and [2]Phocăis: [3]Nerēis is common.

1. *The-*

1. *Thebaïdis* juſſis ſua tempora frondibus ornant. Ovid. Met. 6. 163.
2. *Phocăis* effundit vaſtos balliſta molares. Silius Ital. 1. 334.
3. Et tibi præ invidia *Nerēides* increpitarent. Prop. 1. 26. 15.
4. *Nerēi*, te vereor; tua fulmine ſævior ira eſt. Ovid. Met. 13. 858.

3. Words ending in *acus*, *icus*, and *idus*, ſhorten the penultimate; as [1]Ægyptiăcus, [3]aromatĭcus, [4]callĭdus.

1. Quos *Ægyptiăcos* ſemper renuiſtis ab ævo— Calc.
2. Idaliæ lucos, ubi mollis *amarăcus* illum— Virg. Æn. 1. 693.
3. Vatis *fatidĭcæ*, cecinit quæ prima futuros. Virg. Æn. 8. 340.
4. Utque ſuum laqueis, quos *callĭdus* abdidit auceps. Ovid.

1. Except [1]Merācus, [2]opācus, [3]amīcus, [4]aprīcus, [5]antīcus, [6]fīcus, [7]mendīcus, [8]poſtīcus, [9]pudīcus, [10]umbilīcus, [11]vīcus.

2. Alſo [12]nīdus, [13]sīdus; [14]fīdus, infīdus: but [15]perfīdus (from *per* and *fides*), follows the general rule.

1. Ah! pereat quicunque *merācas* repperit uvas. Prop. 2. 3. 27.
2. Continui montes, niſi diſſocientur *opāca*. Hor. Epiſt. 1. 16.
3. Eſſe tibi magnus, Theleſine, videris *amīcus*— Mart. 3. 40. 3.
4. Duceret *aprīcis* in collibus uva colorem. Virg. Ecl. 9. 49.
5. Et ſuper *antīcos* in frontis imagine crines— Mill.
6. Cum me *fīcus* alat, cum paſcar dulcibus uvis. Mart. 13. 49.
7. Nec *mendīca* ferat barbati prandia nudi— Mart. 14. 81.
8. Occipiti cæco, *poſtīcæ* occurrite ſannæ. Perſ. 1. 62.
9. Perduci poterit tam frugi tamque *pudīca*. Hor. b. 2. s. 5. 77.
10. Nec *umbilīcis* quod decorus et cedro. Mart. 8. 61.
11. Et tua patricius culmina *vīcus* habet. Mart. 7. 72.
12. Ore ferunt, dulcem *nīdis* immitibus eſcam. Virg. G. 4. 17.
13. Hoc metuens, cœli menſes et *sīdera* ſerva. Virg. G. 1. 335.
14. Fortunata domus, modò ſit tibi *fīdus amīcus*. Prop. 3. 20. 9.
15. Diſſimulare etiam ſperaſti, *perfīde* tantum. Virg. Æn. 4. 305.

4. Words ending in [1]*imus* or [2]*ymus*, ſhorten the penultimate; as finitĭmus, maxĭmus, thўmus, fortissĭmus.

Thus anĭmus, decĭmus, fĭmus, ocĭmum, anonўmus, callionўmus, and all adjectives and ſuperlatives in *imus* ſhorten the penultimate.

1. Entelle heroum quondam *fortiſsĭme* fruſtra. Virg. Æn. 5. 389.
2. Fervet opus, redolentque *thўmo* fragrantia mella. Virg. G. 4. 169.

1. Except [1]bīmus, [2]līmus, [3]mīmus, [4]opīmus, [5]quadrīmus, [6]sīmus, [7]trīmus.

2. And two ſuperlatives, īmus and prīmus.

1. Tum vitulos, *bīmâ* curvans, jam cornua fronte. Virg. Georg.
2. *Līmus* ut hic dureſcit, et hæc ut cera liqueſcit. Virg. Ecl. 8. 80.
3. Scribere ſi fas eſt imitantes turpia *mīmos*— Ovid. Triſt. 2. 515.
4. Aut ſpoliis ego jam raptis laudabor *opīmis*. Virg. Æn. 10. 449.
5. Deprome *quadrīmum* Sabinâ. Hor. b. 1. od. 9. 7.
6. Dum tenera attondent *sīmæ* virgulta capellæ. Virg. Ecl. 10. 7.
7. Quæ, velut latis equa *trīma* campis— Hor. b. 3. od. 11. v. 9.

Note.—The quantity of the penultimate of patrimus and matrimus is undetermined: Facciolatus, the Italian lexicographer, ſays "lis eſt inter grammaticos de quantitate eorum penultimæ, quæ adhuc eſt ſub judice, quia nihil certi afferri adhuc potuit."

5. Other vowels before final *mus* or *mum* are long; as rāmus, rēmus, pōmum, dūmus.

So amōmum, cāmus, cardamōmum, cinnamōmum, dēmum, extrēmus, fūmus, grūmus, hāmus, poſtrēmus, prōmus, racēmus, ſuprēmus, volēmum.

Sylveſtris raris ſparſit labruſca *racēmis*. Virg.

1. Except [1]atŏmus, [2]balsămum, [3]cinnămum, [4]dŏmus, [5]glŏmus, [6]hŭmus, [7]poſtŭmus, [8]thalămus, [9]tŏmus.

2. And words ending in *dromus*, from the Greek δρόμος; as epidrŏmus, hemerodrŏmus.

1. Parvarum ſerie conſtant connexa *atŏmorum*. An.
2. & 3. *Balsămæ* qui ſemper, *cinnămæ* ſemper olet. Mart.
4. Non unquam gravis ære *dŏmum* mihi dextra redibat. Virg.
5. Ut vinoſa *glŏmos* furtivæ Pyrrhia lanæ— Hor.
6. Spargite *hŭmum* foliis, inducite fontibus umbras. Virg.
7. Silvius, Albanum nomen, tua *poſtŭma* proles. Virg.
8. Poſt ubi jam *thalămis* ſe compoſuere, ſiletur. Virg.
9. Scriptura quanti conſtet, et *tŏmus* vilis. Mart.

6. A vowel before final [1]*le*, [2]*lis*, or [3]*les*, is long; as monīle, annālis, mōles.

So ancīle, bovīle, būle, caprīle, cr ăle, focāle, fœnīle, īle, incīle, mantēle, mantīle, ovīle.

And āles, anīlis, aprīlis, civīlis, carduēlis, curūlis, crudēlis, conjugālis, dotālis, exīlis, fidēlis, herīlis, mīles, patruēlis, prōles, quinctīlis, ſubtīlis, ſextīlis, &c. with many others.

1. Et opportuno ſe *bovīli* condidit. Phædr.
2. At qui umbrata gerunt *civīli* tempora quercu. Virg.
3. Tota cohors. Rarus venit in cænacula *mīles*. Juven.

1. Except [1]verbal nouns or adjectives; as agĭlis, amabĭlis, facĭlis, insĭle, miſsĭlis, miſsĭle, utĭlis.

2. And all adjectives in [2]*atĭlis*; as aquatĭlis, fluviatĭlis, plicatĭlis, volatĭlis.

3. Alſo dapsĭlis, [4]dactўlis, [5]gracĭlis, [6]humĭlis, [7]indŏles, [8]parĭlis, [9]ſimĭlis, [10]ſterĭlis, [11]ſubŏles.

1. Nec tibi deliciæ *facĭles*, vulgataque tantum. Ovid.
2. Paſtor agens telis, liquitque *volatĭle* ferrum. Virg.
3. *Dapsĭlis* excepit dictis, Cereremque ferentes. Faliſc.
4. Hinc pedem ſi ceperimus, edere iterum *dactўlum*. Terent.
5. Et *gracĭlis* ſtructos effugit umbra rogos. Ovid.
6. Atque *humĭles* habitare caſas, et figere cervos. Virg.
7. Quid pius Æneas tanta dabit *indŏle* dignum? Virg.
8. —— Et noctes *parĭles* agitare diebus. Lucret.
9. Stes capite obſtipo, multùm *ſimĭlis* metuenti. Hor.
10. Hìc, *ſterĭlem* exiguus ne deſerat humor arenam. Virg.
11. Denſior hinc *ſobŏles*, hinc largi copia lactis. Virg.

7. Adjectives in *inus* derived from nouns ſignifying trees, [2]plants, and ſtones; alſo from adverbs of time, or from ſubſtantives ſignifying the four ſeaſons of the year, ſhorten the penultimate; as fagĭnus, hyacinthĭnus, adamantĭnus, craſtĭnus, diutĭnus, perendĭnus, chimerĭnus, annotĭnus, hornotĭnus: to which add bombycĭnus, elephantĭnus, which ſeem rather to refer to the ſilk and ivory, than to the animals themſelves.

1. Truditur e ſicco radix *oleagĭna* ligno. Virg.
2. Grandia tolluntur *cryſtallĭna*, maxima rurſus. } Juven.
3. *Myrrhĭna*, deinde adamas notiſſimus. }
4. Et lux cum primum terris ſe *craſtĭna* reddet. Virg.
5. Delicias et panniculus *bombycĭnus* urit. Juven.

Except [1]repentīnus, [2]matutīnus, [3]veſpertīnus.

1. Inque *repentīnos* convivia verſa tumultus. Ovid.
2. *Matutīna* parùm cautos jam frigora mordent. Hor.
3. Nec *veſpertīnus* circumgemit urſus ovile. Hor.

Note.—The penultimate of malinus, Ainſworth, as well as every Engliſh lexicographer, has, without any poetic authority, marked long. Facciolatus, however, gives it that quantity, which, as derived from malus, a tree, it certainly ſhould have.

8. All other adjectives and words ending in *īnus* lengthen the penultimate; as canīnus, bīnus, trīnus, feſtīnus, Latīnus, mediaſtīnus.

Vix primos *inopīna* quies laxaverat artus. Virg.

Except [1]asĭnus, [2]comĭnùs, [3]domĭnus, [4]emĭnùs, [5]facĭnus, [6]sĭnus, [7]termĭnus.

1. Suadebat *Asĭno* fugere, ne poſſet capi. Phædr.
2. & 4. *Comĭnus* enſe ferit; jaculo cadit *emĭnùs* ipſe. Ovid.
3. Tum caput ipſi aufert *domĭno*, truncumque relinquit. Virg.
5. Nondum Juſtitiam *facĭnus* mortale fugarat. Ovid.
6. Nunc tantum *sĭnus*, et ſtatio malefida carinis. Virg.
7. Quicumque mundi *termĭnus* obſtitit. Hor.

9. Other vowels before final *nus* and *num* are long; as urbānus, plēnus, dōnum, mūnus.

So ahēnus, fānum, prōnus, prūnus, ſerēnus, venēnum,

num, vānus, and many others; for the nouns and adjectives compriſed by this rule are numerous.

Aut *montāna* ſedet circum caſtella ſub armis. Virg.

Except [1]galbănus, [2]mănus, [3]oceănus, [4]platănus, [5]tympănum; [6]ebĕnus, [7]gĕnus, [8]tĕnus, [9]Vĕnus; [10]bŏnus, [11]ŏnus, [12]sŏnus, [13]tŏnus.

1. Fuſcos colores, *Galbănos* habet mores. Mart.
2. Et *mănus* in gremio languida facta jacet. Ovid.
3. Quid tantùm *oceăno* properent ſe tingere ſoles. Virg.
4. Non ſine natanti *platăno*, lentaque ſorore. Catul.
5. Hinc radios trivere rotis, hinc *tympăna* plauſtris. Virg.
6. Fert *ebĕnum*, ſolis eſt thurea virga Sabæis. Virg.
7. Idne eſt verum? Imò, id *gĕnus* eſt hominum peſſumum. Ter.
8. Eſt quôdam prodire *tĕnus*, ſi non datur ultrà. Hor.
9. Sic *Vĕnus*; at *Vĕneris* contrà ſic filius ortus. Virg.
10. At *bŏna* pars procerum tacitâ libabit acerrâ. Perſius.
11. Tu pueris curre, Parmeno obviàm, atque his *ŏnera* adjuta. Ter.
12. Omnibus auditur.. *Sŏnus* eſt, qui vivit in illâ. Ovid.
13. Tædia dulciſonis auferat illa *tŏnis*. Cato.

10. Words ending in *ino* or *inor* ſhorten the penultimate; as lĭno, fulmĭno, termĭno.

So sĭno, inquĭno, coinquĭno, circĭno, ſemĭno, grandĭno, germĭno, emĭnor, procraſtĭno, comperendĭno; the compounds of căno, as concĭno, and many others.

Nunc *sĭnite*, et placitum læti componite fœdus. Virg.

Except [1]divĭno, [2]omnĭno, [3]propĭno, [4]ſupĭno; alſo [5]clĭno, and its [6]compounds, as acclĭno, inclĭno, proclĭno, reclĭno.

1. Hâc *divĭnavi*, notitiamque tuli. Ovid.
2. Non impulit me, hæc nunc *omnĭnò* ut crederem. Terence.
3. Nemo *propĭnabit*, Calliodore, tibi. Mart.
4. Gramen, et erecto currum temone *ſupĭnant*. Stat.
5. Quare etiam, atque etiam paulum *clĭnare* neceſſe. Lucret.
6. *Inclĭnat* curſus; et eaſdem *circĭnat* auras. Ovid.

11. Other vowels before final *no* or *nor* are long; as māno, exarēno, pōno, Jūno.

So plāno, trāno, ſerēno, dōno, cōnor, and ſeveral others.

Hâc te nos fragili *dōnabimus* ante cicutâ. Virg.

Except [1]cănо, [2]rĕno, [3]hŏnor, [4]sŏno, and [5]tŏno.

1. Sicelides Muſæ, paullo majòra *cănamus*. Virg.
2. Sed juremus in hæc; ſimul imis ſaxa *rĕnarint*. Hor.
3. Sed cum ſummus *hŏnor* finito computet anno. Juven.
4. Te lyra pulſa manu, te carmina noſtra *sŏnabunt*. Ovid.
5. Cum *tŏnat*, exanimes primo quoque murmure cœli— Juven.

12 A vowel before final *na* is long; as lāna, vēna, ſpīna, nōna, Lūna, rāna, arēna, arvīna, carīna.

Hîc *regīna* gravem gemmis auroque popoſcit. Virg.

Except [1]advĕna, [2]buccĭna, [3]domĭna, [4]gĕna, fiſcĭna, [6]fœmĭna, [7]machĭna, [8]pagĭna, [9]ſarcĭna, [10]tibicĭna, [11]trutĭna.

1. Non tamen hoſpes eris, nec jam potes *advĕna* dici. Mart.
2. Sed qui ſermones? Quæ fœdæ *buccĭna* famæ? Juven.
3. Concurrunt trepidæ comites, *domĭnamque* recentem— Virg.
4. Pendenteſque *gĕnas*, et tales aſpice rugas. Juven.
5. Preſſaque flammeola rumpatur *fiſcĭna* caltha. Col.
6. *Fœmĭna* palantes agit, atque hæc agmina vertit? Virg.
7. Aut hæc in noſtros fabricata eſt *machĭna* muros. Virg.
8. Quam ſibi quæ Vari præſcripſit *pagĭna* nomen. Virg.
9. Muli gravati *ſarcĭnis* ibant duo. Phædr.
10. Ebria nos madidis rumpit *tibicĭna* buccis. Mart.
11. Si volet, hac lege in *trutĭna* ponetur eadem. Hor.

13. A vowel before final [1]*ne*, [2]*ni*, [3]*nes*, [4]*nis*, is long; as mānē, sēni, mānes, fīnis.

So bulbīne, anemōne, confīne, pēne; bīni, lucāni, antepilāni, quīni, ſeptēni, octōni, novēni, dēni, vicēni, ducēni, and other numerals in *ēni*; ſo fūnis, acclīnis, inclīnis, inānis, commūnis, immūnis, commūnis, immūnis, &c.

1. Et quæ *mānè* refert, et quæ ſurgentibus aſtris. Virg.
2. Bis *dēnas* Italo texamus robore naves. Virg.
3. Quòd vivis: *cīnis*, et *mānes* et fabula fies. Perſ.
4. O curas hominum! O quantum eſt in rebus *inānе!* Perſ.

Except [1]bĕne, [2]sĭne, [3]pĕnes, [4]cănis, [5]cĭnis, [6]juvĕnis; and [7]nouns derived from μαίνομαι, as hippomănes, trichomănes.

1. Vivitur parvo *bĕne*, cui paternum— Hor.
2. Mollia cum duris, *sĭne* pondere habentia pondus. Ovid.
3. Me *pĕnes* eſt unum vaſti cuſtodia mundi. Ovid.
4. Sic *cănibus* catulos ſimiles, ſic matribus hædos. Virg.
5. For *cĭnis*, ſee verſe 3. under the above rule.
6. Clamoſus *juvĕnem* pater excitat; accipe ceras. Juven.
7. *Hippomănes*, quod ſæpè malæ legêre novercæ. Virg.

14. A vowel before final [1]*nea*, [2]*neo*, [3]*nia*, [4]*nio*, [5]*nius*, and [6]*nium*, is long; as līnea, cāneo, mūnia, pūnio, favōnius, ſcrīnium.

So arānea, gāneo, declīneo, delīneo, līneo, cicōnia, insānia, Irōnia, colōnia, alcedōnia, lacīnia, querimōnia, delēnio, exināmio, fīnio, insānio, mūnio, confīnium, patrimōnium, vadimōnium, and many others.

1. In foribus laxos ſuſpendit *arānea* caſſes. Virg.
2. Carpamus: dum manè novum, dum gramina *cānent*. Virg.
3. Sævit amor ferri, et ſcelerata *insānia* belli. Virg.
4. Oppida cœperunt *mūnire*, et ponere leges. Hor.
5. Primo reſtituent vere *Favōnii*. Hor.
6. Pullati proceres, differt *vadimōnia* prætor. Juven.

1. Except [1]caſtănea, [2]tĭnea, [3]măneo, [4]mĭneo, [5]mŏneo, [6]tĕneo.

2. Alſo [7]ignomĭnia, [8]vĕnia, [9]lĭnio, [10]lănio, [11]vĕnio.

1. *Caſtănеæ* molles, et preſſi copia lactis. Virg.
2. Aut *tĭneas* paſces taciturnus inertes. Hor.
3. Quæ finis? Aut quod me *măneт* ſtipendium. Hor.
4. Inclinata *mĭnent* in eandem prodita partem. Lucret.
5. Aliquid *mŏneat*, ut illa, quæ te ſcire credas, neſcias. Ter.
6. Utque viam *tĕneas*, nulloque errore traharis. Ovid.
7. Multa gemens, *ignomĭniam*, plagaſque ſuperbi. Virg.
8. Orantes *vĕniam*, et templum clamore petebant. Virg.
9. Neve tua Medæ *lĭniantur* cæde ſagittæ. Propert.
10. *Quin lănient* mundum; tanta eſt diſcordia fratrum. Ovid.
11. Momento cita mors *vĕnit*, aut victoria læta. Hor.

15. A vowel before final *do* is long; as vādo, cēdo, formīdo, rōdo, teſtūdo.

So rādo, crēdo, alcēdo, dulcēdo, cupīdo, crepīdo, nōdo, cūdo, lūdo, altitūdo, beatitūdo, and many others; for the nouns and verbs compriſed by this rule are very numerous.

Poſſe putes illos ſicco freta *rādere* paſſu. Ovid.

Except [1]cădo, [2]dīvĭdo, [3]trepĭdo; and [4]rŭdo[5], which is common; and [6]ĕdo, to eat; ēdo, to declare, publiſh, &c. (the prepoſition *ē* being long,) follows the above rule.

1. Multa renaſcentur, quæ jam cecidere, *cădentque*. Hor.
2. *Divĭdimus* muros, et mœnia pandimus urbis. Virg.
3. Cùm ſubitò *trepĭdare* intus præcordia ſenſi. Ovid.
4. Findor: ut Arcadiæ pecuaria *rūdere* credas. Perſ.
5. Incluſumque cavo ſaxo, atque inſueta *rŭdentum*. Virg.
6. Ut verò eſt expulſa quies; furit ardor *ĕdendi*. Ovid.

16. E before final *rus*, *ra*, *rum*, is ſhort; as mĕrus, hedĕra, cætĕrum.

The nouns and adjectives compriſed by this rule are numerous.

Ite domum ſaturæ, venit *Heſpĕrus*, ite capellæ. Virg.
Certum eſt, in ſylvis, inter ſpelæa *fĕrarum*. Virg.

1. Except

1. Except [1]auſtērus, [2]galērus, [3]plēruſque, [4]sērus, [5]ſevērus, [6]vērus; [7]pēra, [8]cēra, and [9]ſincērus, from ſine cērâ.

2. And though of anthēra, œnothēra, ſtatēra, there is no poetic ſanction, they are long by derivation from ἀνθηρα, θηρευω, and ϛατηρα, ſo panthēra (Virg. Æn. 8. 460.) from θηρ.

1. Qui volet *auſtēros* arte ferire viros. Prop.
2. Bina manu, fulvoſque lupi de pelle *galēros*. Virg.
3. *Plēraque* differat, et præſens in tempus omittat. Hor.
4. *Sērus* in offenſam rettuleritque pedem. Tibul.
5. Cum ſit triſte habitu, vultuque et veſte *ſevērum*. Juven.
6. *Vērùm*, quid facias? Ut homo eſt, ita morem geras. Ter.
7. *Pēras* impoſuit Jupiter nobis duas. Phædr.
8. Limus ut hîc durescit, et hæc ut *cēra* liquescit. Virg.
9. Enſe recidendum; ne pars *ſincēra* trahatur. Ovid.

17. Other vowels before final [1]*rus*, [2]*ra*, [3]*rum*, are long; as cārus, mīrus, mōrus, mūrus; hāra, ſpīra, ōra, natūra, lōrum, &c.

So āra, tiāra, īra, līra, hōra, aurōra, lōra, manticōra, prōra, captūra, figūra, censūra; alſo the nouns, adjectives, and participles in *rus*, &c. are very numerous.

1. Exultans rorem latè diſpergit *amārum*. Virg.
2. Vela legunt ſocii, et *prōras* ad littora torquent. Virg.
3. Puniceo tingit pendentia *mōra* colore. Ovid.

1. Except [1]barbărus, [2]cammărus, [3]camŭrus, [4]canthărus, [5]chŏrus, [6]helleborus, [7]nŭrus, [8]opipărus, [9]ovipărus, [10]ſpărus, [11]Tartărus, [12]tŏrus.

2. Alſo [13]anchŏra, [14]cithăra, [15]mŏra, [16]purpŭra, [17]philўra.

3. And the following in *rum*; [18]fŏrum, [19]ſuppărum, [20]gărum, [21]părùm.

4. Alſo the [22]compounds of *vŏro*, as carnivŏrus, omnivŏrus; thoſe ending in [23]*phŏrus* and *phŏra*, from φερω, as amphŏra, canephŏra, echphŏra, phoſphŏrus, ciſtophŏrus, &c.; and the derivatives of ἄργυρος, as hydrargўrum, lithargўrus.

1. *Barbărus* hîc ego ſum, quia non intelligor ulli. Ovid.
2. Sed tibi dimidio conſtrictus *Cammărus* ovo. Juven.
3. Pes etiam et *camŭris* hirtæ ſub cornibus aures. Virg.
4. Et gravis attritâ pendebat *canthărus* ansâ. Virg.
5. Doctus et Phœbi *chŏrus*, et Dianæ. Hor.
6. Scillamque, *helleborosque* graves, nigrumque bitumen. Virg.
7. Si qua tibi *nŭrus* eſt, ſi qua eſt tibi filia, voces. Ovid.
8. Vino ornamentis *opipărisque* opſoniis. Plaut.
9. Præpinguis teres, *ovipăra* congeſtior alvo. Auſon.
10. Agreſtiſque manus armat *ſpărus*: vertitur ipſe. Virg.
11. *Tartăra* Panthoiden iterum Orco— Hor.
12. Proximus ut viridante *tŏro* conſederat herbæ. Virg.
13. *Anchŏra* jam noſtram non tenet ulla ratem. Ovid.
14. Non ſtudio *cithăræ*, nec Muſæ deditus ulli. Hor.
15. Troja cadet; ſed erit noſtri *mŏra* longa laboris. Ovid.
16. Per hoc inane *purpŭræ* decus precor. Hor.
17. Diſplicent nexæ *philўrâ* coronæ. Hor.
18. Inſanumque *fŏrum*, aut populi tabularia vidit. Virg.
19. *Suppăra* nudatos cingunt anguſta lacertos. Lucret.
20. Preſſit cella, *gărо* de ſuccis piſcis Iberi. Hor.
21. Matutina *părùm* cautos jam frigora mordent. Hor.
22. Mittere *carnivŏris* præberi pabula mandat. An.
23. *Phoſphŏre* redde diem; quid gaudia noſtra moraris? Mart.
24. *Amphŏra* non meruit tam pretioſa mori. Mart.

18. E before final *ro* or *ror* is ſhort; as fĕro, gĕro, tĕro.

So tempĕro, aſpĕro, blatĕro, cætĕrò, capĕro, celĕro, conſidĕro, deſidĕro, ſcelĕro, propĕro, sĕro (to ſow), quĕror, &c.

Verùm, quid facias? ut homo eſt, ita morem *gĕras*. Ter.

Except [1]ſpĕro; [2]aſſevĕro and [3]perſevĕro from ſevērus, and the adverb [4]sĕrò from sērus; for sĕro, to ſow, is ſhort.

1. *Spēret* idem, ſudet multùm fruſtràque laboret. Hor.
2. Profitebitur, jurabit, *aſſevērabit*. Scaz.
3. Poſt manes tumulumque *perſevēret*. Mart.
4. Verùm. Age modò hodie: *sērò* ac nequidquam voles. Ter.

19. Other vowels beforè final *ro* or *ror* are long; as vāro, ſpīro, ōro, ūro.

So līro, tīro, inquīro, acquīro, conquīro, plōro, labōro, auctōro, ignōro, cūro, figūro, lūror, dūro, and many others.

Delicias et panniculus bombycinus *ūrit*. Juven.

1. Except [1]ărо, [2]cărо, [3]fŭro, [4]hilărо, [5]infŏro, [6]mŏror, [7]părо, [8]ſatŭro, [9]vŏro.

2. Alſo the [10]derivatives from genitives increaſing ſhort in *ŏris* or *ŭris*; as decŏro, murmŭro, from decusŏris, murmur-ŭris.

So memŏro from memor-ŏris; corpŏror from corpusŏris; robŏr from robus-ŏris; exaugŭro from augurŭris; fulgŭro from fulgur-ŭris; expectŏro from pectus-ŏris.

1. Littus *ărant*, Rutuloſque exercent vomere colles. Virg.
2. Sed malè viva *cărо* eſt. Lambendo mater in artus— Ovid.
3. Quid *fŭris?* Aut quonam noſtri tibi cura receſſit. Virg.
4. Hos ubi facundo tua vox *hilărаverat* ore. Ovid.
5. Licètne *infŏrare*, ſi incomitiare non licet? Plaut.
6. Quid vitam *mŏror* inviſam, Pallante perempto. Virg.
7. Umbras, et cœlo diffundere ſigna *părabat*. Hor.
8. Qua *ſatŭrat* Calabris culta Galeſis aquis? Mart.
9. Optima ſylvarum interea, pelagique *vŏrabit*. Juven.
10. Et validas auget vires, et *robŏrat* ictum. Lucret.

20. Words ending in [1]*atus*, [2]*etus*, [3]*otus*, [4]*utus*, lengthen the penultimate; as probātus, cētus, tōtus, tūtus.

So grātus, facētus, bolētus, pōtus, agrōtus, argūtus, aſtūtus, brūtus, hirsūtus, mūtus, and many others; alſo participles in *ātus*, *ētus*, *ōtus*, and *ūtus*, as mandātus, decrētus, nōtus, minūtus, metūtus, conſtitūtus, volūtus, &c.

1. O *fortunātos* nimium, ſua ſi bona norint! Virg.
2. Tu rem impeditam et perditam reſtituas? hem! quo *frētus* ſum. } Ter.
3. Facilè omnes, cum valemus, recta conſilia, *ægrotis* damus. } Ter.
4. *Tūta* manent; mediis Tanaïs fumavit in undis. Ovid.

1. Except [1]cătus, [2]lătus-ĕris, [3]ſtătus-ûs; [4]impĕtus, [5]mĕtus, [6]vĕtus; and [7]antidŏtus.

2. [8]Venĕtus is ſhort by derivation from Venĕtiæ; [9]quŏtus from quŏt; [10]tŏtus (ſo great), from tŏt, for tōtus is long; and [11]arbŭtus from arbor-arbŏris.

3. Of dicrŏtum, and automătus from automăton, there is no poetic authority.

4. Except alſo the plural genitives of nouns ending in ma-mătis; as poemătum.

5. And the participles dătus, rătus, sătus, ſtătus; for which ſee the rule concerning diſſyllabic ſupines.

1. Me plus ſapere quàm vos, dederim vobis conſilium *cătum*. Plaut.
2. Impulit in *lătus*, et venti, velut agmine facto— Virg.
3. Et enim verò quoniam formam cepi hujus in me et *ſlătum*. Plaut.
4. Æquora; ſic illam fert *impĕtus* ipſe volantem. Virg.
5. Necdum eſt ille dolor, ſed jam *mĕtus* incubat amens. Lucan.
6. Et *vĕtera* oblitis jura referre foris. Propert.
7. Et venditaret falſo *antidŏtum* nomine. Phædr.
8. Sic *Venĕtus* ſtagnante Pado, ſuſóque Britannus— Lucan.
9. & 10. Nec *tŏta* pars homo terrai, *quŏta tōtius* unus. Lucret.
11. Inſeritur verò ex fœtu nucis *arbŭtus* horrida. Virg.

21. Words ending in *itus* lengthen the penultimate; as aurītus, crinītus, invītus, perītus.

Fac jam tu, præco, nunc omnem *aurītum* populum. Plaut.

1. Except

1. Except [1]anhelĭtus, [2]ſervĭtus, [3]ſpirĭtus, and [4]ſuſpirĭtus.

2. Alſo [5]all adverbs in *ītùs;* as humanĭtùs, penĭtùs.

3. [6]Blĭtum is not derived from the termination *itus*, but from *βλιτον*, and therefore ſhortens the penultimate.

4. Alſo polyſyllablic participles in *itus*, not derived from preterites in *īvi;* as habĭtus, exercĭtus-a-um, and nouns derived from them; as habĭtus-ûs, and exercĭtus-ûs.

5. And the participles from the verb eo, and its compounds; as tranſĭtus-a-um, and their derivatives; as tranſĭtus-ûs; the participle ambĭtus is, however, long, and the noun ambĭtus-ûs ſhort.

1. & 4. Simul enunciato *ſuſpirĭtûs.* Vix ſuffero, hercle, *anhelĭtum.* — Plaut.
2. Apud me juſta et clemens fuerit *ſervĭtus.* — Ter.
3. Dum memor ipſe mei, dum *ſpirĭtus* hos reget artus. — Virg.
5. Inſequor, et cauſas *penĭtùs* tentare latentes. — Virg.
6. Apponunt rumicem, braſſicam, betam, *blĭtum.* — Plaut.

For the 4th and 5th exceptions, ſee the rules for polyſyllabic ſupines.

22. A vowel before final [1]*men*, [2]*mens*, [3]*mentum*, is long; as levāmen, clēmens, āmentum.

So acūmen, crīmen, flāmen, flūmen, grāmen, jurgāmen, volūmen, argūmentum, jūmentum, atrāmentum, and many others; the nouns compriſed by this rule being numerous.

1. *Flūminibus* ſalices, craſſique paludibus alni. — Virg.
2. Ego hanc *clēmentem* vitam, urbanum, atque otium. — Ter.
3. *Strāmenta* deſunt. Tollere hæc aranea. — Phædr.

1. Except [1]tămen, [2]colŭmen, [3]hўmen, [4]elĕmentum.

2. Alſo [5]alĭmentum, [6]docŭmen or docŭmentum, [7]emolŭmentum, [8]monĭmentum or monŭmentum, [9]regĭmen, [10]ſpecĭmen, [11]tegĭmen or tegŭmen and integŭmentum.

3. And ſuch verbs as frĕmo, gĕmo, &c. will naturally ſhorten the penultimate of frĕmens, gĕmens, &c.

Note.—The irregularity of ſuch words as monĭmentum, docŭmentum, &c. has been conſidered as ariſing from the ſupine of the ſecond or third conjugation; which originally, before the effect of ſyncope, is ſuppoſed to have generally been in *ĭtum;* as moneo, monĭtum, monĭmentum; doceo, or dokeo, dokitum, and by ſyncope dok'-tum or doctum; whence dokĭmentum or docŭmentum, &c. But if theſe verbal nouns were primitively deducible from their ſupines, many of them muſt have ſubſequently aſſumed the characteriſtic of the infinitive preſent, as the *g* of regimen and tegimen will teſtify. See Salmon's Stemmata Latinitatis on the terminations *men* and *mentum*.

1. Sed *tămen* iidem olim curru ſuccedere ſueti. — Virg.
2. Bone cuſtos, ſalve; *colŭmen* verò familiæ. — Ter.
3. Vulgus *Hўmen Hўmenæe* vocat, fugit ille vocantes. — Ovid.
4. Doctores, *elĕmenta* velint ut diſcere prima. — Hor.
5. Atque ipſæ vitiis ſunt *alĭmenta* vices. — Ovid.
6. Et *docŭmenta* damus, qua ſimus origine nati. — Ovid.
7. Nullus in urbe locus, nulla *emolŭmenta* laborum. — Juven.
8. Hic dabat, hæredes *monĭmentum* ne ſequeretur. — Hor.
9. In quo conſilium vitæ, *regĭmenque* locatum eſt. — Lucret.
10. Hocc' etiam in primis *ſpecĭmen* verum eſſe videtur. — Lucret.
11. Iſtæc ego mihi ſemper habui ætati *tegŭmentum* meæ. — Plaut.

23. A vowel before final [1]*ma*, [2]*mes*, [3]*mis*, is long; as hāma, līmes, ſublīmis.

So agēma, dāma, fāma, plūma, poēma, rīma, rūma, sīma, ſquāma, ſpūma, ſtrūma, fōmes, trāmes, illīmis, cōmis, sēmis, deplūmis, decirēmis, quadrirēmis, quinquerēmis, infāmis, and many others in each of theſe terminations.

1. Cum canibus timidæ venient ad pocula *dāmæ.* — Virg.
2. Excitat invalidas admoto *fōmite* flammas. — Lucan.
3. *Sublīmes* in equis redeunt, pacemque reportant. — Virg.

1. Except [1]cŏma, [2]cŏmes, [3]cucŭmis, [4]fămes, [5]incolŭmis, [6]lacrўma, [7]nĭmis, [8]pyrămis.

2. Alſo the [9]derivatives[10] of anĭmus and decĭmus; as anĭma, exanĭmis, decĭma or decŭma.

3. [11]Dynămis and [12]endrŏmis have their penultimate regulated by the Greek ſhort *α* and *ο*; as *δύναμις, ἐνδρομὶς.*

1. *Cōmuntur* noſtræ, matre jubente, *cŏmæ.* — Ovid.
2. Jamque *cŏmes* ſemper magnorum prima malorum. — Lucan.
4. Sæva *fămes* aderat: nulloque obſeſſus ab hoſte. — Lucan.
3. Cæruleus *cucŭmis*, tumidoque cucurbita ventre. — Propert.
5. Fecit; et *incolŭmis* lætor quòd vivit in urbe. — Hor.
6. Cogat et invitam *lacrўmas* ſiccare cadentes. — Propert.
7. Fortuna multis dat *nĭmis*, ſatis nulli. — Mart.
8. Non mihi *pyrămidum* tumulis evulſus Amaſis. — Lucan.
9. Tantùm *anĭmas*, nobis *anĭmum* quoque; mutuus ut nos. — Juven.
10. Tibi propino *decŭma* fonte: tibi tutè unde, ſi ſapis. — Plaut.
11. *Dynămin* domi habent maximam. — Plaut.
12. Dona peregrinam mittimus *endrŏmida.* — Mart.

Note.—Ainſworth refers to Plaut. Trinum. 3. 3. 15. for colŭmis: Taubmanni edit. anno 1621, has "Columen te ſiſtere illi, et detraxe autument." The editions of Lambinus and Camerarius have alſo colŭmen, according to the moſt ancient MSS. and editions. Facciolatus conſiders colŭmis to be of doubtful authority: it cannot, therefore, be admitted as an exception to this rule. For columen, ſee rule 22, No. 2.

24. I or Y, or a vowel derived from the ſhort increment of the genitive, before final *mo* or *mor*, is ſhort; as anĭmo, æſtĭmo, decĭmo, lacrўmo, and hiĕmo from hiems-ĕmis.

Quo redit ad faſtos, et virtutem *æſtĭmet* annis. — Hor.

Except [1]līmo and [2]rīmor.

1. *Līmat* non odio obſcuro morſuque venenant. — Hor.
2. Dulcibus in ſtagnis *rimantur* prata Caïſtri. — Virg.

25. Other vowels before final *mo* or *mor* are long; as clāmo, nēmo, prōmo, sūmo.

So fāmo, ſquāmo, tēmo, dēmo, poſtrēmo, fūmo, irrūmo, ſpūmo, rūmor, &c.

Excutit et longe lapſum *tēmone* relinquit. — Virg.

Except [1]ămo, [2]autŭmo, [3]crĕmo, [4]dŏmo, [5]ĕmo, [6]frĕmo, [7]gĕmo, [8]hŏmo, [9]prĕmo, [10]trĕmo, [11]tŭmor, [12]vŏmo.

1. Votum in *ămante* novum; vellem, quod *ămamus* abeſſet. — Ovid.
2. Neque ſe id pigere, et deinde facturum *autŭmat.* — Ter.
3. Atque omnem ornatum, flammâ crepitante, *crĕmari.* — Virg.
4. Non anni *dŏmuere* decem, non mille carinæ. — Virg.
5. Si quis *ĕmat* citharas, emptas comportet in unum. — Hor.
6. Poſt tergum nodis, *frĕmit* horridus ore cruento. — Virg.
7. Parte flagellari *gĕmuit* ſua robora caudæ. — Ovid.
8. *Hŏmo* ſum; humani nihil à me alienum puto. — Ter.
9. Ignoſci; *prĕmit* ille graves interritus iras. — Lucan.
10. Tempeſtas concuſſa *trĕmit*, *frĕmituſque* moventur. — Lucret.
11. Cuſtodum et nullo ſepta *tŭmore*, placet. — Propert.
12. Mane ſalutantum totis *vŏmit*-ædibus undam. — Virg.

Note.—Comŏ-ĕre follows the general rule; but cŏmo-āre, a verb *ſeldom* uſed, ſhortens the penultimate: both are derived from cŏma.

26. A vowel before final *lo* or *lor* is long; as cālo, cēlo, pīlo, sōlo.

So hālo, mālo, vēlo, sīlo, nōlo, pālor, sōlor, peculor, and ſeveral others.

Excipit, ac feſſos opibus *sōlatur* amicis. — Virg.

1. Except [1]ălo, [2]călor, [3]cŏlor, dŏlo ([4]noun or [5]verb), [6]dŏlor, [7]mŏlo, [8]ventĭlo, [9]vŏlo, and [10]cŏlo-ĕre, to cultivate, but [11]cōlo-are, to filter, follows the general rule.

2. Alſo the penultimate of [12]conſŭlo is ſhort, from conſul-ŭlis; ſo [13]gĕlo from gĕlu, and [14]aſſimĭlo from ſimĭlis.

3. Except alſo [15]verbs in *ulo* or *ulor*, which are generally derived from diminutives in *ulus*; as circŭlo, circŭlor, from circŭlus.

1. Tutius et geminos anxia mater *ăllit*. Propert.
2. Et *călor* extremus primo cum frigore mixtus. Lucret.
3. Mille trahens varios adverſo Sole *cŏlores*. Virg.
4. Pila manu, fæveſque gerunt in bella *dŏlones*. Virg.
5. Materiemque *dŏlare*, levare ac radere tigna. Lucret.
6. Nulla fides damnis, veriſque *dŏloribus* adſit. Hor.
7. *Mŏlendum* uſque in piſtrino; vapulandum; habendæ compedes. Ter.
8. *Ventĭlet* æſtivum digitis ſudantibus aurum. Juven.
9. Cæpere: alternos Muſæ meminiſſe *vŏlebant*. Virg.
10. Ignem Trojanum, et Veſtam *cŏlit* Alba minorem. Juven.
11. Et *cŏlare* vagos inductis retibus amnes. Manil.
12. Utrique; id oro te, in commune ut *conſŭlas*. Ter.
13. Nec Pallas ſpectare poteſt: vultuſque *gĕlaſſent*. Lucan.
14. Grandia ſi parvis *aſſimĭlare* licet. Ovid.
15. Licèt ſuperbus *ambŭles* pecuniâ. Hor.

Note.—Ainſworth has bombĭlo, which ſhould be bombīto. See Facciolatus.

27. A vowel before final [1]*bes* and [2]*ges* is long; as nūbes, ambāges.

So lābes, tābes, pūbes, compāges, impāges, ſtrāges, frūges, &c.

1. Sub pedibus videt *nūbes* et ſidera Daphnis. Virg.
2. Jam catervatim dat *ſtrāgem* atque aggerat ipſis. Virg.

Except [1]hĕbes, [2]indĭges, [3]lĕbes, [4]sĕges, and [5]tĕges.

1. Utque *hĕbeti* pectus tantummodo contudit ictu. Ovid.
2. Dîi patrii *indĭgetes* et Romule Veſtaque mater. Virg.
3. Tertia dona facit geminos ex ære *lĕbetes*. Virg.
4. Illa *sĕges* demum votis reſpondet avari. Virg.
5. Inſtitor hybernæ *tĕgetis*, niveique cadurci. Juven.

28. A vowel before final [1]*des* and [2]*pes* is ſhort; as fīdes, tăpes.

So analectĭdes, anterĭdes, hyădes, pleiădes, sŭdes, and all maſculine patronymics, according to the firſt rule; ſo alſo ăpes, dăpes, trăpes, and the following compounds of pes, bĭpes, trĭpes, quadrŭpes, centĭpes, antipŏdes, celerĭpes, gracilĭpes, alĭpes, levĭpes, ſonĭpes, cornĭpes, ignĭpes, longĭpes, lorĭpes, palmĭpes, ſolidĭpes, caprĭpes, &c.

1. Mens bona, fama, *fides*, hæc clarè, et ut audiat hoſpes. Perſ.
2. Inſtratos oſtro *alipedes* pictĭque *tăpetis*. Virg.

1. Except [1]clādes, [2]sēdes, rūpes, [4]sēpes, and [5]stīpes.

2. And though we are without poetic authority for carcinōdes, caulōdes, horminōdes, yet their penultimate is evidently long from the Greek ω; ſo epōdes; as καρκινώδες, καυλώδης, ἑρμινῶδης, ἐπώδης.

1. *Clădibus* irruimus nocturaque poſcimus arma. Lucan.
2. Ducit ad infernas per multa ſilentia *sēdes*. Ovid.
3. Ille, velut pelagi *rūpes* immota reſiſtit. Virg.
4. Texendæ *sēpes* etiam, et pecus omne tenendum eſt. Virg.
5. *Stīpitibus* duris agitur *sŭdibuſque* præuſtis. Virg.

Note.—The claſſical exiſtence of trūdes ſeems not to be ſatisfactorily proved: Ainſworth and Facciolatus cite only one authority, Tacit. Ann. 3. 46, where commentators propoſe sūdes, as a better reading.

29. A vowel before final [1]*dex*, [2]*dix*, [3]*lex*, [4]*mex*, [5]*nix*, or [6]*rex*, is long; as cōdex, rādix, īlex, cīmex, jūnix, cārex.

So jūdex, lōdix, ſpādix, hālex, pūlex, pūmex, rāmex, tōmex, rēmex, mūrex, sōrex, &c.

1. Inde porrò ad puteum, atque ad robuſtum *cōdicem*. Plaut.
2. Pronus ab arboreâ cecidit *rādice* retentus. Ovid.
3. Procumbunt piceæ, ſonat icta ſecuribus *īlex*. Virg.
4. Cui domus et dulces latebroſo in *pūmice* nidi. Virg.
5. Quàm mox horſum ad ſtabulum *jūnix* recipiat ſe è pabulo. Plaut.
6. Et Calabrum coxit vitiato *mūrice* vellus. Perſ.

Except [1]cŭlex, [2]sĭlex, and [3]rŭmex.

1. Tota abit hora. Mali *cŭlices*, ranæque paluſtres. Hor.
2. Spem gregis, ah! *sĭlice* in nudâ connixa reliquit. Virg.
3. Apponunt *rŭmicem*, braſſicam, betam, blitum. Plaut.

Note.—Alex, in the beſt authors and editions, is read ălec, and is therefore no exception to this rule.

30. A vowel before final [1]*per* and [2]*ter* is ſhort; as sŭper, arbĭter.

So ăper, căper, ĭter, lăter, accipĭter, diamĕter, păter, Jupĭter, Dieſpĭter, and all adverbs in *ter*; as alĭter, amplĭter, acrĭter, celerĭter, and many others.

1. Dum juga montis *ăper*, fluvios dum piſcis, amabit. Virg.
2. Non locus effuſi latè maris *arbĭter*, auſert. Hor.

1. Except [1]nūper, [2]āter, [3]frāter, [4]māter, [5]crāter, [6]dēter, [7]tēter.

2. Uter-tra-trum follows the general rule; but [8]ūter-tris, a bag, lengthens the penultimate.

3. Alſo [9]sōter from σωτηρ, of which the poets give no example, except through its derivative sōteria.

1. Nunc huc remiſit *nūper* ad me epiſtolam. Plaut.
2. Calculus immitem dimittitur *āter* in urnam. Ovid.
3. Cui volet, importunus ebur; *frāter*, *păter*, adde. Hor.
4. Cui *māter* mediâ ſeſe tulit obvia ſylvâ. Virg.
5. Tum *păter* Anchiſes magnum *crātera* coronâ. Virg.
6. Nam *dēteriores* omnes ſumus licentiâ. Ter.
7. *Tēter* ut immundæ carnis abiret odor. Mart.
8. Mollibus in pratis unctos ſaliere per *ūtres*. Virg.
9. Nam quoties ſurgis, *sōteria* poſcis amicos. Mart.

31. A vowel before final [1]*ba*, [2]*bo*, [3]*pa*, [4]*po*, is ſhort; as făba, bĭbo, săpa, nuncŭpo.

So jŭba, ſyllăba, cĭbo, prŏbo, glŏbo, cŭbo, arrhăbo, ſcăbo, nĕpa, lŭpa, pŏpa, upŭpa, alăpa, crĭpa, legicrĕpa, metŏpa, crĕpo, ſtrĕpo, căpo, occŭpo, emancĭpo, particĭpo, anticĭpo, &c.

1. Denſa *jŭba*, et dextro jactata recumbit in armo. Virg.
2. Non auro, myrrhaque *bĭbunt*: ſed gurgite puro. Lucan.
3. Et Laletanæ nigra lagena *săpæ*. Mart.
4. Adſidet, et totum prope ſaucibus *obcŭpat* amnem. Lucret.

Except [1]glēba, [2]ſcrība, [3]ſcrībo, [4]lībo, [5]nūbo, [6]būbo, [7]cēpa, [8]rāpa, [9]ſcōpa, [10]clēpo, [11]stīpo.

1. Liquitur, et Zephyro putris ſe *glēba* reſolvit. Virg.
2. Linquimus, inſani ridentes præmia *ſcrībæ*. Hor.
3. Sumite materiam veſtris, qui *ſcrībitis* æquam. Hor.
4. Purpureoſque metunt flores, et flumina *lībant*. Virg.
5. Iis *nūbant*, et illos ducere eadem hæc lex jubet. Ter.
6. Solaque culminibus ferali carmine *būbo*. Virg.
7. Cædenda eſt hortis eruta *cēpa* meis. Ovid.
8. Hæc tibi brumali gaudentia frigore *rāpa*. Mart.
9. Vilibus in *ſcōpis*, in mappis, in ſcobe, quantus. Hor.
10. Qui hæc habent conſilia; ubi data occaſio eſt, rape, *clēpe*, tene, harpaga. Plaut.
11. *Stīpant*, et liquido diſtendunt nectare cellas. Virg.

Note.—Cūpa, ſtūpa, and pūpa, are ſometimes more properly ſpelled cuppa, ſtuppa, puppa; ſince this latter orthography deſignates their quantity, and is more conſiſtent with their derivation from κυβέα, (French couppe,) σύστασις, &c. Cōpa and cōpo ſeem corrupted readings for caupo, which the more accurate editions ſubſtitute.

32. A vowel before final *ga* is long; as ſtēga.

So aurīga, bīga, quadrīga, collēga, sāga, pȳga, rūga, ſanguisūga, ſolipūga, &c.

At Novius *collēga* gradu poſt me ſedet uno. Hor.

Except [1]calīga, [2]offifrăga, [3]tŏga, and the [4]derivatives of fŭgo, as fŭga, perfŭga, lucifŭga, lucrifŭga.

1. Cæſar cognomen *calĭgæ* cui caſura dederunt. Auſon.
2. Adcipitres, atque *oſſifrăgæ*, mergeique, marinis. Lucret.
3. Lis numquam, *tŏga* rara, mens quieta. Mart.
4. Quâ venti incubuere, *fŭgam* dant nubila cœlo. Virg.

33. A vowel before final *go* is long; as imāgo, orīgo, inſtīgo.

So ærūgo, rūgo, aurīgo, fulīgo, compāgo, cartilāgo, conſilīgo, calīgo, fīgo, ūīgo, heſperūgo, sūgo, ſuffrāgo, &c.

Adſpirate meis, primâque ab *orīgine* mundi. Ovid.

1. Except [1]ĕgo, [2]fŭgo, [3]harpăgo, lĭgo ([4]noun or [5]verb), [6]rĕgo, [7]rĭgo, [8]rŏgo, [9]ſtrĭgo, [10]tĕgo.

2. Alſo [11]congrĕgo is ſhort, from grex-grĕgis; and [12]jŭgo, from jŭgum.

3. [13]Lĕgo-ere of the third conjugation ſhortens the penultimate; but [14]lēgo-are, of the firſt, lengthens it.

4. Except alſo [15]ăgo, and its [16]compounds; as nĕgo, navĭgo, litĭgo, mitĭgo, &c. It is to be obſerved, however, that when the [17]compound has been formed by ſyncope or craſis, the penultimate, according to the rule for contracted ſyllables, becomes long; as fatīgo, from fatum or affatim and ago; indāgo, from inde and ago; farrāgo, from farre and ago; vertīgo, from vertendo and ago; caſtīgo, from caſtum and ago; dēgo, from de and ago, &c.

1. & 12. Quas *ĕgo* non gentes, quas non face corda *jŭgavi*. Stat.
2. Trans pontum *fŭgat*, et terris immittit apricis. Virg.
3. Conſulit blandiloquentulus, *harpăgo*, mendax, cuppes, avarus. Plaut.
4. Longis purgare *lĭgonibus* arva. Ovid.
5. Diſſociata locis concordi pace *lĭgavit*. Ovid.
6. Pacatumque *rĕget* patriis virtutibus orbem. Virg.
7. Prata *rĭget* fons interdum, campiſque redundet. Lucret.
8. Sacerdos, id faciam; atque aquam hinc de proximo *rŏgabo*. Plaut.
9. Namque ubi *ſtrĭgandum* eſt, et ubi currendum, ſcio. Phædr.
10. Superba jactas, *tĕgere* quod debet pudor. Phædr.
11. Inde ea comprendunt inter ſe, conque *grĕgantur*. Lucret.
12. Qui *lĕgitis* flores, et humi naſcentia fraga. Virg.
13. Quin potiùs, quod *lēgatum* eſt tibi negotium. Plaut.
14. Et potum, paſtas *ăge*, Tityre, et inter *ăgendum*. Virg.
15. Hoc etiam ſævas paulatim *mitĭgat* iras. Ovid.
16. Conſiliis animum *fatīgas?* Hor.

34. A vowel before final [1]*gus*, [2]*gum*, or [3]*gium*, is ſhort; as pelăgus, jŭgum, navĭgium.

So aſparăgus, catalŏgus, confrăgus, naufrăgus, oſſifrăgus, dialŏgus, epilŏgus, etholŏgus, elĕgus, lucifŭgus, indĭgus, noctivăgus, măgus, rŏgus, the noun săgus or săgum; conjŭgium, elŏgium, fortilĕgium, naufrăgium, prodĭgium, diffŭgium, perfŭgium, horolŏgium, remĭgium, ſacrilĕgium, aquilĕgium, confŭgium, &c.

1. Materiæ tanto in *pelăgo*, turbâque alienâ? Lucret.
2. Robuſtus quoque jam tauris *jŭga* ſolvet arator. Virg.
3. Excipe *naufrăgium* non duro littore noſtrum. Ovid.

1. Except [1]fāgus, [2]frāgum, [3]frīgus, [4]pāgus, and the adjective [5]sāgus.

2. Alſo [6]contāgium, [7]faſtīgium, [8]ſuffrāgium, [9]veſtīgium.

3. And [10]chorāgus, [11]chorāgium from χορήγος, χορήγιον; and [12]pædagogus from ἄγω.

1. Tityre, tu patulæ recubans ſub tegmine *fāgi*. Virg.
2. Arbuteos fœtus, montanaque *frāga* legebant. Ovid.
3. Ante focum, ſi *frīgus* erit, ſi meſſis in umbrâ. Virg.
4. Quàm ſi me toto laudet vicinia *pāgo*. Juven.
5. Ipſe nihil certum *sāgis* clangoribus æther. Stat.
6. Nec mala vicini pecoris *contāgia* ladent. Virg.
7. Ambages; ſed ſumma ſequar *faſtīgia* rerum. Virg.
8. Libera ſi dentur populo *ſuffrāgia*, quis tam, &c. Juven.
9. Pauca tamen ſuberunt priſcæ *veſtīgia* fraudis. Virg.
10. Ipſe ornamenta a *Chorāgo* hæc ſumpit ſuo periculo. Plaut.
11. Nam hoc pœne iniquum eſt Comico *chōragio*. Plaut.
12. Mihi *pædagōgus* fuerat, quaſi uti mihi foret. Plaut.

35. A vowel before final [1]*va*, [2]*ve*, [3]*ves*, [4]*vis*, [5]*vo*, [6]*vus*, is long; as clāva, proclīve, dīves, cīvis, pāvo, rīvus.

So cēva, convīva, dīva, gingīva, pāva, prærogatīva, ūva, æſtīva, olīva, conclāve, nēve, clāvis, fuāvis, nāvis, rāvis, acclīvis, declīvis, proclīvis, vīvo, prāvo, rīvo, nāvo, prīvo, æſtīvo, flāvus, ignāvus, æſtīvus, dīvum, ōvum, prāvus, and all adjectives ending in *īvus*, which are numerous.

1. Duceret apricis in collibus *ūva* colorem. Virg.
2. Currere per totum pavidi *conclāve* magiſque. Hor.
3. *Dīves* agris, *dīves* poſitis in fœnere nummis. Hor.
4. Nec prohibent *clāves*, et canis ipſe tacet. Tib.
5. Ulceris os; alitur vitium, *vīvitque* tegendo. Virg.
6. Tam ficti *prāviique* tenax, quàm nuncia veri. Virg.

1. Except [1]ăvis, [2]brĕvis, [3]grăvis, [4]lĕvis, [5]ŏvis.

2. Alſo [6]căvo, [7]grăvo, [8]jŭvo, [9]lăvo, [10]lĕvo, [11]nŏvo, [12]ŏvo.

3. And [13]ăvus, [14]căvus, [15]făvus, [16]nŏvus.

1. Fiet aper, modò *ăvis*, modò ſaxum, et, cum volet, arbor. Hor.
2. Vitæ ſumma *brĕvis* ſpem nos vetat inchoare longam. Hor.
3. Reddit, ubi Æoliden ſaxum *grăve* Siſyphon urget. Ovid.
4. Ante *lĕves* ergo paſcentur in æthere cervi. Virg.
5. Inſtituit, Pan curat *ŏves*, *ŏviumque* magiſtros. Virg.
6. Dura tamen molli ſaxa *căvantur* aquâ. Ovid.
7. Unde *grăvet* pennas; ſi celſior ignis adurat. Ovid.
8. Temperie cœli, corpuſque, animuſque *jŭvantur*. Ovid.
9. Prandeo, poto, cano, ludo, *lăvo*, cæno, quieſco. Mart.
10. Cantantes ut eamus, ego hoc te faſce *lĕvabo*. Virg.
11. Nec remorantur ibei: ſic rerum ſumma *nŏvatur*. Lucret.
12. Quo nunc Turnus *ŏvat*, ſpolio gaudetque potitus. Virg.
13. Stat fortuna domus et *ăvi*, numerantur *ăvorum*. Virg.
14. Sed tùm fortè *căvâ* dum perſonat æquora conchâ. Virg.
15. Mella *făvis*, illi tiliæ atque uberrima pinus. Virg.
16. Pura *nŏvum* vati laurea mollit iter. Propert.

36. A vowel before final *ca* is long; as ſpīca, formīca, feſtūca.

So antīca, apīca, cloāca, carrūca, currūca, erīca, mīca, myrīca, lactūca, lectīca, noctilūca, rīca, rubrīca, lorīca, pīca, paſtināca, phōca, ſambūca, sīca, urtīca, veſtīca, &c.; and ſeveral ending in *theca*, from θήκη, as apothēca, bibliothēca, oporothēca, &c.

Parvula nam exemplo eſt, magni *formīca* laboris. Hor.

Except [1]alĭca, [2]braſsĭca, [3]fulĭca, [4]mantĭca, [5]pertĭca, [6]tunĭca, [7]falarĭca or phalarĭca, [8]dĭca.

1. Nos *alĭcam*, mulſum poterit tibi mittere dives. Mart.
2. Me notat, et junco *braſsĭca* vincta levi. Propert.
3. In ſicco ludunt *fulĭcæ*, notaſque paludes. Virg.
4. *Mantĭca* cui lumbos onere ulceret, atque eques armos. Hor.
5. *Pertĭca* dat plenis immitia vulnere ramis. Ovid.
6. Sufficiunt *tunĭcæ* ſummis Ædilibus albæ. Juven.
7. Sed magnum ſtridens contorta *falarĭca* venit. Virg.
8. Cedè dum, en unquam injuriarum audiſti mî ſcriptam *dĭcam*. Ter.

Note.—1. Aphāca is rather aphăce-es, from ἀφακή, and therefore does not relate to this rule.

2. And ſince adjectives in *icus* ſhorten the penultimate; wherever the termination *ica* is derivable from an adjective in *icus*, though the adjective itſelf be not in uſe, the penultimate is ſhort by derivation; as,

Piratĭca from piratĭcus; *i. e.* ars piratæ piratĭca.
Fabrĭca from fabrĭcus; *i. e.* officina fabri fabrĭca.
Flaminĭca from flaminĭcus; *i. e.* fœmina flaminis flaminĭca.
Manĭca from manus; *i. e.* veſtis manûs manica.
Pedĭca from pedĭcus; *i. e.* catena pedis pedica.
Lucanĭca from Lucanĭcus; *i. e.* eſca Lucanorum lucanĭca.
Bucolĭca from bucolĭcus; *i. e.* carmina βουκολιαστῶν bucolĭca.
Baſilĭca from baſilĭcus; *i. e.* aula βασιλέως βασιλικὴ vel baſilica.
Arithmetĭca from arithmetĭcus; *i. e.* τέχνη ἀριθμῶν arithmetĭca.
Mnemonĭca from μνημονικὸς; *i. e.* τέχνη μνήμης μνημονικὴ.

37. Words ending in [1]*aris* or [1]*are* lengthen the penultimate; as alāris, altāre.

So agricolāris, peculiāris, nāris, alveāre, capillāre, plantāre, quāre, and many others.

1. Suſpiciens, patulis captavit *nārĭbus* auras. Virg.
2. Suſpicit exigui lætum *plantārĭbus* horti. Juv.

Except [1]hilăris, [2]bimăris, [3]canthăris, [4]cappăris, [5]măre, and [6]dăre.

1. Oderunt *hilărem* triſtes, triſtemque jocoſi. Hor.
2. Aut Epheſum *bimărĭſve* Corinthi. Hor.
3. *Canthărĭdum* ſuccos, dante parente, bibas. Ovid.
4. *Cappărĭn*, et putri cepas alece natantes. Mart.
5. Ante *măre* et tellus, et quod tegit omnia cœlum. Ovid.
6. See, for *dăre*, the verbal increment in *a*.

38. Words ending in [1]*elis*, [2]*elus*, [3]*ela*, [4]*elum*, [5]*oſus*, [5]*udus*, [7]*ator*, [8]*utor*, lengthen the penultimate; as fidēlis, phasēlus, ſuadēla, prēlum, fumōſus, sūdus, orātor, ūtor.

So crudēlis, carduēlis, patruēlis, candēla, loquēla, querēla, corruptēla, cicindēla, clientēla, muſtēla, nitēla, Philomēla, parallēlus, polymēlus, arenōſus, formōſus, luctuōſus, perniciōſus, nūdus, crūdus, lūdus, ūdus, and many others.

1. Nunquam eſt *fidēlis* cum potente ſocietas. Phædr.
2. Et circum pictis vehitur ſua rura *phasēlis*. Virg.
3. Qualis populeâ mærens *Philomēla* ſub umbrâ. Virg.
4. & 5. Colaque *prēlorum fumōſis* deripe tectis. Virg.
6. Quid Nero tum sævâ, *crudâque* tyrannide fecit? Juven.
7. Hinc altâ ſub rupe canet *frondātor* ad auras. Virg.
8. Nec ſoleas fecit; *sūtor* tamen eſt ſapiens. Qui?— Hor.

39. Words ending in [1]*ober*, [2]*uber*, or [3]*aver*, lengthen the penultimate; as Octōber, ſalūber, papāvĕr.

So sūber, tūber, ūber, hūber, pūber, cadāver, &c.

1. Te taceo, *Octōber* fœnere ditat agros. Auſon.
2. Quique frequens herbis et fertilis *ūbere* campus. Virg.
3. Lilia purpureis miſta *papāvĕribus*. Prop.

Except [1]colŭber and [2]rŭber.

1. Inque pruinoſo *colŭber* diſtenditur arvo. Lucan.
2. Crine *rŭber*, niger ore, brevis pede, lumine læſus. Mart.

40. Adverbs in [1]*tim* lengthen the penultimate; as oppidātim, virītim, tribūtim: except [2]ſtătim.

1. Et velut abſentem *certātim* Actæona clamant. Ovid.
2. Nec ſpernat auris, nec tamen credat *ſtătim*. Phædr.

Note.—"Noſtra Lexica, Graduſque ad Parnas. Pænultimam adverbii, *aſſătim*, longâ apice ſignant. Nec eo inficias, quin poetæ degeneris Latinitatis eam produxerint." Vide tamen Lexicon Facciolati, ubi hanc obſervationem invenies, "Annianus poeta, apud Gell. l. 7. c. 7. ita diſputat de quantitate penultimæ, ut ſtatuat eam eſſe corripiendam: innuat, autem, olim etiam productam fuiſſe: quod et ab Aratore factum eſt. L. 2. in Ac. Apoſtol. v. 326. Verùm non eſt hoc ſatis, ut contra communem uſum produci poſſet."

41. Words ending in final *quus* are compounded with *æquus*, and therefore lengthen the penultimate; as antīquus, inīquus, oblīquus.

Terra *antīqua*, potens armis atque ubere glebæ. Virg.

Except relĭquus, which is not derived from æquus, and is therefore excepted.

Texantur *relĭqua* tecta palude tibi. Mart.

Note.—Though the real cauſe of the penultimate of inīquus, antīquus, &c. being long is the contraction of the *æ*, of æquus, from which they are derived, into *i*, which is therefore long, according to the rule we have given for contraction: yet ſince the above may be a more obvious diſtinction than a latent cauſe, we have not thought it improper to add it. And ſince this remark is applicable to ſome other terminations and examples, noticed in this analyſis, it is ſufficient here, once for all, to give this general anſwer.

42. Words ending in *pōla*, or *pōlium*, being derived from πωλέω, lengthen the vowel before *l*; as bibliopōla, œnopōlium.

So myropōla, myropōlium, propōla, pharmacopōla, &c.

1. Sed qui me vendit *Bibliopōla* putat. Plaut.
2. Nam omneis plateas perreptavi, gymnaſia et *myropōlia*. Plaut.

43. Words ending in [1]*areo*, [2]*arius*, [3]*erium*, [4]*orius*, lengthen the antepenultimate; as pāreo, cibārius, ācrotērium, meſsōrius.

So āreo, clāreo, hordeārius, ſextārius, librārius, mercenārius, herbārius, capiſtērium, dictērium, eccleſiaſtērium, nicetērium, ſphæriſtērium, adulatōrius, cenſōrius, and many others.

1. Vim geminam ſentit, *pūretque* incerta duobus. Ovid.
2. In hunc diem jam tuus ſum *mercenārius*. Plaut.
3. Omnibus arrides, *dictēria* dicis in omnes. Mart.
4. Quem *censōria* cum meo ſevero. Mart.

1. Except [1]căreo, [2]vărius, and [3]nectăreus, from nectar-ăris.

2. Alſo [4]deſidĕrium, from deſidĕro; [5]magiſtĕrium, from magiſtĕr; and [6]miniſtĕrium, from miniſtĕr.

3. And the [7]derivatives of genitives increaſing in ſhort *ŏris*; as æquŏreus, arbŏreus, caſtŏreus, corpŏreus, ebŏreus, marmŏreus, ſtercŏreus, robŏreus, from æquor-ŏris, arbor-ŏris, caſtor-ŏris, corpus-ŏris, eburŏris, marmor-ŏris, ſtercus-ŏris, robur-ŏris.

4. Except alſo ſome [8]derivatives from *o* (omicron), as bŏreus, antibŏreus, hyperbŏreus, from *βορέας*.

1. Scilicet et morbis et debilitate *cărebis*. Juven.
2. Et *vărias* uſus meditando extunderat artes. Virg.
3. Attica *nectăreum* turbatis mella falernum— Mart.
4. Roma, domuſque ſubit, *deſidĕriumque* locorum. Ovid.
5. Virtute, id factum, tuâ, et *magiſtĕrio* tuo. Plaut.
6. Feſſa *miniſtĕriis* mulces, reparaſque labori. Ovid.
7. *Arbŏreæ* frondes auro radiante nitentes. Ovid.
8. Vita procul patria peragenda ſub axe *Bŏrea*. Ovid.

44. Words ending in [1]*aceus*, [2]*aſeus*, [3]*ancus*, [4]*eneus*, [5]*oneus*, lengthen the antepenultimate; as teſtāceus, cāſeus, ſubitāneus, ahēneus, idōneus.

So arenāceus, hederāceus, hordeāceus, reſināceus, cretāceus, arāneus, conditāneus, rejectāneus, collectāneus, bipedāneus, and many others.

1. Herbas utiliores *argillācea* terra. Var.
2. Pinguis et ingratæ premeretur *cāſeus* urbi. Virg.
3. Nec nebulam noctu, neque *arānei* tenuia fila— Lucret.
4. Si rectè facies: hic murus *ahēneus* eſto. Hor.
5. Opportunus ita eſt ſi forte et *idōneus* aër— Lucret.

1. Except caſtăneus, from caſtănea.

*Caſtănea*ſque nuces, mea quas Amaryllis amabat. Virg.

45. Words ending in *icius*, *icium*, or *itius*, ſhorten the antepenultimate; as patrĭcius, ædifĭcium, ædilĭtius.

Patrĭcios omnes opibus cùm provocet unus. Juven.

So gentilĭcius, tribunĭcius, adventĭtius, factĭtius, auſpĭcium, judĭcium, artifĭcium, aruſpĭcium, malefĭcium, benefĭcium, opifĭcium, extiſpĭcium, harruſpĭcium, ſacrifĭcium, indĭcium, offĭcium, panefĭcium, and many others.

1. Except [1]novĭcius, or novĭtius; and thoſe which come from long ſupines; as effutĭtius, from effutio, īre, īvi, ītum.

2. Alſo [2]convĭcium, [3]lĭcium, and [4]nutrĭcium, from nutrix-īcis.

1. Jam ſedet in ripa tetrumque *novĭcius* horret. Juv.
2. Neve in me ſtolidæ *convĭcia* fundere linguæ. Ovid.
3. Et prenſos domitare boves, et *lĭcia* telæ. Virg.
4. Omniaque infantum mixta *nutrĭtia* turba— Manil.

46. Words ending in [1] *ăticus*, [2] *atilis*, [3] *etudo*, [4] *atio*, [5] *utio*, lengthen the antepenultimate; as aquāticus, aquātilis, valētudo, festinātio, locūtio.

So pluviātilis, plicātilis, defuētudo, cremātio, balbūtio, and many others.

1. Calcavêre pedis, nec solvit *aquāticus* Auster. Ovid.
2. Labitur occultè, fallitque *volātilis* ætas. Ovid.
3. Gratia, fama, *valētudo* contingat abunde. Hor.
4. Sceleste hæ sunt ædes, impia est *habitātio*. Plaut.
5. *Balbūtit* scaurum, pravis fultum malè talis. Hor.

Except some ending in *măticus*, from neuters in *ma-ătis*; as aromăticus, from aroma-ătis; rheumăticus, from ῥεῦμα-ατος; grammăticus, from γράμμα-ατος; and hepăticus, from hepar-ătis.

Grammăticas ambire tribus, et pulpita dignor. Hor.

47. Abilis lengthens the antepenultimate; so does ibilis, when from long preterites in īvi; otherwise it shortens it, as amābilis; expetībilis, from expeto, īvi, ītum; terrībilis, from terreo, ŭi, ĭtum.

Accipiam, cunctisque meum *lætābile* factum. Ovid.
Terrībili squalore Charon; cui plurima mento— Virg.

48. [1] Abulum, [2] aculum, [3] ecula, lengthen the antepenultimate; [4] iculum, [5] icula, shorten it; as pābulum, gubernāculum, apēcula, ridĭculus, aurĭcula.

1. *Pābula* parva legens, nidisque loquacibus escas. Virg.
2. Omnia transformat sese in *mirācula* rerum. Virg.
3. Aut ursum, aut pugiles; his nam *plebēcula* gaudet. Hor.
4. Quàm ex hoc *fontĭculo* tantundem sumere. Eò fit. Hor.
5. Humanum genus est avidum nimis *auricularum*. Lucret.

Except [1] perĭculum, and [2] some long by derivation; as hædĭculus, from hædīle; redimīculum, from redimio, īvi, &c.; lorīcula, from lorīca; postīculum, from postīcus; nutrīcula, from nutrix-īcis.

1. Sed tibi vexatæ per multa *perīcula* vitæ. Prop.
2. Et tunicæ manicas et habent *redimīcula* mitræ. Virg.

49. Words ending in [1] *ācium*, [2] *ēlia*, [3] *fārĭam*, lengthen the antepenultimate; as mendācium, pittācium, contumēlia, multifārĭam.

1. Impercepta pia *mendācia* fraude latebant. Ovid.
2. Quod quum inquinâssent omni *contumēlia*. Phædr.
3. Ut dispartirem obsonium hic *bifārĭam*. Plaut.

50. Numerals ending in [1] *ni*, lengthen the penultimate; in [2] *ginti*, [3] *ginta*, *gies*, and [5] *ēsimus*, the antepenultimate; as bīni, sēni, vicēni, ducēni, vīginti, octōginta, nonāgies, octōgies, vigēsimus, multēsimus.

So quīni, septēni, octōni, novēni, undēni, duodēni, tredēni, &c.; quadrāginta, quinquāginta, &c.; quadrāgies, quinquāgies, &c.; trigēsimus, quadragēsimus, &c.

1. Bis *dēnas* Italo texamus robore naves. Virg.
2. *Vīginti* tauros magnorum horrentia centum. Virg.
3. *Trīginta* magnos volvendis mensibus orbes. Virg.
4. Phœbus *nonāgies* illuxerat polum utrumque. Hipponac.
5. Bis jam pene tibi consul *trigēsimus* instat. Mart.

51. Words ending in [1] *ates*, [2] *itis*, [3] *otis*, [4] *ota*, and [5] *eta*, lengthen the penultimate; as vātes, vītis, caryōtis, diōta, mēta.

So crātes, penātes, mītis, chalcītis, pleurītis, ampelītis, arthrītis, caprītis, mephītis, caryōta, cestrōta, bēta, crēta, cosmēta, comēta, poēta, sēta, &c.

1. Cælicolæ, clarique suos posuêre *penātes*. Ovid.
2. Contuderit *vites*, oleamve momorderit æstas. Hor.
3. Et notas *caryōtidas* theatris— Mart.
4. O Thaliarche merum *diōtâ*— Hor.
5. Quorsum abeant sani? *crētâ* an carbone notandi?— Hor.

Except [1] pŏtis, [2] sĭtis, [3] nŏta, [4] rŏta, [5] drapĕta.

1. Quis *pŏtis* est, nisi vis animæ, quæ membra gubernat. Lucret.
2. Depositura *sĭtim* vicini fontis in undâ. Ovid.
3. A quo repulsus tristem sustinuit *nŏtam*. Phædr.
4. Hîc neque tum solis *rŏta* cerni, lumine largo. Lucret.
5. Constant, conferunt sermones inter sese *drapĕtæ*. Plaut.

52. Lastly; the following final syllables lengthen the preceding vowel, [1] *nar*, [2] *cal*, [3] *gal*, [4] *nal*, and [5] *tal*; as lacūnar, pulvīnar, cervīcal, vectīgal, Bacchānal, minūtal, and some others.

1. Meâ renidet in domo *lacūnar*. Hor.
2. Tinge caput nardi folio, *cervīcal* olebit. Mart.
3. Jurgatur verbis: ego *vectīgalia* magna. Hor.
4. *Bacchānal* te exercuisse, quom qui sis, alium rogites? Plaut.
5. Hesternum solitus medio fervare *minūtal*. Juven.

53. Also, whatever terminations are naturally derivable from any of the preceding final syllables, lengthen or shorten, according to their primitive termination, their penultimate, or antepenultimate syllable; as masculines ending in *ārius*, may form feminines in *āria*, and neuters in *ārium*; so *ōrius*, *ōria*, *ōrium*; *ētus*, *ēta*, *ētum*, &c. as ærārius, belonging to copper or brass; ærāria, a copper mine; ærārium, a treasury; hence rosārium, pomārium, muscārium, meritōrium, quercētum, rosētum, palmētum, &c.

Note.—1. And it should be recollected, that since compounds and derivatives follow the quantity of their primitives, the compounds and derivatives of such words as form exceptions to any of these rules, will follow the general rule for the quantity of derivative words.

2. And it may be here necessary, finally, to remind the young prosodian of the same rule, since the quantity of many vowels is explicable solely by this law, and requires no other direction; as ædīlitius from ædīlis; alienigena from alienus; contrādico from contrā; aliquātenus from aliquā, &c. Hence adjectives ending in *ax-ācis* form derivatives in *ācia*, *ācitas*; as capax-ācis, capācitas, audax-ācis, audācia: in the same manner genitives increasing short, shorten the corresponding vowel of the derivative; as cartilago-gĭnis, cartilagĭneus, cartilagĭnosus. Thus preterites and supines having their penultimate long, lengthen accordingly the derivative vowel; as dormīto from dormio-īvi-ītum; conditio, condītitius from condio-īvi-ītum; so condītio, condītus, condītor from condo-dĭdi-dĭtum: hence arrīsio, arrīsor, audītio, definītio, are from arrīdeo-rīsi-rīsum, &c. Thus words ending in *ālis* may form derivatives in *ālia*, *ālitas*, *āliter*, *ālitius*, *āliculus*; hence cerealia, æquālitas, artificiāliter, canālitius, canāliculus, arise from the primitive termination *ālis*: and thus nouns in *ātio* have their derivatives in *ātiuncula*; as ædificātio, ædificātiuncula, &c.

54. I [1] before or [2] after *r*, is long; as īra, scrīnium.

1. *Īra* furos brevis est. Animum rege, qui nisi paret— Hor.
2. Mixtaque *rīdenti* colocasia fundet acantho. Virg.

1. Except [1] hĭrudo, [2] hĭrundo, [3] rĭgo, [4] rĭgeo, [5] trĭbus, [6] vĭreo.

2. Also, *ri* followed by [7] *c* is short; as frĭco, Afrĭcus, fabrĭco, lubrĭco, currĭculum; yet [8] lumbrīcus, [9] rubrīca, [10] trīcæ, and its derivative [11] extrīco, and [12] rīca, follow the general rule.

3. And *ri* followed by a vowel, is short by the rule "a vowel before another," &c. as penurĭa.

1. Qualis volo, vetulos duo; jam ego me convortam in *hĭrudinem*— Plaut.
2. Pervolat, et pennis altaatria lustrat *hĭrundo*. Virg.
3. Omnia quæ maria, ac terras, sparguntque, *rĭgantque*. Lucret.
4. Sanguine et igne micant oculi, *rĭget* horrida cervix. Ovid.
5. Et ditant Latias tertia dona *trĭbus*. Mart.
6. Quo seges in campo, quo *vĭret* uva jugo. Prop.
7. *Afrĭcus* in glaciem frigore nectit aquas. Prop.
8. Foras, foras, *lumbrĭce*, qui sub terrâ erepsisti modò. Plaut.
9. Non secùs ac si oculo *rubrĭcam* dirigat uno. Pers.
10. Litibus, neque *trĭcis*: quam ob rem ego argentum numerem foras? Plaut.
11. Mercedem aut nummos unde unde *extrĭcat*, amaras— Hor.
12. Supparum, aut subminiam, *rĭcam*, basilicum, aut exoticum. Plaut.

55. Y

55. Y before or after R, is long; as Butȳrum, collȳrium, papȳrus.

1. *Collȳræ* facite ut madeant et colliphia. Plaut.
2. Succinctus patriâ quondam Criſpine *papȳro*. Juven.

1. Except [1]lachrȳma, [2]lȳra, [3]corȳlus, [4]philȳra, [5]pȳrus, [6]ſatȳra, [7]zephȳrus.

2. And the derivatives of ἀργυρος; as hydrargȳros, lithargȳros.

3. See the 3d exception to the laſt rule.

1. Et *lacrȳmis* ſpargunt rorantibus ora genaſque. Lucret.
2. Sit tibi Muſa *lȳræ* ſolers, et cantor Apollo. Hor.
3. Neve inter vites *corȳlum* ſere; neve flagella. Virg.
4. Ebrius incinctis *philȳrâ* conviva capillis. Ovid.
5. Inſere nunc, Melibœe, *pȳros*, pone ordine vites. Virg.
6. Sunt quibus in *Satȳrâ* videar nimis acer, et ultra. Hor.
7. At verò *Zephȳris* cum læta vocantibus æſtas— Virg.

56. U [1]before or [2]after R, is long; as lūridus, ūro, rūmor.

1. Neglectis *ūrendâ* ſilix innaſcitur agris. Hor.
2. Quæ vos ad cœlum effertis *rūmore* ſecundo. Hor.

1. Except [1]cŭrulis, [2]cærŭlus, [3]fŭro and fŭror, [4]frŭtex, [5]lemŭres, [6]nŭrus, [7]querŭlus, [8]rŭdis, [9]rŭdens, [10]rŭbeo, [11]rŭtilus, [12]rŭmex, [13]tugŭrium, [14]ſatŭr-ŭra-ŭrum.

2. Except alſo *ri* in [15]genitives, increaſing ſhort in *ŭcis* or *ŭris*, and their derivatives; as crux-crŭcis, trux-trŭcis, augur-ŭris, murmur-ŭris, ſulphur-ŭris, which give crŭcio, trŭcido, murmŭro, augŭrium, ſulphŭreus, and the like.

3. Alſo, [16]meditatives in *ŭrio* and *luxŭrio*; as esŭrio: [17]other verbs in *urio* follow the general rule; as ligūrio, ſcatūrio.

4. U before final *r*, and *ru* followed by a vowel, are regulated by the rules for thoſe circumſtances; as augŭr, ſatŭr, rŭino.

1. Prætor adeſt vacuæque loco ceſſere *cŭrules*. Lucan.
2. Adnixi torquent ſpumas, et *cærŭla* verrunt. Virg.
3. Quid *fŭris*? Aut quonam noſtri tibi cura receſſit? Virg.
4. Contexit illum *frŭtice*, et admonuit ſimul. Phædr.
5. Nocturnos *lemŭres* portentaque Theſſala rides? Hor.
6. Cinctaque adeſt virgo matrum *nŭruumque* catervâ. Ovid.
7. Et nunquam *querŭli* cauſa doloris abeſt. Ovid.
8. Quem dixêre Chaos; *rŭdis* indigeſtaque moles. Ovid.
9. Inſequitur clamorque virûm, ſtridorque *rŭdentum*. Virg.
10. Purriceis invecta rotis Aurora *rŭbebat*. Virg.
11. Robora complexus *rŭtilo* curvata metallo. Lucan.
12. Apponunt *rŭmicem*, braſſicam, betam, blitum. Plaut.
13. Pauperis et *tugŭrî* congeſtum ceſpite culmen. Virg.
14. Aut intus clauſos *ſatŭra* ad præſepia ſervant. Virg.
15. Vultus in unum me *trŭces*. Hor.
16. Græculus *cſŭriens*, in cœlum juſſeris, ibit. Juven.
17. Tractavit calicem manibus, dum furta *ligūrit*. Hor.

57. [1]O and [2]U, before *m* are long; as vōmer, būmaſtus.

1. Ingemere, et ſulco attritus ſplendeſcere *vōmer*. Virg.
2. Quale ſolet ſylvis *brūmali* frigore viſcum. Virg.

1. Except, to *o* before *m*, [1]cŏmeta, [2]cŏmedo, [3]ŏmitto, [4]tŏmaclum.

2. Alſo atŏmus, dŏmus, glŏmus, tŏmus (for which ſee ſect. 2, rule 5); cŏma, cŏmes (for which ſee ſect. 2, rule 23); dŏmo, hŏmo, and vŏmo; (for which ſee ſect. 2, rule 25.)

1. Non ſecus ac liquida ſi quando nocte *cŏmetæ*. Virg.
2. Ut libet: hæc porcis hodie *cŏmedenda* relinques. Hor.
3. Pleraque differat, et præſens in tempus *ŏmittat*. Hor.
4. Quod fumantia qui *tŏmacla* raucus. Mart.

3. Except, to *u* before *m*, [1]crŭmena, [2]cŭmulus, [3]hŭmerus, [4]nŭmella, [5]nŭmerus, [6]sŭmus, [7]tŭmeo.

4. Alſo, colŭmen, docŭmentum, emolŭmentum, tegŭmen (for which ſee ſect. 2, rule 22); hŭmus, poſtŭmus (for which ſee ſect. 2, rule 5); cucŭmis (for which ſee ſect. 2, rule 23); and autŭmo; (for which ſee ſect. 2, rule 25.)

5. For circŭmeo and circŭmago, ſee the rule for *m* final.

1. Quid eum velit, homo, *crŭmenam* ſibi de collo detrahit. Plaut.
2. Exhauſtum in *cŭmulos* omniſque in fluctibus unda eſt. Lucan.
3. Ipſe ſubibo *hŭmeris*: nec me labor iſte gravabit. Virg.
4. Nervos, catenas, carceres, *nŭmellas*, pedicas boias. Plaut.
5. Rari quippe boni, *nŭmero* vix ſunt totidem, quot— Juv.
6. Alii ſimul delinquunt, cenſores *sŭmus*. Phædr.
7. Igne micant oculi, corpus *tŭmet* omne veneno. Ovid.

58. U before *c* is long; as būcula, dūco, cadūcus.

Vidi ego labentes acies, et tela *cadūca*. Prop.

1. Except [1]lŭcellum, [2]lŭcerna, [3]nŭcleus, [4]volŭcer.

2. And in [5]genitives increaſing ſhort in *ŭcis*, and their derivatives; as dux-ŭcis, crux-ŭcis, trux-ŭcis; hence crŭcio, trŭcido, &c.

1. Quid purè tranquillet; honos, an dulce *lŭcellum*— Hor.
2. Hæc ego non credam Venuſina digna *lŭcernâ*. Juv.
3. Mella dari, *nŭcleoſque* jubet, dulceſque placentas. Mart.
4. Interea *volŭcer* motis conterrita pennis. Petron.
5. Abſtraxitque hominem in maximam malam *crŭcem*. Plaut.

59. Syllables indifferently ſpelled with one or two conſonants are long; as literæ or litteræ, litus or littus, cūpa or cuppa, pūpa or puppa, ſtūpa or ſtuppa, ſcīroma or ſcirroma, ſtlōpus or ſtloppus or ſcloppus, cōliphium or colliphium, which ſhould invariably retain the double conſonant, ſince it is by poſition alone that they are long, by the conſonant, and not by the vowel, reduplication.

60. Syllables indifferently ſpelled with a ſingle vowel, or a diphthong, are long; as tēda or tæda, prēlum or prælum, which latter orthography, the moſt expreſſive of the vowel quantity, it is better to retain.

61. Vowels derived from η, ω, ει, ου, are long, as hērōus, Sīrius, mūſa, from ἥρως, σείριος, μοῦσα.

Note.—Many of theſe are already compriſed under the preceding rules; the principal words referrible *alone* to this rule, are cōlon, cratēra, hēpar, hēros, lēcythus, lēthum, lichen, ōde, rhētor, ſpēlunca, thēſauros, thōrax, theōria. To theſe we may add near 200 words of very rare occurrence, chiefly ſignifying plants, herbs, ſtones, minerals, &c. &c. as anthēdon, aſclēpias, aſplēnon, &c. Of theſe we would here inſert our manuſcript liſt, but ſince they are principally confined to ſuch authors as Pliny, Celſus, Vitruvius, and Frontinus, they are matter rather of occaſional reference, than of any grammatical rule.

62. Some words alike in orthography, differ in quantity *only* according to their ſignification; as

1. . . . . Pōpulus arbor
2. . . . . Eſt; notat et pŏpulus
3. . . . . Plebem. Sic mălus eſt pro
4. . . . . Pravo; gignit item mālum.
5. . . . . Navis mālus; mālina mālus,
6. . . Stirpe unâ produci poſſint. Māla genam vult;
7. . . . . Māla poma. Et pălus
8. . . . . Faciens păludis; eſt ferè
9. . . . . Stagnum lacuſve; at non tamen ſic
10. . . . . Pălus notans sŭdem. Nĭtor, nĭtenſque,
11. . . . . Nĭteo; creatque nĭtor et nĭtens sŏcŭs.
12. . . . Pro tellure sōlum; non ita sōlus aut
13. . . . Ab eo sōlŭm. Plăga notione
14. . . . Retis vel ōræ corripitur; licet
15. . . . Verberis aut vice vulneris, tu
16. . . Extendas ita plāgam. Pila ſic in globuli lŏco
17. . . . . Contrahiturque: mole
18. . . Denotata, porrige pĭlam: notat atque pĭlus
19. . . . . Aciei feriem miſſileque;
20. . . . . Ea pĭlum quoque, maſſamque terit. Sin
21. . . . . Vice crinis pĭlus eſt; atque pĭlo dat: pĭlo
22. . . . Significat fŭrāri, non fŭrēre. Et notat cŏmāre
23. . . . Cæſariem gerere; ſed cōmĕre ornare eſt cōmam.
24. . . . Cōlāre aquam nos dicimus; ‖ ſed cŏlĕre arva, ſona.

Note.

Note.—The above verſes not only furniſh the words relating to rule 62, but alſo, to unite two objects in one, they at the ſame time afford a ſpecimen of all the Horatian metre, which, to the claſſical ſtudent, may prove a uſeful compendium. It is, probably, only the ſecond production of the kind in print. The firſt is quoted by the two editors of Horace, Cruquius and Baxter, and, had its ſubject been as eligible as the deſign, the preſent would have been ſuperſeded. For a definition of the Horatian metres compoſing this ſpecimen, the reader may conſult Lyne's Latin Primer, (edit. 4th) page 246, or VERSIFICATION, in the ſequel of this work. The following, however, are the Horatian metres, as exemplified in the above lines: 1. An Adonic; 2. A dactylic penthemimer; 3. A Pherecratian tripodia; 4. A Glyconic choriambic; 5. Dactylic tetrameter; 6. An hexameter; 7. Iambic dimeter acephalous; 8. Iambic dimeter; 9 Iambic dimeter hypercatalectic; 10. Iambic trimeter catalectic; 11. Iambic trimeter; 12. An aſclepiad; 13. A Sapphic hendecaſyllabic; 14. A great Alcaic; 15. A ſmall Alcaic; 16. Alcaic choriambic; 17. Choriambic dimeter; 18. Epichoriambic tetrameter; 19. Ionic à minori trimeter; 20. Sapphic Ionic; 21. Ionic à minori tetrameter; 22. Dactylic heptameter; 23. Firſt elegiambic Archilochian; 24. Second elegiambic Archilochian. The remaining words alluded to by rule 62, are compriſed by the following hexameters.

25. Ad mediam noctem *sērum* producere poſſis;
26. Datque *sĕrum* tibi lac. *Sōpire* facit *sōpor* omnes.
27. Ac ſoboles *pernīcis*, uti *perniciter*, eandem
28. Deductam vocalem extendunt. Perque *nĕcare*
29. *Perniciem* proleſque tibi dant. *Ācer* ācutum
30. Denotat; arborem *ăcer* vult; atqui corripiuntur
31. Amborum ſoboles. *Prŏcĕres*, faciens *prŏcĕrum*, ſit
32. Pro magnatibus; et celſo *prōcērus*. Et *lăbor*
33. *Lābi*; ſed *lăbĕfacta lăbore*; *lăboro*, *lăbare*.
34. Rurſus, *litteræ* uti *liqueant* tibi, diſcere poſſis
35. Ut liceat proferre, metalla *līquare*, *līquorem*,
36. *Līqui*. *Lūteum* et in *lūteo lūto* oleſcere *lūtum*.
37. *Īdem ĕădem*, necnon *ĭdem*, et in ſexto ſit *eādem*.
38. *Līberī* uti ſint verò *liberi*, iis nihil extat
39. Utiliùs, quàm ut ſanctus *līber* hiſce *lĕgendus*
40. Sit, tunc his *lĭbertatem lēgabis*: ibidem
41. Ut *mōres mōri* poſſint ſolùmque ſalutem
42. Æternamque *mŏrari*; quâ, *mŏrŭ* pernicioſa
43. Valde eſt; utque ita *mōri mōrenturque* revera,
44. Diſcent. *Dēnique* hæc, *dīco*, mentique *dicanda*.

General Rule.

63. A vowel before a ſingle conſonant, not affected by any preceding or following rule, is ſhort; as săpio, sĭlĭqua, grăcilĭtas.

1. Attamen excipias hæc paucula, ceu, crocodĭlus,
2. Ālea, fūlīgo, pīrāta, abſtēmius, ōlim,
3. Ārea, sōlenniſque vēnēficus, ĭlicet, īco,
4. Hĭbernus mātūtinuſque ſalārica, nōdus,
5. Clītellæ, bālænaque, cōram, lĭlia, gluten,
6. Māturus, limax, capitōlium, anōnymus, ĭlia,
7. Adduntur nĭdor, vendēmia, flāgito, vĕlox
8. Tĭbia, tībīcenque academĭa, fĭbula, pāla,
9. Grādivus, Māvors, Sāturnus, Jūpiter, Īris,
10. Pȳthon, Idōla ethnica, vel crepitacula. Rurſus
11. Āla, repāgula, sēmi, sēmis, cōpia, fīlum,
12. Vĭburnum, contāmino et āles crāpula, tālus,
13. Vitupĕro, mausōleum, māgālia, rāpum,
14. Cālīgo, sūgillo, mūlus, mūtuus, ĭdus,
15. Mētīri, bālīſtaque, fēlix, dēnuo, quālus,
16. Sōlicito, prīdem, ſic prĭdie, et sīmia, sēpes,
17. Lāmina, tēmētum, irrītare, monēdula, mūgil,
18. Rhīnoceros, dūdum, nāſus, prævāricor, adde
19. Vāricor; invīto ceu vīto, sōlea, dōnec,
20. Jūniperuſque. Nec ōtia dantque nĕgōtia; sōlers
21. Eurīpus, grātus, pēnūria, pōcula, rhēda,
22. Ōciùs Iliadem, fīli perdiſce Hŏmēri;
23. Cūleus, et vībex, imbēcillīſque. Dat hīlum,
24. Progeniemque nĭhil. Quàm ſæpe, heu! ducere poſſint
25. Nūgaces, nūgas, tricaſque. Cānōpus, asilus,
26. Glūtire ac vēcors, sŏcors, exōticus, āër,
27. Āëris ac āĭo quoque āĭo; vīpera, crĕber,
28. Vāpulo; et audīre atque ōb, obēdīre efficiuntque
29. Adduntur gnōmon, vāgire, bonāſus, ōmāſum,
30. Dividere, ac ĭdiōta, fināpis, trāgula, jūgis;
31. Corripiunturque hæc măceo, măcer; exprime prolem
32. Măcero: et adde vŏco, quod vōcem, vŏciferoque
33. Vōcalem variat, formatque vŏcabula. Plăco:
34. Plācatus plăceo plăcidus, plăcabilis, unà
35. No nāvi nātum nāto, uti nōtum nōta, vādo
36. Atque vădum, nūbo unà pronūba ſunt varianda.
37. Sic obliviſcor et pecūlia, sīlus, aëdon,
38. Faſtīdire hālec, marsūpia, fābula, phrāſis,
39. Sibilo anīcetum ſquālere et ephēbus, iūlus,
40. Glŏcire, ŏceanus, pīpire, facētia, tūber,
41. Et cŏlum, lĭbum, conchȳlia, ſtrāgula, tăbum
42. Faux dat præfŏco, ſic veſpertīlio, pūpus,
43. Sĕculum et adduntur sūfes et sēria rāſis
44. Rāvīre ac ūdus mūgire et bāſia, năpus
45. Brāchia fĕriæ anētha et anōdyna glōria thōrax
46. *Sīdera* cœlorum *consĭdera*, opes meliores
47. Terrenis necnon *desĭdera*, omitte minora.

Note—1. To confine the preceding rules to limits as ſhort as poſſible, 1ſt, the preceding rules and their exceptions relate only to words of pure or Auguſtan Latin. 2. Some terms of very rare occurrence, chiefly the names of plants, herbs, ſtones, foſſils, &c. near 300 in number, are omitted, as matters of occaſional reference, rather than of conſtant attention or grammatical rule.

2. We have now, after four conſecutive analyſes of the language, for the more complete information of the ſtudent, accompliſhed a taſk, perhaps never achieved before, nor, ſo far as we are acquainted, offered to the public, in any proſodial ſyſtem. And we can venture to affirm, that any perſon well acquainted with common proſody, and the rules of this ſection, will not, within the precincts of Auguſtan Latin, find a ſingle word, except the few of rare and unfrequent occurrence mentioned above, whoſe quantity is not regulated or accounted for by the rules now given. Thus, for the firſt time, we have reduced that, the majority of Latin quantity, by all preceding proſodians referred to a courſe of obſervation and practice alone, to a regular claſſification and ſyſtem. Would our limits permit, we would here, for the ſake of exemplification, take the words compriſed by any letter of the alphabet, and account for the quantity of each by the principles and criteria we have here conſidered.

3. It is almoſt neceſſary here to add, that the quantities of ſyllables are marked with very frequent inaccuracy in moſt of our common dictionaries. The poets are the only ſatisfactory teſt.

SECTION III.—*On final Syllables.*

1. A final, in words declined by caſes, is ſhort; as famă, regnă, lampadă.

Anchoră de prora jacitur: ſtant littore puppes. Virg.

1. Except the ablative ſingular of the firſt declenſion; as hâc muſâ, hoc Æneâ.

2. The vocative ſingular from Greek nouns in *as*; as O Pallā, O Atlā.

1. Pro picien-, *ſummā* placidum caput extulit *undā*. Virg.
2. Non hæc, O *Pallā*, dederas promiſſa parenti. Virg.

2. A final, in words not declined by caſes, is long; as amā, ultrā, prætereā.

1. Littus *amā* et lævas ſtringat ſine palmula cautes. Virg.
2. *Interēā* magno miſceri murmure pontum. Virg.

1. Except ită and ejă ſhort, and poſtea common.

2. Quia is generally ſhort, but ſince Phædrus lengthens it, we may pronounce it to be common.

3. Some proſodians quote puta, with the *a* ſhort, from Perſius, 4. 9. But the beſt editions have puto, a reading evidently preferable, in point both of ſenſe and grammar.

4. Though numerals in *ginta* are ſometimes found ſhort, approved authors lengthen the *a*; yet it may be well to recollect, that the Greek termination KONTA, whence the Latin *ginta* is evidently borrowed, has the final vowel ſhort; as

Τοῖς δ' ἅμα τεσσαρα KONTA μελαιναι νηες ἑποντο. Hom.
[See many other inſtances in Iliad B.]

1. . . Ferret ad aurigeræ caput arboris, *ejă*, per ipſum. Val. Flac.
2. Tum ſic affatur regem, atque *ităque* turbidus inſit. Virg.
3. Si auctoritatem *poſteă* defugeris. Plaut.
4. *Poſteă* mirabar, cur non ſine litibus eſſet. Ovid.
5. Haud, (equidem credo,) *quiă* ſit divinitus illis. Virg.
6. Ego primam tollo, nominor *quiă* leo. Phædr.
7. *Sexagintă* teras cum limina mane ſenator. Mart.
8. *Trigintă* toto mala ſunt epigrammata libro. Mart.

3. E final is short; as natĕ, patrĕ, currĕ, nempĕ, antĕ.

Incipĕ, parvĕ puer, risu *cognoscerĕ* matrem. Virg.

1. Except that final E in all cases of the [1] first and [2] fifth declension, is long; as Calliopē, Tydidē, Anchisē, fidē; also [2] famē, originally of the fifth. Thus also, *rē, diē,* and their [3] compounds quarē, hodiē, pridiē, postridiē, quotidiē.

2. Also in [4] all nouns wanting the singular; as cetē, melē, tempē, pelagē, Greek neuters plural.

3. The second person singular of the imperative of the [5] second conjugation, has the E long; as docē, monē; but [5] cave, [6] vale, [9] vide [10], [7] responde [8], and [11] salve[12], have *e* common.

4. [13] Monosyllables ending in E are long; as *ē, mē, tē, sē, nē* (left or not) except [13] enclitics and syllabic adjectives; as *quĕ, nĕ, vĕ, ptĕ, cĕ, tĕ;* as nequĕ, quoquĕ, suaptĕ, hujusce, tutĕ, &c.

5. [14] Adverbs in *e* coming from nouns of the second declension are long; as placidē, pulchrē, valdē or validē, &c. Except [15] benĕ, malĕ, [16] supernĕ, [16] infernĕ, magĕ.

6. [17] Fermē, [18] ferē, and [19] ohē, have *e* long.

1. Hanc tua *Penelopē* lento tibi mittit, Ulysse. Ovid.
2. Et quamquam sævit pariter *rabiēque, famēque.* Ovid.
3. Quæ mens est *hodiē,* cur eadem non puero fuit? Hor.
4. At *pelagē* multa, et late sustrata videmus. Lucret.
5. Vade, *valē, cavĕ* ne titubes, mandataque frangas. Hor.
6. Idque, quod ignoti faciunt, *valĕ* dicere saltem. Ovid.
7. *Respondē,* quibus amissas reparare queam res. Hor.
8. Si quando veniet? dicet; *respondĕ,* poëta. Mart.
9. Quid sis nata *vidē,* nisi te quoque decipis ipsam. Ovid.
10. *Vidĕ,* ne dolone collum compungam tibi. Phædr.
[See also Pers. 1. 108.]
11. Lector *salvĕ.* Taces, dissimulasque? Vale. Mart.
12. *Salvē,* Pæoniæ largitor nobilis undæ. Claud.
13. Vera, inquit; *nequĕ* me Argolica *dē* gente negabo. Virg.
14. *Præcipuē,* cum jam hic trabibus contextus acernis. Virg.
15. Nil *benĕ* cum facias, facis attamen omnia belle. Mart.
16. Tecta *supernĕ* timent: metuunt *infernĕ* cavernas. Lucret.
17. Mobilis et varia est *fermē* natura malorum. Juven.
18. Jamque *ferē* sicco, subductæ littore puppes. Virg.
19. Importunus amat laudari? donec *ohē!* jam. Hor.

4. I final is long; as dominī, classī, fierī, docerī, audī, ī, filī.

Olli respondit rex *Albāi Longāi.* Enn.

1. Except the *i* of Greek vocatives; as Alexĭ, Amaryllĭ, Thetĭ, Parĭ, Daphnĭ; but Simoïs, or such as belong to nouns having *entos* in the genitive, are long.

2. Greek datives singular of the third declension, from nouns increasing, are varied. Minoidĭ and Tethyĭ in Catullus, and Palladĭ in Statius, are short.* Thetidī in Catullus, and Paridī and Tyndaridī in Propertius, are long; but Greek datives formed by contraction are always long; as Demosthenī, metamorphosī; also those which come from the first declension in Greek; as Orestī, Euripidī.

3. Neuters in *i* are also short; as gummĭ, melĭ, finapĭ.

4. Datives and ablatives plural of Greek nouns in *si* (*sin* before a vowel) are short; as heroisĭ, Troasĭ.

5. Mihi, tibi, sibi are common. Also ibi, nisi, ubi and quasi; but these last are more frequently short.

* *Note.*—These may be long by poetic licence, or by position; for the *i* of Greek cases is naturally short. Orphĕī may be considered as a dactyl in Virgil. Ecl. 4. 57; and by synæresis it is a spondee in the Georgics, 4. 535 and 553.

1. O crudelis *Alexī,* nihil mea carmina curas. Virg.
2. *Palladĭ* litoreæ celebrabat Scyros honorem. Stat.
3. *Troasĭn* invideo, quæ si lacrymosa suorum. Ovid.
4. Non unquam gravis ære domum *mihī* dextra redibat. Virg.
5. Extremum hunc, Arethusa, *mihi* concede laborem. Virg.

5. O final is common; as quando, Cato, leo, ambo, octo, amo, doceto.

1. Arma amens *capiō,* nec sat rationis in armis. Virg.
2. Non *amŏ* te, sabidi; nec possum dicere quare. Mart.

1. Except [1] monosyllables, which are long; as ō, prō, dō, stō, and prōh, *h* not being accounted as a letter.

2. [2] Greek feminines ending in *o* are long; as Didō, Sapphō, Cliō.

3. O final in [1] datives and ablatives of the second declension, is long; as somnō; to which add another ablative, as ergō, for the sake of, ergo therefore belonging to the rule.

4. Also [3] Greek cases, written in the original with omega; as Androgeō, Athō.

5. [4] Adverbs formed from nouns have the final *o* long; as subitō, meritō, multō; [5] and illō, quō, eō, and their compounds. Also citrō, intrō, retrō, ultrō. But the [6] following are sometimes found short, denuŏ, idcircŏ, serŏ, profectŏ, [9] postremŏ, the conjunction [10] verŏ, [11] porrŏ, to which some add sedulŏ, crebrŏ, and mutuŏ. [12] Modŏ (used adverbially,) and its compounds are short; as quomodŏ, dummodŏ, postmodŏ.

6. Though the final *o* of verbs, occasionally by writers of a [13] secondary class, and more rarely by those of the [15] Augustan age, has been made sometimes short, yet its derivation from the Greek omega, and the more general practice of the principal poets, make it long: the *o* of scio, [16] nescio, puto, cito, and of the imperative cedo, only, are generally short.

7. The gerund in *do,* in reality, being nothing else than the dative or ablative of the second declension, is, accordingly, by all authors of the Augustan age, made long: the [17] exceptions to this rule are very few, and only by writers of an inferior class.

8. [18] Ambo, duo, imo, illico, ego, generally shorten *o* final.

1. *Prō* molli violâ, *prō purpureō* narcisso. Virg.
2. *Clōque,* et Beroë soror, oceanides ambæ. Virg.
3. In foribus letum *Androgeō:* tum pendere pœnas. Virg.
4. Adde, quod iste tuus, tam *rarō* prælia passus. Ovid.
5. Usque *adeōne* times, quem tu facis ipse timendum? Lucret.
6. *Idcircŏ* gemellum vocitarunt choriambon. Terent.
7. *Idcircō* certis dimensum partibus orbem. Virg.
8. Imperium tibi *ferŏ* datum: victoria velox. Claud.
9. Et Scauros, et Fabricios; *postremŏ* severos. Juven.
10. Quod petimus: sin *verŏ* preces et dicta superbus. Val. Flac.
11. Vester *porrŏ* labor fœcundior historiarum. Juven.
12. Hic inter densas corylos *modŏ* namque gemellos. Virg.
13. Horrida Romuleum certamina *pangŏ* duellum. Enn.
14. *Prandeŏ, potŏ,* cano, ludo, *lavŏ, cœnŏ,* quiesco. Mart.
15. *Dixerŏ* quid si forte jocosius, hoc mihi juris. Hor.
16. Sic ubi *nescivŏ* quis Lycia de gente virorum. Ovid.
17. Quæ nosti, *meditandŏ* velis inolescere menti. Auson.
18. Præterea *duŏ* nec tuta mihi valle reperti. Virg.

6. U final is long; as vultū, cornū, Panthū, dictū, diū.

Quo res summa loco, *Panthū?* quam prendimus arcem. Virg.

1. Except [1] indŭ for in, and [2] nenŭ for non, both used by Lucretius, the former likewise by others, in composition, as indŭperator, have the *u* short.

2. Also the [3] *ŭ* before the elided *s*; as nunciŭ, plenŭ, for nuncius, plenus.

1. *Indŭ*

1. *Indŭ* manu validas potis eſt moderanter habenas. Lucret.
2. *Nenŭ* queunt rapidi contra conſtare leones. Lucret.
3. Vicimus O ſocii, et magnam *pugnavimnŭ* pugnam. Enn.

7. Y final is ſhort; as Molў, Tiphў, Chelў, Tethў.

Molў vocant ſuperi. Ovid.

Except when *y* is a contraction, as in Tethy, inſtead of Tethyi, the dative, it is long by the general rule for craſis.

Quam *Tethȳ* longinqua dies, Glaucoque repoſtâm. Val. Flac.

8. Latin words ending in B ſhorten the preceding vowel; foreign words lengthen it, as ăb, ŏb, Jōb, Jacōb.

Magnus *ăb* integro ſec'lorum naſcitur ordo. Virg.

9. Final C lengthens the preceding vowel; as āc, sīc, hīc, (adverb), dūc, illūc, &c.

Sīc oculos, *sīc* ille manus, *sīc* ora ferebat. Virg.

1. Except that nec and donec are ſhort, as alſo the imperative fac.*

2. Hic and hoc of the nominative and accuſative, are common.

* Two paſſages quoted from incorrect copies of Ovid, to prove *fac* long, in better editions appear *facito* and *face*; ſo that, according to the opinion of Alvarez, it is ſafer to conſider *fac* as ſhort.

1. Parve, *nĕc* invideo, ſine me, liber ibis in urbem. Ovid.
2. *Donĕc* eris felix, multos numerabis *amīcos*. Ovid.
3. Signa rarius, aut ſemel *făc* illud. Mart.
4. Hic vir, *hĭc* eſt, tibi quem promitti ſæpius audis. Virg.
5. Hic gladio fidens, *hĭc* acer et arduus haſta. Virg.

10. Final D, in Latin words, ſhortens the preceding vowel; in foreign words it lengthens it; as quĭd, ăd, apŭd, illŭd, sĕd, Davīd.

Ipſe docet *quĭd* agam. Fas eſt et *ăb* hoſte doceri. Ovid.

11. Final L ſhortens the preceding vowel: as mĕl, fĕl, pŏl, ſimŭl, ſemĕl, nihĭl, consŭl.

Innocui veniant: *procŭl* hinc, *procŭl* impius eſto. Ovid.

1. Except that Hebrew words are generally long; as Daniēl, Nabāl, Saūl.

2. Sāl, fōl, and nīl, are long.

1. Non *sāl*, oxyporumve caſeuſve. Stat.
2. Omnia ſub pedibus, quà *sōl* utrumque recurrens. Virg.
3. *Nīl* opis externæ cupiens, *nĭl* indiga laudis. Claud.

12. Final M was, anciently, ſhort, and was not, as now, elided when followed by a vowel.

Inſignitâ ferè tum millia *militŭm* octo. Enn.

It is ſhort in *circŭm*, in compoſition with words beginning with a vowel, as [1] circŭmeo, [2] circŭmago.

1. Cujus non hederæ *circŭmiere* caput. Propert.
2. Quo te *circŭmagas*? quæ prima aut ultima ponas? Juven.

13. Final N lengthens the preceding vowel; as ēn, ſplēn, quīn, nōn, sīn, rēn, Pān, Salamīn, Oriōn, Titān.

Merſit et ardentes *Orīn* aureus ignes. Manil.

1. Except nouns ending in [1] *en*, which have *ĭnis*, ſhort, in the genitive; as carmĕn-ĭnis, tegmĕn-ĭnis.

2. Alſo nouns in [2] *on* of the ſingular number, from the Greek *o* (omicron), and which, in Latin, are of the ſecond declenſion; as Iliŏn, Pylŏn.

3. N is ſhort in the accuſatives of Greek nouns, having the final ſyllable of their nominative ſhort; as Majăn, Æginăn, Orpheŏn, Alexĭn, Ibĭn, Chelўn, Itўn.

4. Alſo ăn, ĭn, forsăn, forſităn, tamĕn, attamĕn, veruntamĕn, vidĕn', ſatĭn', have *n* ſhort.

1. Addunt et titulum; titulus breve *carmĕn* habebat. Ovid.
2. Laudabunt alii claram *Rhodŏn*, aut Mitylenen. Hor.
3. Tantaque nox animi eſt, *Itўn* huc arceſſite, dixit. Ovid.
4. Mittite; *forsăn* et hæc olim meminiſſe juvabit. Virg.
5. *Forſităn* et, Priami fuerint quæ fata, requiras. Virg.
6. Educet. *Vidĕn'* ut geminæ ſtent vertice criſtæ. Virg.

14. Final R ſhortens the preceding vowel; as vĭr, puĕr, tĕr, timŏr, calcăr, Hamilcăr, amamŭr, audiuntŭr.

Tum *patĕr* omnipotens miſſo perfregit Olympum. Ovid.

1. Except [1] Greek nouns, and [2] ſuch as have *ēris*, long, in the genitive; as cratēr, ſtatēr, vēr, Recimēr, [3] Iber-ēris; but [4] Celtiber', the compound of Iber, has the penultimate common.

2. Alſo [6] aēr and æthēr, though they increaſe ſhort in the genitive.

3. And [7] fār, [8] lār, [9] nār, [10] cūr, [11] fūr, and [12] pār, with its [12] compounds, compār, impār, diſpār.

1. *Cratēr* auratis ſurgit cælatus ab aſtris. Manil.
2. *Vēr* erat æternum, placidique tepentibus auris. Ovid.
3. Si tibi durus *Ibēr*, aut ſi tibi terga dediſſet. Lucan.
4. Nunc *Celtibēr* in *Celtibēria* terrâ. Catul.
5. Ducit ad auriferas quod me ſalo *Celtibĕr* oras. Mart.
6. Inde mare, inde *aēr*, inde *æthēr* ignifer ipſe. Lucret.
7. *Fār* erat, et puri lucida mica ſalis. Ovid.
8. Exagitant et *Lār*, et turba Diania fures. Ovid.
9. Sulfureâ *Nār* albus aquâ, fonteſque Velini. Virg.
10. Multa quidem dixi, *cūr* excuſatus abirem. Hor.
11. Callidus effracta nummos *fūr* auferet urcâ. Mart.
12. Ludere *pār*, *impār*, equitare in arundine longa. Hor.

Note.—*Cor* long is attributed to Ovid, but the line in which it is ſaid to be thus found, is read differently in corrected editions; the ſame remark is applicable to *vir*; as

1. Molle meum levibuſque *cŏr* eſt violabile telis. Ovid.
2. De grege nunc tibi *vir*, nunc de grege natus habendus. Ovid.

Thus corrected, *vir* is long merely by poſition.

15. Words ending in AS, lengthen the final ſyllable; as mās, vās, crās, fās, amās, farās, pietās, Thomās, Muſas.

Hās autem *terrās*, Italique hanc littoris oram— Virg.

1. Greek nouns in *as* are ſhort, which make the genitive in *ados* or *adis*, as Arcas, Pallas, Lampas, Ilias: to which add the noun Anăs, and Latin nouns in *as*, formed after the manner of Greek patronymics; as Appiăs.

2. Alſo the final *as* of Greek accuſatives plural of the third declenſion is ſhort; as craterăs, lampadăs, Troăs, Cyclopăs, heröas, heroidăs, Hectorăs, &c.

1. Bellica *Pallăs* adeſt, et protegit ægide fratrem. Ovid.
2. Et pictis *anăs* enovata pennis. Petron.
3. *Appiăs* expreſſis æra pultat aquis. Ovid.
4. *Naidăs* his venam, quæ nunquam areſcere poſſet— Ovid.

16. Words ending in ES lengthen that ſyllable; as rēs, ſpēs, vulpēs, quiēs, hærēs, eſsēs, Anchisēs, totiēs, locuplēs.

Vulpēs ad cœnam dicitur ciconiam. Phædr.

1. [1] The nouns and vocatives plural of Greek nouns increaſing (not in ος) ſhort in the ſingular, are ſhort; as Amazonĕs, Arcadĕs, Delphinĕs, Naiadĕs, Gryphĕs, Phrygĕs.

2. To which may be added Greek vocatives ſingular in *es*, coming from nominatives in *es*, not formed from *eus* of the Doric dialect, and having their genitive in *eos*; as Demoſthenĕs, Socratĕs.

3. E final is short; as natĕ, patrĕ, currĕ, nempĕ, antĕ.

Incipĕ, parvĕ puer, risu *cognoscerĕ* matrem. Virg.

1. Except that final E in all cases of the [1] first and [2] fifth declension, is long; as Calliopē, Tydidē, Anchisē, fidē; also [2] famē, originally of the fifth. Thus also, *rē, diē*, and their [3] compounds quarē, hodiē, pridiē, postridiē, quotidiē.

2. Also in [4] all nouns wanting the singular; as cetē, melē, tempē, pelagē, Greek neuters plural.

3. The second person singular of the imperative of the [5] second conjugation, has the E long; as docē, monē; but [5] cave, [6] vale, [9] vide [10], [7] responde [8], and [11] salve[12], have *e* common.

4. [13] Monosyllables ending in E are long; as *ē, mē, tē, sē, nē* (left or not) except [13] enclitics and syllabic adjectives; as *quĕ, nĕ, vĕ, ptĕ, cĕ, tĕ;* as nequĕ, quoquĕ, suaptĕ, hujusce, tutĕ, &c.

5. [14] Adverbs in *e* coming from nouns of the second declension are long; as placidē, pulchrē, valdē or validē, &c. Except [15] benĕ, malĕ, [16] supernĕ, [16] infernĕ, magĕ.

6. [17] Fermē, [18] ferē, and [19] ohē, have *e* long.

1. Hanc tua *Penelopē* lento tibi mittit, Ulysse. Ovid.
2. Et quamquam sævit pariter *rabiēque, famēque.* Ovid.
3. Quæ mens est *hodiē*, cur eadem non puero fuit? Hor.
4. At *pelagē* multa, et late sustrata videmus. Lucret.
5. Vade, *valē, cavĕ* ne titubes, mandataque frangas. Hor.
6. Idque, quod ignoti faciunt, *valĕ* dicere saltem. Ovid.
7. *Respondē*, quibus amissas reparare queam res. Hor.
8. Si quando veniet? dicet; *respondĕ*, poëta. Mart.
9. Quid sis nata *vidē*, nisi te quoque decipis ipsam. Ovid.
10. *Vidĕ*, ne dolone collum compungam tibi. Phædr.
[See also Pers. 1. 108.]
11. Lector *salvĕ*. Taces, dissimulasque? Vale. Mart.
12. *Salvē*, Pæoniæ largitor nobilis undæ. Claud.
13. Vera, inquit; *nequĕ* me Argolica *dē* gente negabo. Virg.
14. *Præcipuē*, cum jam hic trabibus contextus acernis. Virg.
15. Nil *benĕ* cum facias, facis attamen omnia belle. Mart.
16. Tecta *supernĕ* timent: metuunt *infernĕ* cavernas. Lucret.
17. Mobilis et varia est *fermē* natura malorum. Juven.
18. Jamque *ferē* sicco, subductæ littore puppes. Virg.
19. Importunus, amat laudari? donec *ohē!* jam. Hor.

4. I final is long; as dominī, classī, fierī, docerī, audī, filī.

Ollī respondit rex *Albōī Longāī*. Enn.

1. Except the *i* of Greek vocatives; as Alexĭ, Amaryllĭ, Thetĭ, Parĭ, Daphnĭ; but Simōī, or such as belong to nouns having *entos* in the genitive, are long.

2. Greek datives singular of the third declension, from nouns increasing, are varied. Minoidĭ and Tethyĭ in Catullus, and Palladĭ in Statius, are short.* Thetidī in Catullus, and Paridī and Tyndaridī in Propertius, are long; but Greek datives formed by contraction are always long; as Demosthenī, metamorphosī; also those which come from the first declension in Greek; as Orestī, Euripidī.

3. Neuters in *i* are also short; as gummĭ, melĭ, finapĭ.

4. Datives and ablatives plural of Greek nouns in *si* (*sin* before a vowel) are short; as heroisĭ, Troasĭ.

5. Mihi, tibi, sibi are common. Also ibi, nisi, ubi and quasi; but these last are more frequently short.

* *Note.*—These may be long by poetic licence, or by position; for the *i* of Greek cases is naturally short. Orphēĭ may be considered as a dactyl in Virgil. Ecl. 4. 57; and by synæresis it is a spondee in the Georgics, 4. 535 and 553.

1. O crudelis *Alexī*, nihil mea carmina curas. Virg.
2. *Palladī* littoreæ celebrabat Scyros honorem. Stat.
3. *Troasĭn* invideo, quæ si lacrymosa suorum. Ovid.
4. Non unquam gravis ære domum *mihī* dextra redibat. Virg.
5. Extremum hunc, Arethusa, *mihī* concede laborem. Virg.

5. O final is common; as quando, Cato, leo, ambo, octo, amo, doceto.

1. Arma amens *capiō*, nec sat rationis in armis. Virg.
2. Non *amŭ* te, sabidi; nec possum dicere quare. Mart.

1. Except [1] monosyllables, which are long; as ō, prō, dō, stō, and prōh, *h* not being accounted as a letter.

2. [2] Greek feminines ending in *o* are long; as Didō, Sapphō, Cliō.

3. O final in [1] datives and ablatives of the second declension, is long; as somnō; to which add another ablative, as ergō, for the sake of, ergo therefore belonging to the rule.

4. Also [3] Greek cases, written in the original with omega; as Androgeō, Athō.

5. [4] Adverbs formed from nouns have the final *o* long; as subitō, meritō, multō; [5] and illō, quō, eō, and their compounds. Also citrō, intrō, retrō, ultrō. But the following are sometimes found short, denuŏ, idcircŏ, ferŏ, profectŏ, [9] postremŏ, the conjunction [10] verŏ, [11] porrŏ, to which some add sedulŏ, crebrŏ, and mutuŏ. [12] Modŏ (used adverbially,) and its compounds are short; as quomodŏ, dummodŏ, postmodŏ.

6. Though the final *o* of verbs, occasionally by writers of a [14] secondary class, and more rarely by those of the [15] Augustan age, has been made sometimes short, yet its derivation from the Greek omega, and the more general practice of the principal poets, make it long: the *o* of scio, [16] nescio, puto, cito, and of the imperative cedo, only, are generally short.

7. The gerund in *do*, in reality, being nothing else than the dative or ablative of the second declension, is, accordingly, by all authors of the Augustan age, made long: the [17] exceptions to this rule are very few, and only by writers of an inferior class.

8. [18] Ambo, duo, imo, illico, ego, generally shorten *o* final.

1. *Prō* molli violâ, *prō purpureō* narcisso. Virg.
2. *Cliōque*, et Beroë soror, oceanitides ambæ. Virg.
3. In foribus letum *Androgeō*: tum pendere pœnas. Virg.
4. Adde, quod iste tuus, tam *rarō* prælia passus. Ovid.
5. Usque *adeōne* times, quem tu facis ipse timendum? Lucret.
6. *Idcircō* gemellum vocitarunt choriambon. Terent.
7. *Idcircō* certis dimensum partibus orbem. Virg.
8. Imperium tibi *ferō* datum: victoria velox. Claud.
9. Et Scauros, et Fabricios; *postremŏ* severos. Juven.
10. Quod petimus: sin *verŏ* preces et dicta superbus. Val. Flac.
11. Vester *porrŏ* labor fœcundior historiarum. Juven.
12. Hic inter densas corylos *modŏ* namque gemellos. Virg.
13. Horrida Romuleum certamina *pangŏ* duellum. Enn.
14. *Prandeŏ, potŏ*, cano, ludo, *lavŏ, cænŏ*, quiesco. Mart.
15. *Dixerŏ* quid si forte jocosius, hoc mihi juris. Hor.
16. Sic ubi *nescīŏ* quis Lycia de gente virorum. Ovid.
17. Quæ nolīī, *meditandŏ* velis inolescere menti. Auson.
18. Præterea *duŏ* nec tutâ mihi valle reperti. Virg.

6. U final is long; as vultū, cornū, Panthū, dictū, diū.

Quo res summa loco, *Panthū?* quam prendimus arcem. Virg.

1. Except [1] indŭ for in, and [2] nenŭ for non, both used by Lucretius, the former likewise by others, in composition, as indŭperator, have the *u* short.

2. Also the [3] *ŭ* before the elided *s*; as nunciŭ, plenŭ, for nuncius, plenus.

1. *Indŭ* manu validas potis eſt moderanter habenas. Lucret.
2. *Nenŭ* queunt rapidi contra conſtare leones. Lucret.
3. Vicimus O ſocii, et magnam *pugnavimŭ* pugnam. Enn.

7. Y final is ſhort; as Molў, Tiphў, Chelў, Tethў.

Molў vocant ſuperi. Ovid.

Except when *y* is a contraction, as in Tethy, inſtead of Tethyi, the dative, it is long by the general rule for craſis.

Quam *Tethȳ* longinqua dies, Glaucoque repoſtâm. Val. Flac.

8. Latin words ending in B ſhorten the preceding vowel; foreign words lengthen it, as ăb, ŏb, Jōb, Jacōb.

Magnus *ăb* integro ſec'lorum naſcitur ordo. Virg.

9. Final C lengthens the preceding vowel; as āc, sīc, hīc, (adverb), dūc, illūc, &c.

Sīc oculos, *sīc* ille manus, *sīc* ora ferebat. Virg.

1. Except that nec and donec are ſhort, as alſo the imperative fac.*

2. Hic and hoc of the nominative and accuſative, are common.

* Two paſſages quoted from incorrect copies of Ovid, to prove *fac* long, in better editions appear *facito* and *face*; ſo that, according to the opinion of Alvarez, it is ſafer to conſider *fac* as ſhort.

1. Parve, *nĕc* invideo, ſine me, liber ibis in urbem. Ovid.
2. *Donĕc* eris felix, multos numerabis *amīcos*. Ovid.
3. Signa rarius, aut ſemel *făc* illud. Mart.
4. Hic vir, *hĭc* eſt, tibi quem promitti ſæpius audis. Virg.
5. Hic gladio fidens, *hĭc* acer et arduus haſta. Virg.

10. Final D, in Latin words, ſhortens the preceding vowel; in foreign words it lengthens it; as quĭd, ăd, apŭd, illŭd, sĕd, Davīd.

Ipſe docet *quĭd* agam. Fas eſt et *ăb* hoſte doceri. Ovid.

11. Final L ſhortens the preceding vowel: as mĕl, fĕl, pŏl, ſimŭl, ſemĕl, nihĭl, consŭl.

Innocui veniant: *procŭl* hinc, *procŭl* impius eſto. Ovid.

1. Except that Hebrew words are generally long; as Daniēl, Nabāl, Saūl.

2. Sāl, sōl, and nīl, are long.

1. Non *sāl*, oxyporumve caſeuſve. Stat.
2. Omnia ſub pedibus, quà *sōl* utrumque recurrens. Virg.
3. *Nīl* opis externæ cupiens, *nĭl* indiga laudis. Claud.

12. Final M was, anciently, ſhort, and was not, as now, elided when followed by a vowel.

Inſignitâ ferè tum millia *militŭm* octo. Enn.

It is ſhort in *circŭm*, in compoſition with words beginning with a vowel, as [1] circŭmeo, [2] circŭmago.

1. Cujus non hederæ *circŭmiere* caput. Propert.
2. Quo te *circŭmagas*? quæ prima aut ultima ponas? Juven.

13. Final N lengthens the preceding vowel; as ēn, ſplēn, quīn, nōn, sīn, rēn, Pān, Salamīn, Oriōn, Titān.

Merſit et ardentes *Orīōn* aureus ignes. Manil.

1. Except nouns ending in [1] *en*, which have *ĭnis*, ſhort, in the genitive; as carmĕn-ĭnis, tegmĕn-ĭnis.

2. Alſo nouns in [2] *on* of the ſingular number, from the Greek *o* (omicron), and which, in Latin, are of the ſecond declenſion; as Iliŏn, Pylŏn.

3. N is ſhort in the accuſatives of Greek nouns, having the final ſyllable of their nominative ſhort; as Majăn, Æginăn, Orpheŏn, Alexĭn, Ibĭn, Chelўn, Itўn.

4. Alſo ăn, ĭn, forsăn, forſităn, tamĕn, attamĕn, veruntamĕn, viděn', ſatĭn', have *n* ſhort.

1. Addunt et titulum; titulus breve *carmĕn* habebat. Ovid.
2. Laudabunt alii claram *Rhodŏn*, aut Mitylenen. Hor.
3. Tantaque nox animi eſt, *Itўn* huc arceſſite, dixit. Ovid.
4. Mittite; *forsăn* et hæc olim meminiſſe juvabit. Virg.
5. *Forſităn* et, Priami fuerint quæ fata, requiras. Virg.
6. Educet. *Viděn'* ut geminæ ſtent vertice criſtæ. Virg.

14. Final R ſhortens the preceding vowel; as vĭr, puĕr, tĕr, timŏr, calcăr, Hamilcăr, amamŭr, audiuntŭr.

Tum *patĕr* omnipotens miſſo perfregit Olympum. Ovid.

1. Except [1] Greek nouns, and [2] ſuch as have *ēris*, long, in the genitive; as cratēr, ſtatēr, vēr, Recimēr, [3] Iber-ēris; but [4] Celtiber, the compound of Iber, has the penultimate common.

2. Alſo [6] aēr and æthēr, though they increaſe ſhort in the genitive.

3. And [7] fār, [8] lār, [9] nār, [10] cūr, [11] fūr, and [12] pār, with its [12] compounds, compār, impār, diſpār.

1. *Cratēr* auratis ſurgit cælatus ab aſtris. Manil.
2. *Vēr* erat æternum, placidique tepentibus auris. Ovid.
3. Si tibi durus *lbēr*, aut ſi tibi terga dediſſet. Lucan.
4. Nunc *Celtibēr* in *Celtibēria* terrâ. Catul.
5. Ducit ad auriferas quod me ſalo *Celtibĕr* oras. Mart.
6. Inde mare, inde *aēr*, inde *æthēr* ignifer ipſe. Lucret.
7. *Fār* erat, et puri lucida mica ſalis. Ovid.
8. Exagitant et *Lār*, et turba Diania fures. Ovid.
9. Sulfureâ *Nār* albus aquâ, fonteſque Velini. Virg.
10. Multa quidem dixi, *cūr* excuſatus abirem. Hor.
11. Callidus effracta nummos *fūr* auferet urcâ. Mart.
12. Ludere *pār*, *impār*, equitare in arundine longa. Hor.

Note.—*Cor* long is attributed to Ovid, but the line in which it is ſaid to be thus found, is read differently in corrected editions; the ſame remark is applicable to *vir*; as

1. Molle meum levibuſque *cŏr* eſt violabile telis. Ovid.
2. De grege nunc tibi *vir*, nunc de grege natus habendus. Ovid.

Thus corrected, *vir* is long merely by poſition.

15. Words ending in AS, lengthen the final ſyllable; as mās, vās, crās, fās, amās, farās, pietās, Thomās, Muſas.

Hās autem *terrās*, Italique hanc littoris oram— Virg.

1. Greek nouns in *as* are ſhort, which make the genitive in *ados* or *adis*, as Arcas, Pallas, Lampas, Ilias: to which add the noun Anăs, and Latin nouns in *as*, formed after the manner of Greek patronymics; as Appiăs.

2. Alſo the final *as* of Greek accuſatives plural of the third declenſion is ſhort; as craterăs, lampadăs, Troăs, Cyclopăs, heroăs, heroidăs, Hectorăs, &c.

1. Bellica *Pallăs* adeſt, et protegit ægide fratrem. Ovid.
2. Et pictis *anăs* enovata pennis. Petron.
3. *Appiăs* expreſſis ærea pulſat aquis. Ovid.
4. *Naidăs* his venam, quæ nunquam areſcere poſſet— Ovid.

16. Words ending in ES lengthen that ſyllable; as rēs, ſpēs, vulpēs, quiēs, hærēs, eſsēs, Anchisēs, totiēs, locuplēs.

Vulpēs ad cœnam dicitur ciconiam. Phædr.

1. [1] The nouns and vocatives plural of Greek nouns increaſing (not in εος) ſhort in the ſingular, are ſhort; as Amazonĕs, Arcadĕs, Delphinĕs, Naiadĕs, Gryphĕs, Phrygĕs.

2. To which may be added Greek vocatives ſingular in *es*, coming from nominatives in *es*, not formed from *eus* of the Doric dialect, and having their genitive in *eos*; as Demoſthenĕs, Socratĕs.

3. * *Es*, in the preſent tenſe of *ſum*, and its [3]compounds, is ſhort; as adĕs, abĕs, prodĕs, potĕs, &c.; and in the prepoſition penĕs.

4. [4] Latin nouns of the third declenſion, in *es*, increaſing ſhort in the genitive, are ſhort in the final ſyllable; as hebĕs, alĕs, pedĕs, limĕs, obsĕs. [5] But *es* is long in theſe following; Cerēs, pariēs, ariēs, abiēs, pēs, and its [6] compounds, as bipēs, tripēs, alipēs, ſonipēs; to which ſome add præpēs, a derivative of præpeto.

1. *Troadĕs*; et patriæ ſumantia tecta reliquunt. Ovid.
2. Quiſquis ĕs, amiſſos hinc jam oblivifcere Graios. Virg.
3. Nunc *adĕs* O cœptis, flava Minerva, meis. Ovid.
4. Vivitur ex rapto; non *hoſpēs* ab hoſpite tutus. Ovid.
5. Flava *Cerēs* alto nequicquam ſpectat Olympo. Virg.
6. Creditur: ipſe *ariēs* etiam nunc vellera ficcat. Virg.
7. Deſuper Aurigæ dexter *pēs* imminet aſtro. Manil.
8. Stat *ſonipēs*, et fræna ferox ſpumantia mandit. Virg.

**Note.*—1. Though *es*, in the prefent tenſe of *ſum* and its compounds is ſhort, it is not in any other tenſe, nor in the final ſyllable of *eſſes*, (as has been aſſerted,) as

Peſſēs in tanto vivere flagitio? Propert.
Eſſēs Ionii facta puella maris. Propert.

2. Whenever paries, aries, and abies are found long, there happens to be a cæſura; and perhaps Ceres and pes are long by diaſtole: Auſonius ſhortens bipes and triges; and Probus obſerves that alipes and ſonipes are likewiſe ſhort: though the contrary appears in Virgil, Lucan, and Horace, yet ſome of the above-mentioned words could not be introduced into heroic verſe without the influence of a figure to lengthen their final ſyllable. Præpes, which comes not from *pes*, but from *πρόπετης*, is ſhort in Virgil. (Æn. 5. 254.) Tigrēs, aſcribed to Ovid, is, by the beſt critics, rejected.

17. IS final is ſhort; as bĭs, ĭs, quĭs, cĭs, magĭs, turrĭs, militĭs, creditĭs, Thetĭs.

Tum *bĭs* ad occaſum, bis ſe convertit ad ortum. Ovid.

1. Except [1] plural caſes in *is*; as nobīs, vobīs, ([2] quīs for quibus), musīs; the plural accuſatives [3] omnīs, [4] urbīs, &c.

2. The nominative in *is* is long, when the [5] genitive ends in *ītis*, *īnis*, or *ēntis* long; as līs, Samnīs, Salamīs, Simoīs.

3. *Is* is long in the adverbs [9] gratīs and forīs; in the noun glīs, and in vīs, whether noun or [8] verb.

4. All [6] ſecond perſons ſingular in *is* are long; when the ſecond perſons plural have *ītis* long; as cīs, fīs, sīs, īs, abīs, audīs, velīs, nolīs, poſsīs, &c.

5. [10] *Ris* of the perfect is commonly conſidered ſhort, of the [11] future [12], common; ſo are the penultimates of ausĭs and faxĭs: ris and ritis of [13] ero and potero are more frequently ſhort.

1. Inducenda rota eſt: das *nōbĭs* utile munus. Mart.
2. *Quīs* ante ora patrum Trojæ ſub mœnibus altis. Virg.
3. Non *omnīs* arbuſta juvant, humileſque myricæ. Virg.
4. Adde tot egregias *urbĭs*, operumque labohrem. Virg.
5. Sed *līs* eſt mihi de tribus capellis. Mart.
6. *Neſcīs*, heu! neſcis dominæ faſtidia Romæ. Mart.
7. Ignea convexi *vīs* et ſine pondere cœli. Ovid.
8. Si *vīs* eſſe aliquis. Probitas laudatur et alget. Juven.
9. *Gratīs* anhelans, multa agendo, nil agens. Phædr.
10. *Dixerĭs* egregie notum ſi callida verbum. Hor.
11. Quas gentes Itâlum, aut quas non *oraverĭs* urbes. Virg.
12. Da mihi te placidum; *dederīs* in carmine vires. Ovid.
13. Fortunate puer, tu nunc *erĭs* alter ab illo. Virg.

18. OS final is long; as rōs, vōs, nōs, mōs, flōs, trōs, arbōs, honōs, cuſtōs, nepōs.

Ōs homini ſublime dedit, cœlumque tueri. Ovid.

1. Except [1] Greek genitives in *os*; as Arcadŏs, Tethyŏs, Tereŏs, Orpheŏs.

2. Alſo [2] compŏs, impŏs, and [3] ŏs-oſſis, with its compounds exŏs, have the final ſyllable ſhort.

3. [4] Greek nominatives and vocatives of the ſecond declenſion have *os* ſhort; as Clarŏs, Tenedŏs, Leſbŏs, Atropŏs. But thoſe nouns of the Attic dialect, having their genitives in omega, are long, as Androgeōs, Athōs: alſo nouns of the ſame dialect, which have changed *laŏs* (λαὸς) into *leos* (λεὼς), as Peneleōs, Meneleōs.

4. Greek neuters in *os* are ſhort; as Argŏs, epŏs, chaŏs, melŏs.

1. Alta jacet vaſti ſuper ora *Typhoëŏs* Ætna. Ovid.
2. Inſequere, et voti poſtmodo *compŏs* eris. Ovid.
3. *Exŏs* et exſanguis tumidos perfluctuat artus. Lucret.
4. Tum, cum triſtis erat, defenſa erit *Iliŏs* armis. Ovid.
5. Quantus *Athōs*, aut quantus Eryx, aut ipſe caruſcis. Virg.
6. Et *Chaŏs* et Phlegethon, loca nocte ſilentia latè— Virg.

19. US final is ſhort; as tenŭs, littŭs, penitŭs, intŭs, Ambobŭs, Montibŭs, Amamŭs.

Incipe: paſcentes ſervabit *Tityrŭs* hædos. Virg.

1. Except [1] monoſyllables in *us*; as grūs, plūs, rūs, thūs, jūs.

2. Alſo the [2] genitives of feminine nouns in *o*; as Cliūs, Sapphūs, Mantūs.

3. Genitives ſingular, and nominatives, accuſatives, and vocatives plural of the fourth declenſion, (all being contracted,) have *us* long; as fructūs, manūs.

4. Alſo nouns increaſing long in the genitive; as palūs-ūdis, virtūs-ūtis, tellūs-ūris, Opūs-ūntis.

5. *Us* is long in the [5] compounds of *πους*, (forming the genitive in podis or podos,) as Tripūs, Melampūs, Œdipūs, Polypūs.

6. Alſo [6] thoſe nouns which have *u* in their vocative; as Panthūs, O Panthu.

7. Finally, [7] Ιησους has the final ſyllable long.

1. Romæ *rūs* optas, abſentem ruſticus urbem. Hor.
2. *Didūs* atque ſuum miſceri ſanguine ſanguen. Varro.
3. Pars fecreta *domūs* ebore et teſtudine cultos— Ovid.
4. Ridet ager; neque adhuc *virtūs* in frondibus ulla eſt. Ovid.
5. Hic *Œdipūs* Ægea tranabit freta. Seneca.
6. *Panthūs* Othryades, arcis Phœbique facerdos. Virg.
7. Et cœlo et terris venerandum nomen *Jeſus*.

20. YS final is ſhort; as Capўs, chelўs, chlamўs.

At *Capўs*, et quorum melior ſententia menti. Virg.

Except nouns which form the nominative in *yn* alſo; as Gortўs, Phorcўs. To theſe add contracted plurals; as Erynnўs, for Erinnyēs, or Erinnyās.

21. Final T ſhortens the preceding vowel; as capŭt, amăt.

Verum hæc tantum alias inter; *capŭt extulĭt* urbes. Virg.

Except when final *t* is long by craſis: as redit for rediit or redivit.

Magnus civis *obīt* et formidatus Othoni. Juven.

22. The laſt ſyllable of every verſe is conſidered common; that is, if the ſyllable be naturally long, it may be accounted ſhort; or, if it ſuit the verſe, *vicĕ verſâ*.

Gens inimica mihi Tyrrhenum navigat *æquōr*. Virg.
Creſcit occulto velut arbor *ævŏ*. Hor.

Note.—1. In the firſt of theſe examples, *ŏr*, naturally ſhort, forms the ſecond ſyllable of a ſpondee; in the laſt, a Sapphic verſe, the word *ævŏ*, which is naturally a ſpondee, forms a trochee.

2. "The grammarians that diſpleaſe Dr. Clarke, (ſee Clarke's Homer, Iliad A. v. 54.) by ſaying that the laſt ſyllable of a verſe is common, only mean, that the *local* quantity ſuperſedes the natural quautity of the ſyllable."

For the laſt principal head of proſody; ſee VERSIFICATION.

QUAN-TSOM, in *Geography*, a town of China, of the third rank, in Pe-tche-li; 32 miles S. of Chunte.

QUANTUM

QUANTUM MERUIT, called alſo an *aſſumpſit*, in *Law*, an action upon the caſe, grounded upon a neceſſity to pay a man for doing any thing ſo much as it deſerves or merits.

This valuation of his trouble is ſubmitted to the determination of a jury; who will aſſeſs ſuch a ſum in damages as they think he really merited.

QUANTUM *Valebat*, or an implied aſſumpſit, is where goods and wares ſold, are delivered by a tradeſman at no certain price, or to be paid for them as much as they are worth in general; then *quantum valebat*, or an action on the caſe, lies, and the plaintiff is to aver them to be worth ſo much; ſo where the law obliges one to furniſh another with goods or proviſions, as an inn-keeper his gueſts, &c.

QUANTZ, JOHN JOACHIM, in *Biography*, chamber muſician to Frederic II. king of Pruſſia, to whom he had been flute-maſter before his acceſſion to the crown. Quantz was born at Oberſcheden, a village in the electorate of Hanover, in 1697. His father, who was a blackſmith, obliged him to work at the anvil before he was nine years old; which muſt have afforded him an early opportunity of making the famous Pythagorean experiment, mentioned by Jamblichus (de Vit. Pythag.), and by all the muſical writers of antiquity. Indeed, the ear of our young Ardalus had been already formed, in his excurſions with his brother, a village muſician, who uſed to play about the country on holydays and feſtivals, whom he accompanied upon theſe occaſions, on the baſe-viol, when but eight years old, and without knowing a note of muſic; but this performance, bad as it was, pleaſed him ſo much, that he determined to chooſe muſic for his profeſſion; though his father, who died when he was only ten years of age, recommended to him, on his death-bed, to continue in the honourable profeſſion of his anceſtors.

Quantz, after loſing his father, had no other friends to depend upon for counſel and protection, than two uncles, who lived at Merſeburg in Saxony; and theſe, ſending for him, gave him the choice of their ſeveral profeſſions, the one being a taylor, and the other a *kunſtpfeifer*, or town-wait.

Upon this occaſion, the paſſion for muſic in the young Quantz overpowered all other conſiderations, and, preferring the fiddle-ſtick to the anvil or ſhears, he bound himſelf apprentice to his uncle, the muſician, for five years; but this uncle dying three months after, he was transferred to his ſon-in-law, Fleiſchhack, who was of the ſame profeſſion; and it was under him that he firſt practiſed the violin, an inſtrument to which his inclination at this time impelled him, preferably to any other.

Soon after this, however, he practiſed the hautbois, and the trumpet, with which inſtruments, and the violin, he chiefly filled up the term of his apprenticeſhip; but as a true town muſician, in Germany, is expected to play upon all kinds of inſtruments, he had been obliged, occaſionally, to apply himſelf, during this period, to the ſackbut, cornet, baſe-viol, French horn, common flute, baſſoon, viol da gamba, and the lord knows how many more. Theſe were in the way of buſineſs, but for pleaſure, he now and then took leſſons on the harpſichord, of the organiſt Kieſewetter, who was likewiſe his relation; by which he laid the firſt foundation of his knowledge in harmony, and love for compoſition.

Luckily for Quantz, his maſter, Fleiſchhack, was not, like other country muſicians, fond only of old, dry, ſtiff, and taſteleſs compoſitions, but had ſufficient diſcernment to chooſe his pieces out of the neweſt and beſt productions of the times, by Telemann, Melchoir, Hofmann, and Heinechen, which were publiſhed at Leipſic; from the peruſal, and practice of which, our young performer derived great advantage.

The duke of Merſeburg's band not being very numerous, the town-waits, at this time, were often called in, to aſſiſt at the muſical performances, both of court and chapel. Here Quantz frequently heard foreigners play and ſing, in a manner far ſuperior to any profeſſors whom he had hitherto met with, which excited in him a ſtrong deſire to travel. Dreſden and Berlin were at this time the moſt renowned cities in Germany, for the cultivation of muſic, and the number of able muſicians. He eagerly wiſhed to viſit one of thoſe cities, but was deſtitute of the means. However, he now began to feel his ſtrength, and truſting to his feet and his fiddle, he boldly ſet off for Dreſden.

It was in the year 1714 that he arrived in that city. His firſt entrance was not auſpicious, being wholly unable to procure employment: on this account, he made an excurſion to Radeburg, where a journeyman fiddler being wanting, he entered into the ſervice of the town muſician, Knoll; but alas! he was ſoon driven from this poſt, by the fatal accident of the town being burnt down by lightning. Again reduced to the ſtate of a fugitive, and a wanderer, he levied contributions round the country by the power of his violin, which was now his principal inſtrument, till he reached Pirna.

Here, deſtined ſtill to be *ſervus ſervorum*, he could procure no other means of exerciſing his profeſſion, than by accepting the office of deputy to a ſick journeyman muſician of the town. It was during this time, that he firſt ſaw Vivaldi's concertos for the violin, which were ſo congenial to his own feelings and ideas of perfection, that he made them his model as long as he continued to practiſe that inſtrument.

Still regarding Dreſden as his centre, he eagerly accepted an offer that was made to him, of being temporary aſſiſtant there, to one of the town-waits, who was then ill; an employment which he preferred, for the opportunities it afforded him of hearing good muſic and good muſicians, to the more honourable poſt of being the beſt of bad muſicians at Berenburg, where he might have been appointed firſt violin, with a good ſalary.

His ſecond arrival at Dreſden was in the year 1716, where he ſoon diſcovered that it was not ſufficient for a muſician to be able to execute the mere notes which a compoſer had ſet on paper; and it was now that he firſt began to be ſenſible of the exiſtence of taſte and expreſſion.

Auguſtus II. was at this time king of Poland, and elector of Saxony, and the orcheſtra of this prince at Dreſden was in a flouriſhing condition; however, the ſtyle which had been introduced there, by the concert-maſter Volumier, was French; but Piſendel, who ſucceeded him, introduced a mixed taſte, partly French, and partly Italian, which he afterwards brought to ſuch perfection, that Quantz declares, he never heard a better band in all his future travels.

No orcheſtra in Europe could now boaſt of ſo many able profeſſors, as that of the elector of Saxony, among whom, were Piſendel and Veracini, on the violin; Pantaleone Hebenſtreit, on the pantaleone; Weiſs, on the lute; Richter, on the hautbois; and Buffardin, on the German flute; not to mention ſeveral excellent performers on the violoncello, baſſoon, French horn, and double-baſe.

Upon hearing theſe great performers, Quantz was filled with ſuch wonder, and poſſeſſed of ſuch a rage for improvement, that he laboured inceſſantly to render himſelf worthy of a place among ſuch honourable aſſociates.

For, however prejudiced he may have been in favour of his own reputable calling of kunſtpfeifer, he began now juſt to think it poſſible for him to be prevailed upon, to relinquiſh that part of it, at leaſt, which required him to play

country dances, though in itſelf ſo jovial, pleaſant, and feſtal an employment.

He continued, however, to be the kunſtpfeifer's delegate in this city, till the death of Auguſtus II.'s mother, in 1717, at which time, the general mourning proſcribing the uſe of every ſpecies of convivial muſic, he again, in his uſual manner, commenced traveller, and fiddled his way through Sileſia, Moravia, and Auſtria, to Vienna; and in the month of October, of the ſame year, returned through Prague to Dreſden; which journey, he thinks, contributed more to his knowledge, in practical geography, than in any other art.

The jubilee of the reformation, brought about by Dr. Luther, happening to be celebrated ſoon after his return, he was called upon, among others, to perform a part upon the trumpet, at church, where the chapel-maſter Schmidt having heard him, offered to prevail on the king to have him regularly taught that inſtrument, in order to qualify him for the place of court trumpeter; but Quantz, however ardently he might have wiſhed for an office at court, declined the acceptance of this, well knowing that the good taſte to which he aſpired, was not to be learned upon that inſtrument, at leaſt as it was then played in Dreſden.

In 1718, the Poliſh or royal chapel was inſtituted; it was to conſiſt of twelve performers, eleven were already choſen, and a hautbois player, only, was now wanting, to complete the number. After undergoing the ſeveral trials, and giving the requiſite proofs of his abilities, he had the happineſs to be inveſted with that employment, by the director, baron Seyfertitz, with a ſalary of 150 dollars, and a lodging.

This was an important period in his life, and in the exerciſe of his profeſſion. The violin, which had hitherto been his principal inſtrument, was now laid aſide for the hautbois, upon which, however, he was prevented from diſtinguiſhing himſelf, by the ſeniority of his brethren. Mortified at this circumſtance, he applied himſelf ſeriouſly to the German flute, upon which he had formerly made ſome progreſs without a maſter; but his motive now for reſuming it, was the certainty of his having no rival, in the king's band, as M. Frieſe, the firſt flute, had no great paſſion for muſic, and readily relinquiſhed to him his place.

In order to work upon ſure ground, Quantz took leſſons at this time of the famous Buffardin, with whom, however, he only played quick movements, in which this celebrated flute-player chiefly excelled. The ſcarcity of pieces, compoſed expreſsly for the German flute, was ſuch, at this period, that the performers upon that inſtrument were obliged to adopt thoſe of the hautbois, or violin, and by altering or tranſpoſing, accommodate them to their purpoſe, as well as they could.

This ſtimulated Quantz to compoſe for himſelf; he had not as yet ever received any regular inſtructions in counterpoint, ſo that, after he had committed his thoughts to paper, he was obliged to have recourſe to others to correct them. Schmidt, the chapel-maſter, had promiſed to teach him compoſition, but delayed keeping his word from time to time, and Quantz was afraid of applying to Heinichen, his colleague, for fear of offending Schmidt, as theſe maſters were upon bad terms together. In the mean time, for want of other aſſiſtance, he diligently ſtudied the ſcores of great maſters, and without ſtealing from them, endeavoured to imitate their manner of putting parts together, in trios, and concertos.

About this time he had the good fortune to commence a friendſhip with Pifendel, now appointed concert-maſter, in the room of Volumier. Quantz is very warm in his praiſes of Pifendel, whom he calls a profound theoriſt, a great performer, and a truly honeſt man. It was from this worthy concert-maſter that he learned to perform an adagio, and to compoſe in many parts. Pifendel had in his youth been taught to ſing by the famous Piſtocchi, and had received inſtructions, on the violin, from Torelli; however, having travelled through France and Italy, where he had acquired the peculiarities in the taſte of both countries, he ſo blended them together as to form a third genus, or mixed ſtyle of writing and playing, which was half French and half Italian. Influenced by his example, Quantz declares, that he always preferred this compound ſtyle, to that of Italy, France, or the national ſtyle of his own country.

At the marriage of the prince royal of Poland, in 1719, ſeveral Italian operas were performed at Dreſden. Lotti, the famous Venetian maeſtro di capella, together with the moſt celebrated ſingers of Italy, male and female, were called thither upon this occaſion; theſe were the firſt Italian operas which Quantz had heard, and he confeſſes, that the performance of them gave him a very favourable idea of the genuine and ſound Italian muſic, from which he thinks later times have too much deviated.

After deſcribing the talents of the ſingers who will have their place in our alphabet, he informs us that this famous opera at Dreſden, was broken up by a quarrel between Heinichen, the king of Poland's chapel-maſter, and Seneſino, who this ſame year, 1719, went to England for the firſt time.

Nothing very intereſting occurs in the life of Quantz from this period, till 1723, when he took a journey with Weiſs, the famous luteniſt, and Graun, the compoſer, to Prague.

Quantz, not long after the coronation of Charles VI. at Prague, went to Italy in the ſuite of count Lagnaſco, with the conſent of his royal maſter, the king of Poland. He left Dreſden in May 1724, and, when he arrived at Rome, he found that Vivoldi had juſt introduced the Lombard ſtyle in that city, with which the citizens were ſo captivated, that they would hear no other.

During his reſidence at Rome, he took leſſons in compoſition of the famous Gaſparini, who was at that time ſeventy-two years of age; and after ſtudying counterpoint with him, which he calls muſic for the eye, he went to work for the ear, and compoſed ſolos, duets, trios, and concertos; however, he confeſſes, that .counterpoint had its uſe in writing pieces of many parts; though he was obliged to unlearn many things, in practice, which theory had taught him, in order to avoid that dry, and ſtiff ſtyle, which too cloſe an adherence to rules is apt to produce; upon this occaſion, he very judiciouſly obſerves, that invention is the firſt requiſite in a compoſer, and that it behoves him to preſerve a friendſhip between harmony and melody.

In 1725 he went to Naples, where he met with his countryman Haſſe, who then ſtudied under Aleſ. Scarlatti. Haſſe had not, as yet, diſtinguiſhed himſelf by any compoſitions for the ſtage; however, it was at this time, that a conſiderable Neapolitan banker employed him to ſet a ſerenata for two voices, which he did in the preſence of Quantz; the ſingers who performed in it, were Farinelli and Teſi. Haſſe gained ſo much reputation by this production, that it paved the way to his future ſucceſs, and he was ſoon after appointed compoſer of the great opera at the theatre royal.

Quantz intreated Haſſe to introduce him to his maſter, Scarlatti, to which he readily conſented; but upon mentioning him to the old compoſer, he ſaid, "my ſon, you know I hate wind inſtruments, they are never in tune." However, Haſſe did not ceaſe importuning him, till he had obtained the permiſſion he required.

In

In the viſit which he made to Scarlatti, M. Quantz ſays, that he had an opportunity of hearing him play on the harpſichord, which he did in a very learned manner; but obſerves, that his abilities on that inſtrument were not equal to thoſe of his ſon.

Before his departure from Naples, M. Quantz frequently heard concerts at the duke of Lichtenſtein's, in which Haſſe, Farinelli, Teſi, and Franciſchello, were employed.

In 1726 he was at Venice, during the performance of two rival operas, "Siface," compoſed by Porpora, and "Siroe," by Vinci; the latter was moſt applauded. The Cav. Nicolini, a contralto, La Romanina, a deep ſoprano, and the famous tenor, Paita, were the principal ſingers in theſe dramas.

San Martini, the celebrated performer on the hautbois, who afterwards eſtabliſhed himſelf in London, was now at Venice, as was Vivaldi.

At Turin he met with Somis, under whom, Le Claire was at that time a ſcholar on the violin.

From Turin he went to Paris, which, with reſpect to muſic, was going from one extreme to another.

His character of French ſinging in the former part of the laſt century, is very juſt and characteriſtic.

"I was diſpleaſed with the French taſte now," ſays M. Quantz, "though I had heard it formerly with patience. The old, worn-out, ſecond-hand thoughts, and paſſages ill-expreſſed, diſguſted me now, as much as a ſtale diſh warmed again. The reſemblance between recitative and air, with the affected and unnatural howling of the ſingers, particularly the women, ſhocked my ears."

M. Quantz was the firſt who applied an additional key to the German flute, in order to correct its imperfections; and it was in the courſe of this year, 1726, that he made the diſcovery.

In 1727 he arrived in London, where he found the opera in a very flouriſhing ſtate, under the direction of Handel. The drama of "Admetus" was now in run, of which, he ſays, the muſic was grand and pompous. Seneſino performed the firſt male part, and Cuzzoni and Fauſtina were the principal women.

He then gives a character of the ſingers, ſtate of the opera, and of muſic in general in London, very correctly.

Upon his return to Dreſden, he was eſtabliſhed in the king's chapel, with an addition to his former ſalary of 250 dollars a-year. He now entirely quitted the hautbois, ſuppoſing it hurtful to the embouchure of the flute, which, from this time, he made his ſole ſtudy.

In 1728 he went to Berlin, with baron Seyfertiz, in the ſuite of the king of Poland; where he was obliged, at the command of the queen of Pruſſia, but with the permiſſion of his royal maſter, to remain for ſome months. Piſendel, Weiſs, and Buffardin, were, by the ſame order, called thither. After he had had the honour of playing before the queen two or three times, he was offered a place and penſion of 800 dollars a-year. He was very willing to accept of them, but the king his maſter would not grant his conſent: however, this prince gave him a general permiſſion to go to Berlin as often as he was deſired.

This year, 1728, the prince royal of Pruſſia determined to learn the German flute, and M. Quantz had the honour to teach him. On this account, he was obliged to go twice a year to Berlin, Ruppin, or Reinſberg, the ſeveral reſidences of his royal ſcholar.

After the death of the king of Poland, in 1733, his ſon, Auguſtus III. not chooſing to diſmiſs M. Quantz, raiſed his appointment to 800 dollars, and confirmed the permiſſion which had been granted by his royal father, for his going occaſionally to Berlin.

In 1734 he publiſhed his firſt ſolos; but he does not acknowledge the ſonatas, which were printed under his name, in Holland, about that time.

In 1739, M. Quantz finding a great ſcarcity of German flutes, undertook to bore them himſelf for the uſe of his pupils; an enterpriſe which, afterwards, he found to be very lucrative.

In 1741 he was again invited to Berlin, in order to enter into the ſervice of his royal ſcholar, then king of Pruſſia, with offers of an annual penſion of 2000 dollars for life; a ſeparate payment for compoſitions; 100 ducats for every flute he ſhould deliver; and an exemption from playing in the orcheſtra, or any where elſe, but in the king's chamber, as well as from dependance on any other commands than thoſe of his majeſty; which terms, as the king of Poland was too gracious longer to refuſe his diſmiſſion, M. Quantz was unable to reſiſt.

In 1752 he publiſhed his "Art of Playing the German Flute;" and it was this year that he invented the new joint for the upper-piece of the flute, by which means, without drawing out the middle piece, and without hurting the tone, the inſtrument may be raiſed or lowered half a note.

And now, having traced our induſtrious muſician through the troubleſome mazes by which he arrived at the temple of fortune, we had hopes that we ſhould have left him to the enjoyment of that reputable eaſe, that *otium cum dignitate*, to which every artiſt in years aſpires; but alas! this eminent muſician and worthy man died at Potzdam in leſs than a year after we had ſeen, heard, and converſed with him in that ſummer reſidence of his royal diſciple and patron! A complete liſt of his works is given in Gerber.

QUANUSE, in *Geography*, a town of America, in the Tenneſſee government. N. lat. 35° 12′. W. long. 84° 28′.

QUAPA, a town of Louiſiana, at the conflux of the Akanſas with the Miſſiſippi. N. lat. 33° 48′. W. long. 91° 23′.

QUAPACTOTOTL, in *Ornithology*, a name under which Nieremberg has deſcribed a bird, which, he ſays, imitates the human laugh. He ſays its body is eight inches long, and the tail as many; the beak of a blueiſh-black, and bent and crooked; the breaſt grey, and the belly black; the tail of a browniſh-black; and the wings, neck, and head, of a yellowiſh-brown.

This is the Cuculus ridibundus of Gmelin, the Cuculus Mexicanus of Briſſon, and the Laughing cuckow of Latham. It is found in New Spain.

QUAPIZOTL, in *Zoology*, the name given by Hernandez to the Tajaçu of Marcgrave, the Pecari of Buffon, and the Mexican hog of Pennant. See Sus *Tajaſſu*.

QUAPOYA, in *Botany*, Aubl. Guian. v. 2. 897. t. 343, 344, a barbarous Caribbean name. See Xanthie.

QUAR, in *Agriculture*, a term occaſionally employed, in a provincial manner, to ſignify a ſmall ſort of quarry of any kind, but more eſpecially of the lime-ſtone, free-ſtone, flag-ſtone, or ſlate-ſtone nature. It is much uſed in ſome of the more northern diſtricts of the country. See Quarry.

QUARANTAIN, in old *Law Books*, written *Quarentine*, and *Quarentena*, denotes the ſpace of forty days.

"Quatuor carucatas terræ arabilis, continentes in longitudine 8 quarentenas, & 8 quarentenas in latitudine." Chart. Withlafii Reg. Merc. apud Ingulf.

"Quarentena in London. ponetur pro reſpectu habend. 40 dies poſt ſummonitionem per breve regis, ut conſulant, &c. ſi ſibi viderint expedire." MS. de Temp. Ed. III.

The

The term is borrowed from the French *quarentain;* and is ſometimes uſed for the time of Lent.

QUARANTAIN *of the King*, in France, denotes a truce of forty days appointed by St. Louis, during which time it was expreſsly forbidden to take any revenge of the relations or friends of people who had fought, wounded, or affronted each other in words.

QUARANTAIN, or *Quarentine*, is more particularly uſed for the term of forty days, which veſſels, coming from places ſuſpected of contagion, are obliged to wait in certain places appointed to air themſelves before they come into port.

By the ſtat. 26 Geo. II. cap. 6. explained and amended by 29 Geo. II. cap. 8. the method of performing quarentine, or forty days probation, by ſhips coming from foreign countries, is put in a much more regular and effectual order than formerly; and maſters of ſhips coming from infected places, and diſobeying the directions there given, or having the plague on board, and concealing it, are guilty of felony without benefit of clergy. The ſame penalty alſo attends perſons eſcaping from the lazarettos, and officers and watchmen neglecting their duty, and perſons conveying goods or letters from ſhips performing quarantine. Se PLAGUE.

In caſes of inſurance, before the riſk on a ſhip can be ſaid to be completely ended, ſhe muſt not only have been 24 hours moored at anchor in her port of deſtination, but ſhe muſt have been during that time in *good ſafety*, in the fulleſt ſenſe of thoſe words. If, therefore, the ſhip be obliged to perform quarantine, this does not end the voyage. The voyage only ends when the ſhip is arrived at her port of deſtination, and is there moored 24 hours in good ſafety. Accordingly, if the ſhip, before the 24 hours are expired, be ordered to the proper place for performing quarantine, the riſk continues, though ſhe do not leave her moorings till long after the 24 hours are expired. See RISK.

QUARANTAIN alſo denotes certain duties impoſed upon ſhips, for the purpoſes of quarantine.

QUARANTAIN, *Quarantine*, or *Quarentine*, *Quarentena*, in *Law*, denotes a benefit allowed by the laws of England to the widow of a man dying ſeiſed of land; by which ſhe may challenge to continue in his capital meſſuage, or chief manſion-houſe (ſo it be not a caſtle), for the ſpace of 40 days after his deceaſe; during which time her dower ſhall be aſſigned. The particular lands to be held in dower muſt be aſſigned by the heir of the huſband, or his guardian. Co. Litt. 34, 35.

If the heir, or any other perſon, attempt to eject her, ſhe may have the writ *de quarantena habenda;* which lies for a widow to enjoy her quarantain.

QUARANTAIN is alſo uſed for a meaſure or extent of land, containing 40 perches.

QUARANTARIA, in *Geography*, a high mountain between Jeruſalem and Jericho; which, as tradition ſays, is the mountain to which our bleſſed Saviour was taken by the devil, when he tempted him with the viſionary ſcene of all the kingdoms and glories of the world. This is, as St. Matthew ſtyles it, an exceeding high mountain, and not only difficult, but dangerous, of aſcent. It has a ſmall chapel at the top, and another about half-way of its aſcent, founded upon a prominent part of the rock. Near this latter are ſeveral caves and holes in the ſide of the mountain, made uſe of anciently by hermits, and by ſome in later times, for places in which they kept their Lent; in imitation of that of our bleſſed Saviour. In moſt of theſe grots Maundrell found certain Arabs quartered with fire-arms, who obſtructed his aſcent, demanding 200 dollars for leave to go up the mountain. He and his companions, ſays the traveller, departed without farther trouble, not a little glad to have ſo good an excuſe for not climbing ſo dangerous a precipice. Maundrell's Journey, &c. p. 80.

QUARANTIA, in the Venetian *Polity*, a court of judicature compoſed of forty judges.

The Venetians have an old civil quarantia, a new civil quarantia, and a criminal quarantia.

The criminal quarantia takes cognizance of all crimes except thoſe againſt the ſtate, which belongs to the council of ten. The new civil quarantia judges of appeals made from ſentences made by judges out of the city. The old civil quarantia takes cognizance of appeals from ſentences of ſubaltern judges in that city.

QUARARIBEA, in *Botany*. See MYRODIA.

QUARE *clauſum fregit*, in *Law*. See CLAUSUM *fregit*.

QUARE *ejecit infra terminum*, a writ which lieth, by the ancient law, where the wrongdoer or ejector is not himſelf in poſſeſſion of the lands, but another who claims under him. As where a man leaſeth lands to another for years, and, after, the leſſor or reverſioner entereth, and maketh a feoffment in fee, or for life, of the ſame lands to a ſtranger: now the leſſee cannot bring a writ of *ejectione firmæ*, or ejectment, againſt the feoffee; becauſe he did not eject him, but the reverſioner: neither can he have any ſuch action to recover his term againſt the reverſioner, who did ouſt him; becauſe he is not now in poſſeſſion. And upon that account this writ was deviſed, upon the equity of the ſtatute Weſtm. 2. c. 24. as in a caſe where no adequate remedy was already provided. And the action is brought againſt the feoffee for deforcing, or keeping out, the original leſſee during the continuance of his term: and herein, as in the ejectment, the plaintiff ſhall recover ſo much of the term as remains; and alſo ſhall have actual damages for that portion of it, whereof he has been unjuſtly deprived. But ſince the introduction of fictitious ouſters, whereby the title may be tried againſt any tenant in poſſeſſion, (by what means ſoever he acquired it,) and the ſubſequent recovery of damages by action of treſpaſs for meſne profits, this action is fallen into diſuſe. See EJECTIONE *Firmæ*.

QUARE *impedit*, a writ which lies for him who has purchaſed an advowſon, againſt him that diſturbs him in the right of it, by preſenting a clerk to it when the church is void.

It differs from the aſſize of darrein preſentment, *ultimæ præſentationis*, which lies where a man, or his anceſtors, formerly preſented; this other lying for him who is the purchaſer himſelf. Where a man may have the aſſiſe, he may have this writ; but not contrariwiſe.

In conteſted preſentations, upon the firſt delay or refuſal of the biſhop to admit his clerk, the patron uſually brings his writ of *quare impedit* againſt the biſhop, for the temporal injury done to his property, in diſturbing him in his preſentation. And if the delay ariſes from the biſhop alone, as upon pretence of incapacity, or the like, then he only is named in the writ; but if there be another preſentation ſet up, then the pretended patron and his clerk are alſo joined in the action; or it may be brought againſt the patron and clerk, leaving out the biſhop; or againſt the patron only. But it is moſt adviſeable to bring it againſt all three: for if the biſhop be left out, and the ſuit be not determined till the ſix months are paſt, the biſhop is entitled to preſent by lapſe; for he is not party to the ſuit: but, if he be named, no lapſe can poſſibly accrue till the right is determined. If the patron be left out, and the writ be brought only againſt the biſhop and the clerk, the ſuit is of no effect, and the writ ſhall abate; for the right of the patron is the principal queſtion in the cauſe. If the clerk be left out, and has received

ceived inſtitution before the action brought, (as is ſometimes the caſe,) the patron by this ſuit may recover his right of patronage, but not the preſent turn; for he cannot have judgment to remove the clerk, unleſs he be made a defendant, and party to the ſuit, to hear what he can allege againſt it. For which reaſon it is the ſafer way to infert all three in the writ.

The writ of *quare impedit* commands the diſturbers, the biſhop, the pſeudo-patron, and his clerk, to permit the plaintiff to preſent a proper perſon (without ſpecifying the particular clerk) to ſuch a vacant church, which pertains to his patronage; and which the defendants, as he alleges, do obſtruct; and unleſs they ſo do, then that they appear in court to ſhew the reaſon why they hinder him.

Immediately on the ſuing out of the *quare impedit*, if the plaintiff ſuſpects that the biſhop will admit the defendant's or any other clerk, pending the ſuit, he may have a prohibitory writ, called a *ne admittas;* which recites the contention begun in the king's courts, and forbids the biſhop to admit any clerk whatſoever till ſuch contention be determined. And if the biſhop doth, after the receipt of this writ, admit any perſon, even though the patron's right may have been found in a *jure patronatus*, then the plaintiff, after he has obtained judgment in the *quare impedit*, may remove the incumbent, if the clerk of a ſtranger, by writ of *ſcire facias:* and ſhall have a ſpecial action againſt the biſhop, called a *quare incumbravit;* to recover the preſentation, and alſo ſatisfaction in damages for the injury done him by incumbering the church with a clerk, pending the ſuit, and after the *ne admittas* received. But if the biſhop has incumbered the church by inſtituting the clerk, before the *ne admittas* iſſued, no *quare incumbravit* lies; for the biſhop hath no legal notice, till the writ of *ne admittas* is ſerved upon him. The patron is, therefore, left to his *quare impedit* merely; which now lies (ſince the ſtatute of Weſtm. 2.) as well upon a recent uſurpation within ſix months paſt, as upon a diſturbance without any uſurpation had.

In the proceedings upon a *quare impedit*, the plaintiff muſt ſet out his title at length, and prove at leaſt one preſentation in himſelf, his anceſtors, or thoſe under whom he claims; for he muſt recover by the ſtrength of his own right, and not by the weakneſs of the defendant's: and he muſt alſo ſhew a diſturbance before the action brought. Upon this the biſhop and the clerk uſually diſclaim all title: ſave only, the one as ordinary, to admit and inſtitute; and the other as preſentee of the patron, who is left to defend his own right. And, upon failure of the plaintiff in making out his own title, the defendant is put upon the proof of his, in order to obtain judgment for himſelf, if needful. But if the right be found for the plaintiff, on the trial, three farther points are alſo to be inquired: 1. If the church be full; and, if full, then of whoſe preſentation: for if it be of the defendant's preſentation, then the clerk is removeable by writ brought in due time. 2. Of what value the living is: and this in order to aſſeſs the damages which are directed to be given by the ſtatute of Weſtm. 2. 3. In caſe of plenarty upon an uſurpation, whether ſix calendar months have paſſed between the avoidance and the time of bringing the action: for then it would not be within the ſtatute, which permits an uſurpation to be diveſted by a *quare impedit*, brought *infra tempus ſemeſtre*. So that plenarty is ſtill a ſufficient bar in an action of *quare impedit*, brought above ſix months after the vacancy happens; as it was univerſally by the common law, however early the action was commenced.

If it be found that the plaintiff hath the right, and hath commenced his action in due time, then he ſhall have judgment to recover the preſentation; and, if the church be full by inſtitution of any clerk, to remove him: unleſs it were filled *pendente lite* by lapſe to the ordinary, he not being party to the ſuit; in which caſe the plaintiff loſes his preſentation *pro hac vice*, but ſhall recover two years' full value of the church from the defendant, the pretended patron, as a ſatisfaction for the turn loſt by his diſturbance: or, in caſe of inſolvency, the defendant ſhall be impriſoned for two years. But if the church remains ſtill void at the end of the ſuit, then whichever party the preſentation is found to belong to, whether plaintiff or defendant, ſhall have a writ directed to the biſhop *ad admittendum clericum*, reciting the judgment of the court, and ordering him to admit and inſtitute the clerk of the prevailing party; and, if upon this order he does not admit him, the patron may ſue the biſhop in a writ of *quare non admiſit*, and recover ample ſatisfaction in damages.

Beſides theſe poſſeſſory actions, there may be alſo had a writ of *right of advowſon*, which reſembles other writs of right: the only diſtinguiſhing advantage now attending it being, that it is more concluſive than a *quare impedit;* ſince to an action of *quare impedit* a recovery had in a writ of right may be pleaded in bar.

There is no limitation with regard to the time within which any actions touching advowſons are to be brought; at leaſt none later than the times of Richard I. and Henry III.: for by ſtatute 1 Mar. ſt. 2. c. 5. the ſtatute of limitations, 32 Hen. VIII. c. 2. is declared not to extend to any writ of right of advowſon, *quare impedit*, or aſſiſe of *darrein preſentment*, or *jus patronatus*.

In a writ of *quare impedit*, which is almoſt the only real action that remains in common uſe, and alſo in the aſſiſe of *darrein preſentment*, and writ of right, the patron only, and not the clerk, is allowed to ſue the diſturber. But, by virtue of ſeveral acts of parliament, there is one ſpecies of preſentations, in which a remedy, to be ſued in the temporal courts, is put into the hands of the clerks preſented, as well as of the owners of the advowſon. We mean the preſentation to ſuch benefices, as belong to Roman Catholic patrons; which, according to their ſeveral counties, are veſted in and ſecured to the two univerſities of this kingdom. And particularly by the ſtatute of 12 Ann. ſt. 2. c. 14. § 4. a new method of proceeding is provided; *viz.* that, beſides the writs of *quare impedit*, which the univerſities as patrons are entitled to bring, they, or their clerks, may be at liberty to file a bill in equity againſt any perſon preſenting to ſuch livings, and diſturbing their right of patronage, or his *ceſtuy que truſt*, or any other perſon whom they have cauſe to ſuſpect; in order to compel a diſcovery of any ſecret truſts, for the benefit of Papiſts, in evaſion of thoſe laws whereby this right of advowſon is veſted in thoſe learned bodies: and alſo (by the ſtatute 11 Geo. II. c. 17.) to compel a diſcovery whether any grant or conveyance, ſaid to be made of ſuch advowſon, were made *bona fide* to a Proteſtant purchaſer, for the benefit of Proteſtants, and for a full conſideration; without which requiſites, every ſuch grant and conveyance of any advowſon or avoidance is abſolutely null and void. Blackſt. Com. b. iii.

QUARE *incumbravit*, a writ which lies againſt the biſhop, who, within ſix months after the vacancy of a benefice, confers it on the clerk of any one, while two perſons are contending at law for the right of preſenting. This writ lies always depending the plea. See the preceding article, PRESENTATION, ASSISE *of darrein preſentment*, &c.

QUARE *non admiſit*, a writ which lies againſt the biſhop, for refuſing to admit his clerk, who has recovered in a plea of advowſon, on pretence of lapſe, &c. See QUARE *impedit*.

QUARE *non permittit*, is a writ that lies for one who has a right to preſent for a turn againſt the proprietary.

QUARE *obſtruxit*, a writ that lies for him, who, having right to paſs through his neighbour's grounds, cannot enjoy the ſame, becauſe the owner has fenced it up.

QUARENTINE. See QUARANTAIN.

QUARERA, or QUARATIA. See QUARRY.

QUARITZ, in *Geography*, a town of Sileſia, in the principality of Glogau; 8 miles W. of Gros-Glogau.

QUARKEN, or QUERKEN, a cluſter of ſmall iſlands, in the gulf of Bothnia, near the eaſt coaſt. N. lat. 63° 16'. E. long. 21°.

QUARLES, FRANCIS, in *Biography*, an Engliſh poet, born in 1592, near Rumford, in Eſſex, was ſon of James Quarles, eſq. who held an office at the navy board in the reign of queen Elizabeth. The ſubject of this article was educated at Chriſt's-college in Cambridge, and was afterwards entered a ſtudent in Lincoln's Inn. He obtained the place of cup-bearer to the queen of Bohemia, daughter to James I.; and upon his return, he was appointed ſecretary to archbiſhop Uſher in Ireland, from which country he made his eſcape, on the breaking out of the rebellion in 1641, after the loſs of his property. He had before diſtinguiſhed himſelf by ſome works, chiefly on religious ſubjects, in conſideration of which he had a penſion from Charles I. About this time he had the poſt of chronologer to the city of London. On the commencement of the civil wars, he gave great offence to the parliament by a work, entitled "The Loyal Convert;" and when he actually joined the king at Oxford, he was plundered of his eſtates, his books, and manuſcripts. Theſe loſſes he did not long ſurvive. He died at the age of 52, in 1644. Of his numerous writings, as well in proſe as in verſe, the moſt celebrated, and indeed that by which he is almoſt entirely known, is his "Emblems," a ſet of deſigns exhibited in prints, and elucidated by ſome lines attached to each. A conſiderable part of the work is borrowed from the "Emblems" of Hermannus Hugo, but his verſes are his own. For a conſiderable time they excited a large portion of public admiration in the religious world. They then fell into contempt; but we believe a new edition has of late years been given to the world. Quarles is thus characterized by an able critic: "He is by no means without his beauties; and his verſes, which are generally ſmooth, afford occaſional burſts of fancy, and ſtrokes of pathos, which ſhew real genius, though overrun with falſe taſte. Mr. Jackſon of Exeter, in his "Letters on various Subjects," endeavoured to recall the public attention to this neglected poet, and pointed out with much feeling ſome of his brilliant paſſages; but though curioſity may be amuſed by hunting for his ſcattered beauties, he can never regain a place among the Engliſh claſſical poets."

QUARLESVILLE, in *Geography*, a poſt-town of America, in Brunſwick county, Virginia; 204 miles from Waſhington.

QUARNAMELA, a town of Sweden, in the province of Smaland; 23 miles S. of Wexio.

QUARNERO, or CORNERO, *Gulf of*, a part of the Adriatic, between Iſtria and Morlachia, anciently called "Sinus Flanaticus." It is ſubject to ſudden ſtorms and hurricanes, which render its navigation dangerous.

QUARRE', Fr. In old French muſic, B quarré was the term for B ♮. See QUADRO.

QUARRÉ *les Tombes*, in *Geography*, a town of France, in the department of the Yonne, and chief place of a canton, in the diſtrict of Avallon; 6 miles S. of Avallon. The place contains 2007, and the canton 7287 inhabitants, on a territory of 192½ kiliometres, and 9 communes.

QUARRE'E, in the old French time-table, implied a breve, or ſquare note, equal to two ſemi-breves. See TIME-TABLE.

QUARREL, QUERELA, in *Law*. See QUERELA.

Quarrel ſeems properly to relate to perſonal actions, or at moſt to mixed ones, wherein the plaintiff is called *querens*; and in all declarations of treſpaſs, it is ſaid, *queritur*.

Yet if a man releaſe all quarrels or querels, (a man's own deed being taken moſt ſtrongly againſt himſelf,) quarrel includes all actions; and accordingly all actions, both real and perſonal, are hereby releaſed.

Quarrels or affrays in a church or church-yard are eſteemed very heinous offences, as being indignities to him to whoſe ſervice thoſe places are conſecrated; therefore mere quarrelſome words, which are neither an affray nor an offence in any other place, are penal here. See AFFRAY.

QUARREL between the French and Italian ſingers at Rome, in the time of Charlemagne; for which we refer to our article CHARLEMAGNE. See alſo Rouſſeau's Dict.

QUARREL, in *Armoury*, a bolt, or ſquare-headed arrow, to ſhoot out of an arbaliſt, or croſs-bow.

QUARREL *of Glaſs*. See QUARRY.

The word is formed, by diminution, from the Latin *quadratum*, or the French *quarré*, *ſquare*; or, perhaps, immediately from the Italian *quadrello*, *little ſquare*.

QUARRY, in *Agriculture*, the common name of an opening, pit, drift, or ſhaft, which is dug into the earth or ground, and from which are to be raiſed ores of various kinds, different ſorts of ſtones, ſlates, and other materials of ſimilar natures. It is remarked by the writer of the work on "Landed Property," that the more uſeful and advantageous materials and ſubſtances that have at different times been dug and raiſed out of quarries in this country, are chiefly thoſe of the iron ore kind, lime-ſtone, and other calcareous matters, materials for building, ſuch as ſlates, flags, ſtones, and ſubſtances of other ſorts, matters for the conſtructing and repairing of roads, as ſand, gravel, and others of the ſame nature, earthy ſubſtances for the purpoſes of different manufactures, ſuch as clays, &c. moulds and vegetable earthy matters, and coals, with other articles for uſe as fuel. There are, however, occaſionally raiſed from openings of this nature, a few other kinds of ſubſtances, ſuch as will be noticed below.

It has been farther ſuppoſed by the above writer, that the ſubſtances which he has here mentioned, may with truth be ſaid to be of more real uſe and value to mankind than all the mines of precious metals in the world; and that the eyes of the managers of landed eſtates ſhould conſtantly be turned towards and fixed upon the diſcovery of the hidden valuable treaſures and productions of this nature, wherever there is a probability or likelihood of their being to be met with. It is alſo ſuggeſted, that it would be highly beneficial and advantageous if mineralogiſts, and thoſe who are acquainted with ſuch ſubſtances, were to turn their attention towards the appearances or accompaniments which point out ſuch uſeful concealed matters; as it might greatly facilitate the ſearch for them, and frequently lead fortuitouſly to their diſcovery. The methods which are practiſed in ſearching for and aſcertaining the preſence of different ſorts of materials

rials of this nature, are principally thoſe of boring, by means of an auger or borer made for the purpoſe, into the earth, and digging into it in other ways. In ſearching for moſt ſorts of mineral ſubſtances, coals, and ſome other matters, the uſe of the borer is conſtantly firſt had recourſe to, and not that of ſinking a ſhaft, however favourable the appearances of the place may be for the purpoſe, and the ſucceſs of the undertaking. The ground is firſt tried by this means, and a certainty of ſucceſs or failure gained, as well as that of the moſt proper ſituation for ſinking the ſhaft or making the opening or pit, without much expence being incurred, in caſe of the former. In trying for ochres, marles, and other ſimilar articles, the ſame implement is alſo in common uſe. But in raiſing and providing lime-ſtone, free-ſtone, flags, and ſlates, &c. in ſome caſes, digging down into and opening the ground, by ſpades and other tools, is the mode employed in the firſt inſtance, in conſequence of ſuch ſubſtances being obviouſly preſent in ſufficient quantities to be wrought with advantage. See Borer, Boring, and Auger.

The common methods of working and managing different ſorts of quarries, are in general, in moſt places, tolerably well underſtood and regulated, by ſuch quarrymen as are conſtantly employed in the buſineſs; but a circumſtance which they commonly neglect very much, or are in a great degree inattentive to, in many caſes, is that of making good the ground below, by means of the turf or ſoil which is caſt off from the top, or upper parts; and that of keeping the mouths of the openings ſufficiently clear and free. Another common difficulty incident to them, is that of draining, and freeing their bottom parts from injurious water. This may be effected in various ways, as by the uſe of different ſorts of machinery worked by wind, water, and ſteam, and by ſome other means. See Quarries, *Pits*, &c. *Draining of.*

In many of the more ſouthern diſtricts of the kingdom, and ſtill more in thoſe towards the north, and in Wales, there are quarries, from which ſubſtances of ſome of the following kinds are raiſed and uſed in their neighbourhoods, or ſent away to a diſtance, in a very extenſive manner; ſuch, for inſtance, as thoſe of the ſtony kind, as iron-ſtone or ore, lime-ſtone, marble, chalk, granite, free-ſtone, grit-ſtone, flag-ſtone, white, grey, purple, and blue ſlate-ſtone, ſand-ſtone, ſand, gravel, clay-ſtone, ſcythe-ſtones, tile-ſtones, &c.; different ochres, plumbago or black lead, calamine, gypſum, marle, pipe-clay, alum-earth, fuller's-earth, peat-earth, culm, coal, cannel, ſalt-rock, &c. Theſe quarries and pits are wrought, and the materials got up from them, in ſeveral different ways, according to circumſtances and convenience, as well as the particular nature, kinds, qualities, &c. of the different articles themſelves; all of which are moſtly well known, and capable of being performed by the workmen of their reſpective neighbourhoods, who are commonly employed in them, and very expert in their management.

Stony ſubſtances which bear a great variety of different names, and which poſſeſs equal variety in their qualities and uſeful properties, are met with, and dug up from quarries and pits, in many different diſtricts and ſituations, in almoſt all parts of this iſland, in order to be converted to purpoſes of improvement and utility in a variety of different ways and intentions. Iron-ſtones and ores abound more in the northern parts, though they are occaſionally found in ſome of the ſouthern ones. A conſiderable quantity of highly rich iron-ſtone is got up and ſent annually from the vicinity of Combemartin in Devonſhire, to the iron-works of Mr. Raby at Llenethy in South Wales. A large portion of it is alſo found on the borders of the Orchment river, and diſperſed throughout the whole diſtrict, as well as in other parts of the ſame county. Iron-ſtone is likewiſe met with in Suſſex in large quantities, imbedded with lime-ſtone and ſand-ſtone, that which riſes near to the ſurface being the beſt, the other having a coarſer and more dull appearance, working heavier in the furnace. The very beſt is frequently interſected with thin ſtripes of ſoft marly matter. Iron-ſtone, to a great extent, exiſts on the eſtates of lord Dudley, and many others in Staffordſhire, and contributes much to the employment and proſperity of the inhabitants. But, in the northern part of Lancaſhire, in the diſtrict of Low Furneſs, ſtone and ore of this ſort are perhaps found in the largeſt quantity, of the beſt kind, and in the moſt general manner, of any where in the kingdom. There are numbers of ſhafts, quarries, and pits for raiſing them from, on Lindal Moor, Whittrig Moor, and Croſs Gates, in the vicinity of Dalton, as well as in ſome other places. In the former, the working is uſually effected at the depth of from twenty to forty-five feet, but it has been done at leſs as well as greater depths. The whole of their cavities are chambered with wood, and coſt from a guinea to twenty-five ſhillings in ſinking each fathom, without the wood. The ore runs in veins or ſeams between the rocks on the north and ſouth, being in breadth from about forty to ſixty yards. And it conſtantly dips towards the ſouth-eaſt at the rate of about a foot in five or ſix. The beſt ore is that which has the moſt greaſy appearance, and it is raiſed with leſs difficulty, working leſs hard, requiring leſs flux, and forming a more ſoft iron. It is raiſed from the ſhafts or pits by machinery of the gin or windlaſs kind, the men employing picks, punches, and hammers in digging it up. It was formerly got, in ſome places, by driving levels into the ſides of the hills, and conveying it out on railways, in ſmall waggons; but now the other way is moſtly employed. Four men get about fourteen tons in the day, in ſome ſituations; but in others, double the number are required for getting the ſame quantity. It is wheeled to diſtant heaps, from which much of it is ſent in ſmall carts to the port of Old Barrow, from whence it is ſhipped to different parts of England, Wales, and Scotland, at the expence of from fourteen to thirty ſhillings in freight; and the reſt converted into pig-iron by the furnaces in the neighbourhood. Iron-ſtones and ores are alſo met with in ſome other counties more to the north of the kingdom, where there are pits and quarries for raiſing them from.

Lime-ſtone is a very general ſort of ſtone raiſed from quarries and pits in many different parts of this country, as in Devonſhire, Suſſex, Kent, &c. towards the ſouth, where it lies in vaſt beds, from which it is dug for uſe; in the more midland counties, as in Glouceſterſhire, Shropſhire, Derbyſhire, Staffordſhire, and others, where it exiſts and is employed to a ſtill greater extent; but by far the moſt extenſively in thoſe farther to the north, as Lancaſhire, Weſtmoreland, Yorkſhire, Cumberland, and ſome diſtricts of Scotland. In many parts of the county of Lancaſter it is dug and raiſed from quarries, where it lies in a ſtratified manner at no great depth from the ſurface, being got up without much difficulty or trouble; while in other places it is forced from the ſolid rock, with great labour and expence. This is likewiſe the caſe in many other diſtricts. Wherever it is met with, it is almoſt conſtantly a quarry material of great value, and which affords much employment to labourers.

In the county of Kent, the banks of ſome of the large rivers are ſcooped out into ſtone quarries in a remarkable manner, ſome of them worn out and diſuſed, others in the ſtate of being wrought. It has been obſerved, that this is the neareſt ſtone country into which water-carriage can penetrate from the metropolis; and that the original London

was built, as well as the modern one chiefly paved, by materials from this diſtrict, ſuch as the rag-ſtone, and the large pebbles gathered on the ſea-ſhores, before the Scotch granite came into uſe. In the neighbourhood of Maidſtone there are the appearances of many abandoned and neglected quarries of this nature; but the moſt conſiderable ones, which were lately wrought in that vicinity, are thoſe of Farleigh and Fant. In each of theſe, blocks of ſtones, of different kinds, and of every form and ſize, are met with, being ſeparated by ſeams, and large irregular maſſes of earth of various qualities: among the reſt, brick-earth of the beſt quality. In ſome places, the ſtones are buried ſeveral feet under theſe earthy materials; in others, the rock riſes to the ſurface. After this, the quarrymen worm their way; following it, with irregular windings, leaving behind them refuſe in greater quantity than the uſeful materials which they raiſe.

The ſtony ſubſtances which are principally met with in them, are of two very diſtinct kinds: the one hard, and of a ſtrong contexture, provincially denominated *rag*, or Kentiſh rag; the other of a ſoft crumbly nature, provincially termed *haſſock*. The quarrymen are in the practice of dividing the firſt ſort into two kinds; what they call the *common rag*, and the *cork-ſtone*, the latter being their principal object in theſe immenſe works. It has in its general appearance much reſemblance to the ſtrong grey lime-ſtones which are found in different parts of this country; but when minutely examined by means of a glaſs, its fracture and contexture have the characters of the Devonſhire marbles; except that the grain of this ſort of ſtone is ſomewhat coarſer. In colour, too, it differs from theſe marbles, having a greater reſemblance to the Yorkſhire lime-ſtones. It is uſed for different purpoſes; much of it is ſent to the neighbourhood of London, where it is burnt into lime, for the uſe of the ſugar-bakers; who, for ſome reaſon or other, chiefly employ lime, burnt from this material, or ſtone, inſtead of that of chalk. It is likewiſe made uſe of as a building material; and, particularly in pedeſtals, for the poſts of cattle-ſheds and other farm-offices. It is hewn with ſtone-maſons' axes, working with tolerable freedom.

It is very durable, as ſome part of the baſement of Weſtminſter Abbey appears to have been built with the ſtone from theſe quarries. In this caſe, it ſeems to have been dreſſed ſmooth; and the ſurface ſtill remains with little alteration; having withſtood the attacks of time with great firmneſs; it being even now difficult to detect a looſened ſplinter in the work.

The common rag-ſtone comprehends all the different kinds which are met with in theſe quarries, except that of the above, and that which is of the haſſocky nature; though the true unmixed rag is a diſtinct ſort, having characters different from any of the others. In the colour, it inclines more to the red or liver colour, than that of the cork-ſtone, but otherwiſe reſembles it conſiderably. Viewed with a glaſs, its grain is finer, and the fracture flint-like.

Its uſes are, however, but few. Some of the beſt and moſt regularly-faced ſtones are ſometimes laid aſide for paving materials; but the large pieces are moſtly reſerved, in order to be ſent by water to the diſtrict of Romney Marſh, for the purpoſe of forming the hard materials of the embankments and jetties, which are there made againſt the ſea. The ſmaller ſorts are, in general, converted to uſe as a road material.

The haſſocky ſtone appears to the naked eye to be of a ſoft, white, ſandy quality; and its fracture is the ſame But under the glaſs, its grain is fine, its contexture uniform, and ſo thickly interſperſed with ſmall ſeed-like granules, of a dark or black colour, as to give it a grey appearance. Sometimes bearing evident impreſſions of ſhells. Its texture is looſe and brittle; crumbling eaſily between the fingers into a coarſe ſand-like powder. It will not burn into good lime, although it is almoſt wholly calcareous.

Its principal uſe is that of forming a looſe friable ſort of rubbly ſub-ſoil, in ſome places, which is admirably ſuited to the growth of ſainfoin, and ſome other crops of the plant as well as the fruit-tree kinds.

The quarries in ſeveral other counties contain ſtony materials of theſe different kinds, which are wrought and applied to a variety of different uſes in theſe and other ways.

Quarries of marble are wrought in ſeveral diſtricts in different parts of the country, and afford great advantages in various ways. In Suſſex they have a marble, which, when cut into ſlabs, is uſed for ornamenting chimney-pieces, and many other purpoſes. It is equal in quality and beauty to moſt ſorts when highly poliſhed. For ſquare building and paving it is alſo a material ſcarcely to be exceeded. By burning, it likewiſe affords a very valuable manure, equal, and by ſome thought ſuperior, to chalk, being cheaper to thoſe who are near the places from which it is dug. It is found the moſt perfect about Kirdford, at the depth of from ten to twenty feet underground, in flakes nine or ten inches in thickneſs, and called the Petworth marble. It was much employed in building the cathedral at Canterbury, the pillars, monuments, vaults, pavement, &c. being formed of it. And the archbiſhop's chair is one entire piece of it. Marble is gotten in ſome of the counties in the middle of the iſland, as Derbyſhire, Nottinghamſhire, &c. At Beacon-hill, near Newark, a blue ſtone for hearths is got, which approaches to marble, and is capable of burning into lime. And in the county of Derby much good marble is raiſed in different places. In Lancaſhire there are quarries of fine black marble, and of ſtones, which approach to, and take on the poliſh of marbles. In many of the weſtern and northern parts of Yorkſhire, marble of various kinds is found, ſome much reſembling, and others ſuperior, in cloſeneſs of texture and diſtinctneſs of colours, to that which is wrought in Derbyſhire. Alſo a ſtone, which greatly reſembles the marble of that county, and which is capable of receiving much ſuch a poliſh, and is nearly of the ſame colour, mixture, and appearance. On the ſide of the river Kent, near Kendall, a vein of beautiful marble has been lately diſcovered in the property of D. Wilſon, eſq. of Dallam-Tower; and a main quarry opened upon it. Marble has alſo been met with on the oppoſite bank.

In the county of Inverneſs, likewiſe, marble of the greateſt variety of colours, and of the moſt beautiful ſhades, has been met with in Benevis, on the property of Mr. Camerton; and inexhauſtible quarries of it lie untouched in the iſlands which belong to it.

Beſides, this ſort of material exiſts in immenſe quantities, in quarries, in many other parts of the kingdom.

Chalk is a material which is raiſed from quarries and pits, moſtly in the ſouthern parts of the country, as in Suſſex, Surrey, Kent, Eſſex, Berkſhire, Hertfordſhire, &c. It exiſts in vaſt ranges and tracts in moſt of theſe diſtricts, whence it is dug up from quarries, at different depths, according to circumſtances, expoſed in ſheds to dry, when wet, and then converted into lime for various uſes, by means of fire, or employed in its broken and powdery ſtate, without undergoing the above proceſſes, by merely digging it out of ſuch places. In ſome parts, as in Kent, and the neighbouring diſtricts, it is often dug and raiſed from conſiderable depths, from beds of very great thickneſſes. And near Reading, in Berkſhire, there is a ſtratum of this ſub-

ſtance,

ſtance, which is thirty feet in thickneſs. It is there uſed and dug out for manure, and occaſionally as a building material, for the latter of which purpoſes it is very durable. The remains of the abbey of Hurley, and of the ancient chapel, now the pariſh church, built wholly of chalk, in the reign of William the Conqueror, are, it is remarked by the writer of the corrected Agricultural Survey of the diſtrict, ſtill as freſh and ſound as if they had been the works of the laſt century. Chalk, when once indurated by the air, has a remarkable property in reſiſting the action of the weather.

Granite is a ſtony ſubſtance, which is found to exiſt in ſome of the ſouthern parts of the country, as well as in thoſe of the north, but it abounds much more in the latter.

In the weſtern parts of Cornwall it is in great plenty in the diſtricts of Penwith and Kirrier, preſenting itſelf in large ſlabs on all the rocky hills or tors, as well as in the waſte moors and vallies; and appearing in detached ſpots, even in the ſhelfy ſlaty tracts. It is of different colours and textures, being adapted to a great variety of uſes and purpoſes, as thoſe of building, and being wrought into columnar maſſes, eight or ten feet in length, for ſupporters to ſheds, out-houſes, &c.; and as gate-poſts, and bridges over brooks, rivulets, &c.; as well as in the forming of rollers, malting, ſalting, and pig troughs. It is alſo an article of commerce to different parts. It is ſuppoſed to be exactly of the ſame nature with the original granite; and there are five ſorts of it, which are diſtinguiſhed by their colours, the white, the duſky, or dove-coloured, the yellow, the red, and the black, moſt of which are charged with a brown and bright ſilvery matter.

The county of Inverneſs has a great deal of this ſort of ſtone, and there are numerous quarries in it for raiſing and working of it. The common granite abounds in all the different diſtricts of it. In many places the whole rocks are compoſed of this kind, which is uncommonly uſeful for all ordinary purpoſes. By natural fiſſures, which run in ſtraight lines, and generally at right angles, it is formed into all ſized portions and ſhapes, having uniformly a plain ſurface. And, by means of cutters or tranſverſe lines, theſe ſtones are eaſily quarried, and found in the greateſt plenty every where. They are remarkably beautiful, being almoſt as ſmooth and regular as hewn ſtone, and of courſe well ſuited for various ſorts of building work. The beſt buildings of the county-town are of a dark kind of granite, which is very hard and durable, but which has few or no fiſſures. It is generally found in large blocks, and in many of theſe parts, there is no other material for building or adding ornament with. The manner of giving it the poliſh it admits of at the quarries, is by means of ſmall picks, or pick-axes, which are, in fact, hammers with ſharp points at each end, in the manner of thoſe employed by millers in preparing their grinding ſtones. It is a very heavy, compact ſtone. There is a mixed ſort, denominated peaſy granite, which conſiſts of white, black, and grey ſpots, that ſparkle beautifully in the ſun, and is very ornamental, as well as much uſed for different purpoſes, as ſtairs, doors, and windows. Though this is very ſolid, and almoſt without natural fiſſures, it ſplits very ſtraight, by means of iron wedges, ſet in a line, and ſtruck alternately, with a hammer of great power.

A great deal of this kind of ſtone is imported into the metropolis and other large towns, for paving the ſtreets, &c. It is on the whole a very advantageous ſort of quarry material in various parts of the kingdom.

Quarries of free-ſtone are wrought in a great number of different places. In the more ſouthern parts is found the Portland ſtone, which is ſo famous and uſeful in building. A ſort of this kind of ſtone, which much approaches to it in quality, is alſo met with in Cornwall. Some likewiſe exiſts in Devonſhire and Glouceſterſhire. The Cotſwold quarries in the latter, afford free-ſtone of an excellent quality, particularly thoſe at Painſwick, Lodbury, Lockhampton-hill, &c. It abounds more, however, in Cheſhire, Lancaſhire, Weſtmoreland, Cumberland, and ſome of the ſtill more northern diſtricts. Several excellent quarries of free-ſtone are carried on in the firſt of theſe, as thoſe at Runcorn, Manley, &c. where much valuable ſtone of this nature is raiſed. The ſecond county alſo affords equally valuable quarries in many different places, from which vaſt quantities of the ſtone are raiſed, and employed, or ſent away to a diſtance. Thoſe about Ormſkirk, Up-Holland, and Wigan, as well as thoſe on all the eaſtern ſide, are in general of a very good quality. And in the vicinity of Lancaſter there are ſome excellent ones; that on the moor or common, cloſe to the town, is very extenſive, and affords a free-ſtone that admits of a fine poliſh. In this diſtrict, this ſort of ſtone is met with of a whitiſh-brown, yellowiſh, and reddiſh caſt, but the firſt is by much the moſt eſteemed. In the eaſtern parts of Weſtmoreland, as about Hutton Roofe, and ſome other places, a good ſort of free-ſtone is dug up from pits and quarries formed for raiſing it. This ſort of ſtone exiſts and is quarried almoſt all over the counties of Cumberland and Northumberland; and prevails occaſionally in others, where it is wrought to advantage. A grit-ſtone, ſomewhat of this nature, is met with in ſome diſtricts, as in Shropſhire, &c. which is raiſed from quarries, and uſed as a building material. And a ſand-ſtone exiſts to conſiderable extent in others, as in Suſſex, &c. that is ſometimes dug up, and made uſe of for common buildings, &c. In Cheſhire, on the hills near Macclesfield, about Kerridge, a ſort of ſand-ſtone is met with, which is particularly well ſuited to the making of flags, and whetting tools, as well as ſometimes to the forming of ſlates, for which it was formerly much employed. Near Pott-Shrigley, alſo, a fine ſand-ſtone is found, that admits of a good poliſh. The quarry has not, however, been wrought for ſome late years, as from the extreme hardneſs of the ſtone, the expence of getting it is very conſiderable. There are ſeveral other quarries of excellent free-ſtone wrought in the ſame neighbourhood.

There has been great abundance of free-ſtone wrought, time immemorial, in the low parts of the county of Perth, and quarries of a greater or ſmaller grained ſtone of this ſort appear almoſt in every place, with the exception of the carſes. In the lowlands, and near to the eaſtern ſea, the pores and grain of it are greater; but as the mountains are approached, the pores are leſs, and the grain finer, by which theſe ſtones admit a ſmoother poliſh. The quarry of Tullyalan pariſh, called Long-annat, affords a ſtone of a very excellent quality. It has a white colour, admits of a ſmooth poliſh, and reſiſts the influence of the weather. Some of the principal houſes in that part of the country, as well as ſome of the moſt magnificent public buildings in the capital of Edinburgh, as thoſe of the Exchange, the Infirmary, and the Regiſter-office, conſiſt partly of this ſtone, and thoſe found at hand. And farther, in ſome inſtances it has been carried to the continent. But the quarry of Kingoodie, in the carſe of Gowrie, belonging to Mr. Mylne, of Mylnfield, is unqueſtionably the fineſt of this kind of any in the county. Aſtoniſhing blocks in great number are raiſed there, fifty feet in length, ſixteen feet in breadth, and three feet in thickneſs. Such is the demand for this ſtone, both at home and abroad, that four veſſels are employed in exporting it from this quarry. The work is, however, on the de-

cline, occaſioned by the act of 1794, which impoſed a duty on ſtones, which, although trifling in itſelf, cauſes much grievance, vexation, delay, and trouble, in procuring coaſt-diſpatches, &c.

Flag-ſtones and quarries for the working and preparing of all ſorts of flags, are met with in all thoſe ſituations where free-ſtone is found, and where it exiſts in rather thick ſtrata, or layers of ſome depth, which are capable of being ſeparated by hammers, wedges, or other means. In many places in the ſouthern parts of the iſland, the flags raiſed from ſuch free-ſtone quarries are of an extremely good quality, being uſed in very large quantities for many different purpoſes. Thoſe of Cornwall and Devonſhire alſo, in many caſes, afford a good ſort of flags. The ſand-ſtone quarries of Shropſhire, as at Grinſell, near Shrewſbury, about Bridgnorth, and at Corndon-hill, near Biſhop's-caſtle, as well as in the Swinney mountain, &c. where alternate beds of fine white and red ſtone of this kind, of very ſuperior quality and thickneſs, exiſt; that in the firſt of theſe ſituations, being twenty yards thick, affords flags likewiſe, which are of a very uſeful nature. Free-ſtone flags too, of uſeful ſorts, are met with in the quarries of ſome of the midland counties. And they abound much in many of the free-ſtone quarries of Lancaſhire, Yorkſhire, and ſome of the other more northern diſtricts of the country.

The quarries of this kind become ſlate-ſtone, and furniſh the white, grey, and brown ſlate, wherever the ſtone lies in thin layers, or ſtrata, which are able to be raiſed and ſeparated from each other with convenience and facility. They exiſt in moſt of the above tracts, and are plentiful in ſome of them, eſpecially thoſe towards the north. The Lancaſhire and Yorkſhire quarries, in many places, ſupply the white and grey ſorts in great abundance, and of good qualities. Thoſe of Weſtmoreland, Cumberland, and Northumberland, alſo afford them in many inſtances of a valuable nature. And they are equally good in the ſtill more northern diſtricts. There are numerous quarries of different colours of them in Clydeſdale, Perthſhire, Argyleſhire, and the county of Inverneſs, from which vaſt ſupplies are conſtantly raiſed for home and other uſe. This ſort of ſlate has, however, moſtly the diſadvantages of being very porous, heavy, leſs durable, and of requiring more and ſtronger timber to ſupport it, than ſome other kinds; being only fit for expoſed climates and ſituations.

The quarries of the lighter and thinner kinds of ſlate, of the blue, green, purple, and other colours, formed from other ſorts of ſtone, only exiſt in ſome particular diſtricts, as thoſe of Wales, the northern part of Lancaſhire, and the adjoining counties, and in a few places in Scotland. The ſlate quarries of the Welſh diſtricts ſupply ſeveral kinds and colours in large quantities, and of good qualities, but the dark and lighter purples are the moſt prevalent ſorts in moſt of them. In Lancaſhire the quarries of this kind are very numerous in the part to the north of the ſands, as about Gothwaite-common, Kirby-moor, Coniſtone-hills, and Tilberthwaite-fells, &c.; and from which very large ſupplies of the blue, green, and the dark purple ſorts of ſlate are raiſed, and ſent away for exportation, or conſumed at home for different purpoſes. They are wrought, and the ſlate prepared in ſomewhat different manners in different places. The Gothwaite quarries have the ſlate dug out from the ſide of the hill, and carried away. But in ſome on Kirby-moor, a level is driven through the ground from below, the metal being conveyed away by ſmall four-wheeled waggons on iron rail-ways. Thoſe about Coniſtone are moſtly worked into the hills, and the metal raiſed and carried out from them. Some of the Tilberthwaite quarries are wrought by blaſting the ſlate-ſtone, and collecting and carrying it out of them on ſlanting roads, in ſmall carts or trucks conſtructed for the purpoſe, the levels being below the hills, but not nearly ſo low as the bottoms of the quarries. Others are wrought by draught roads from the bottoms of them. One man will raiſe eighteen or twenty hundred weight of ſlate in one day, where the metal riſes well, but leſs in other caſes. In ſome it is dug out by one ſet of men, ſplit by another, and formed into ſlates by a third, for which purpoſes, flat crow-bars, ſlate-knives, and axes are employed. The ſlate is divided and diſtinguiſhed into three ſorts, as firſts, ſeconds, and thirds, or London, country, and toms. In the firſt, or Gothwaite quarries, the ſlate has a darkiſh purple, or black caſt, and is worth from forty to forty-four ſhillings the ton. In the Coniſtone quarries it has a fine blue and green appearance, and is much thinner and lighter than the other ſort. The Tilberthwaite ſlate, in ſome inſtances, ſplits very fine, thin, and light, but does not cover ſo far as thoſe of the Gothwaite and Kirby quarries. This ſort is worth from forty-eight to fifty ſhillings the ton. In ſome quarries a ſort of rent is paid *per* ton, on the ſlate which is raiſed, as ten ſhillings for the beſt, eight ſhillings for the ſeconds, and ſixpence for the thirds. In others a certain rent only is paid for the liberty of the royalty, and not a tonnage duty. Theſe rents or duties on the workers of theſe quarries, are probably higher than they will bear, and have enabled the Welſh ſlate dealers to underſell thoſe of this county.

Weſtmoreland and Cumberland, in ſome inſtances, afford good blue and green ſlates. In the latter, ſome of an excellent quality are gotten in the quarries of Borrowdale, and inferior ſorts in ſome of the neighbouring mountains.

The county of Argyle, in Scotland, in ſome parts abounds with ſlate-quarries, as the tracts about Eſdale, from which five millions of ſlates have for ſome time been annually ſold at the rate of twenty-five ſhillings the thouſand. Quarries of the ſame kind are alſo wrought in many other parts, with great benefit to the inhabitants.

Slate-quarries are formed in many parts of the highlands of the county of Perth, but none in the low. The ſlates in ſome are of a purple colour, in others of an azure blue, and in a few of a muddy, ſandy, brown complexion along the cutters. It is well known where the different ſorts are quarried. The veins of ſlate-rock ſeem to run from Drumlane, in the pariſh of Aberfoil, in a north-eaſt direction to Dunkeld; and may be traced beyond the limits of the county both ways. The azure coloured are the beſt metal, and riſe of a greater ſize than any of the other kinds. Many of the buildings in different places are ſlated with this beautiful covering. Into the lower diſtricts of the county, ſlates are imported from Eſdale, and the other quarries on the weſt coaſt of the county of Argyle.

Quarries of grey ſlate exiſt in many different parts of the county of Inverneſs, in which the quality is very good, and well ſuited to the climate. In ſome places theſe ſlates are much preferred to blue ones, as the latter are more expenſive in procuring, and though nailed on the roofs ever ſo firmly, are apt to be looſened by high winds, unleſs bedded in lime, which circumſtance renders repairs difficult.

There are numerous quarries of ſand and gravel to be met with in almoſt every diſtrict of the kingdom, which are wrought either for the purpoſe of ſupplying domeſtic uſes, or thoſe of repairing roads, &c. Thoſe of the former ſort, which contain the fine white, red, and yellow ſands, are by far the moſt valuable, and wrought to the greateſt extent, the materials being moſtly dug out from the ſides of banks and other places, and but rarely got by ſinking the

the quarries into the more level parts of the ground, though this method is ſometimes practiſed. The matters are commonly raiſed ſimply by digging and ſpades; and thrown into the carts, in many caſes, from the quarries and pits themſelves. Numerous quarries and pits of this nature exiſt and are wrought to a very great extent in the neighbourhoods of the metropolis, and moſt other large towns, all over the kingdom, for the purpoſe of ſale for various domeſtic uſes.

In the gravelly kinds, thoſe quarries which abound with the ſharp, coarſe, flinty, and pebbly ſorts, are the moſt proper and beneficial for the making and repairing of all ſorts of roads and carriage-ways. They are occaſionally formed by working into banks and ſteep places, but more frequently by openings in the plain ſurface. Their depth is ſometimes conſiderable, the materials being raiſed after being ſcreened, the work, of courſe, very laborious and troubleſome. In other caſes, the carts are filled from the quarries or pits without much difficulty or trouble.

Quarries of clay-ſtone, ſtone-tiles, ſcythe-ſtones, and ſome other ſorts, are found of good qualities in different diſtricts. In Glouceſterſhire they have quarries of blue clay-ſtone at different depths, lying in beds of the ſame coloured clay, diſpoſed in layers of from four to ten inches in thickneſs. The ſtone in new quarries is eſtimated by the effects which the atmoſphere has upon it from ſome expoſure. The beſt ſort is a very uſeful material for ſeveral purpoſes. Quarries of ſtone-tiles principally exiſt, and thoſe articles are raiſed from them, in different part of the Cotſwolds. The beſt are prepared about Miſerdine, Beverſtone, Charlton, and Hampton-field, the colour of which are yellow or grey; but another ſort, which is red grit, is dug up about Iron Acton, and ſome other places, but which is leſs valuable.

There are quarries of ſcythe-ſtones in many parts of Lancaſhire, but the beſt are obtained from thoſe about Rainford, where they are well wrought and prepared for uſe. In ſeveral other diſtricts, quarries of different kinds of whetting-ſtones likewiſe exiſt, and are wrought to advantage.

Ochres of different kinds are met with in different places in quarries formed for the purpoſe of raiſing them. In the county of Devon, formerly large quantities of various ſhades between red and yellow, were raiſed and manufactured in thoſe about Eaſt-down. Umber, in the pariſh of Combemartin, exiſts in a pretty large body. The working and preparing of theſe are, however, now much leſs attended to than heretofore.

In Suſſex there are quarries of red ochre about Graffham, and in various places contiguous to the ſea, as near Chidham, &c. where much is raiſed, prepared, and ſent to London. Ochre quarries alſo exiſt in many counties more to the middle and north of the kingdom, from which great quantities of this ſubſtance are procured and prepared for uſe in different ſorts of arts and manufactures.

Quarries of plumbago, or black lead, are likewiſe occaſionally found and wrought, in different ſituations, in different diſtricts of the country. This ſubſtance has been met with and raiſed near the borders of the Bovey river, in Devonſhire, in ſome quantity, and prepared to be ſent to Exeter for ſale. Quarries of black lead are alſo found and wrought in Borrowdale, in Cumberland, near to the town of Keſwick, to ſome advantage. And they exiſt in ſome of the middle tracts of the iſland, affording great benefit to the proprietors of them. In the county of Inverneſs, there are ſome appearances of black or pencil lead about Glengary, but they have not yet been turned to any uſeful account.

In ſome diſtricts, in the middle parts of the country, quarries of calamine, or *lapis calaminaris*, are met with, and much of this ſubſtance raiſed from them to great profit. It abounds in the Mendip-hills, in Somerſetſhire, about Rowbarrow, Shipham, Winſcomb, and on Broadfield-down, &c. It is ſometimes found within a yard of the ſurface, and ſeldom wrought deeper than thirty fathoms. In ſome places its quality is excellent. It is preſent in other neighbouring mountainous tracts, and raiſed with equal advantage.

Quarries of gypſum preſent themſelves in many different parts, and are wrought in ſome with conſiderable benefit. In the county of Devon, it lies between ſtrata of red-ſtone, marle, and chalk rubble, about Salcombe, Branſcombe, and Beer, being uſeful for various purpoſes. Glouceſterſhire and Derbyſhire have quarries of this nature, where there are fine beds of it. Thoſe of Auſt Cliff in the former, have it not ſo good, however, as that which is met with in the latter county. In Nottinghamſhire it is of an excellent quality, eſpecially that got near Newark and at Redhill. Cheſhire has ſome, but not turned to much account. Weſtmoreland and Cumberland have good quarries of it, in ſome places, where a great deal is gotten up, and made uſe of. And it abounds in different parts of the county of York, where it is raiſed to advantage.

Marle is an article that is met with in pits and quarries in a variety of different ſituations, and of ſeveral different kinds and qualities. It is found and dug up for uſe in many places in Suſſex, and the counties more to the centre of the country; but it prevails in the greateſt plenty in the county of Lancaſter and ſome others, in which it is raiſed or worked out from large openings on the ſides of hills, high banks, or in the plain ſurface, and ſet thickly upon the land. The getting or digging of the material out of ſuch places, is uſually performed by means of ſtrong iron mattocks, crows, ſpades, and wooden ſpiles; large pieces being in ſome caſes forced down, not without danger to the workmen, by driving in the ſpiles or piles from above. This method is called *falling*. The work is extremely ſevere, and commonly done by the rod. The large clods thus forced down, break into ſmall pieces, and are then filled into carts for the purpoſe.

Shell-marle, though it is not much attended to in any part of England, is frequently met with and dug up from various parts of Scotland, and employed on the land in great quantities, with much ſucceſs. The pits and quarries of this ſort are commonly wrought with much more facility than thoſe of the others.

Pipe, and other kinds of fine clays, are dug and raiſed from a ſort of pits or quarries, in large quantities, in many different counties. Near Wear Giffard, in Devonſhire, much of the firſt ſort is dug and ſent coaſtways, though not in ſuch quantities as formerly. Brown potter's-clay is alſo raiſed and ſent away in great abundance from the neighbourhood of Fremington. Theſe ſorts of clays are likewiſe found in much abundance in Berkſhire, and ſtill more fully in ſome of the midland diſtricts, where the pits of them are wrought to a vaſt extent. They are articles of great importance and utility in ſeveral ſorts of manufactures, and for which there is great demand in many inſtances.

Alum earth is a kind of ſtratified matter, which is met with and raiſed from pits and quarries in a number of different ſituations, and various parts of the kingdom. In ſome they are wrought to very conſiderable extents and advantages, but in others in far leſs degrees, and with much leſs ſucceſs.

The ſtrata of this earth are dug and got up in different manners

manners under different circumſtances, but moſtly by means of ſtrong crows, picks, and other tools of a ſimilar kind, being wrought in ſomewhat the ſame method as in the caſes of marle. The buſineſs is uſually executed by common labourers.

Fuller's-earth is another material of this nature, which is dug out of the ground from pits and quarries at different depths in ſeveral parts of the country. In ſome it is very abundant, and of a rich good quality, as in thoſe of the middle and more northern parts of the iſland, forming an article of great uſe and demand in ſeveral branches of buſineſs. In others it is of a much leſs valuable nature, being far leſs in requeſt. That which is found about Tillington, in Suſſex, is conſumed in the neighbouring fulling mills. The mills of this ſort in Yorkſhire, and other parts alſo, conſume immenſe quantities. The material is raiſed from the places in which it is found in much the ſame way as many other earthy ſubſtances, but it ſeldom requires ſo much digging, as it is a far leſs hard matter.

Fuller's-earth was formerly got up from pits and quarries in the neighbourhood of Maidſtone, in Kent, and much ground wrought over; but the beds of ſand by which it is covered are of ſuch depths, as to render the works of little value or importance.

Quarries and pits of mineral peat-earth are found in ſome diſtricts, and much of the material dug up from them, and made uſe of when prepared upon land. The vale of Kennet, in Berkſhire, contains vaſt quantities of it, as well as ſome other parts. It is a ſtratified ſubſtance which is dug from under the ſurface at the depth of from one to ſix feet, laying below ſtrata of ſmall ſhells and calcareous matter. In raiſing it, a peculiar kind of ſpade is made uſe of, which cuts it in long pains, ſomething like ſoap, which, when dry, are burnt into aſhes and laid on the land. This ſubſtance is found to contain the oxyd of iron, gypſum, and the muriates of ſulphur and potaſh, in the proportions of forty-eight, thirty-two, and twenty parts to that of one hundred.

It is ſuggeſted by the writer of the work on "Landed Property," that in moſt mountainous diſtricts, and many low fenny counties, immenſe collections of vegetable mould or peat-earth lie in a ſtate of neglect; even in places where they might be converted to valuable purpoſes; not only as ſources of fuel merely, but as manure, either uſing the vegetable matter in its raw ſtate, or after being reduced to aſhes. In all theſe ſituations it might be readily dug up from different places, and applied to different uſes in each of theſe ways, the pits or other ſpots containing it working in a very eaſy manner. The aſhes of it are only employed on any large ſcale in the above county.

Culm, coal, and cannel, are articles of the fuel kind, which are found in a vaſt number of places, all over the kingdom in pits, mines, or quarries, and which are of the greateſt importance in many of them. Speaking of coals, the author of the work on "Landed Property," conſiders them as riſing in the minds of moſt men, far ſuperior to moſt other productions and ſubterraneous matters, whether they are held in the light of agriculture, manufactures, or national defence. It is aſked, if it were not for the collieries of this country, how many hundred thouſand acres of its land, which are now appropriated to cultivation, would be required for the production of fuel? How many manufactories, eſpecially thoſe of iron, which are ſo very valuable to civilized ſociety, would be cramped, retarded, and ſtopped, in their progreſs and operations? And how many hardy ſeamen would be wanting to its navy? Surely, in his opinion, an indigenous production and material, on which the proſperity of the country ſo greatly depends, is entitled to the guardian care of its government; to aſcertain the preſent expenditure, and the probable ſtock which is remaining. Let us not, it is remarked, play the ſpendthrift, and, by the follies of a day, entail centuries of want on generations to come, and the curſes of millions on the memory of the preſent times.

In endeavouring to find theſe ſorts of ſubſtances in parts where pits of them have not yet been wrought, the ſearching, it is ſuppoſed by the ſame writer, ſhould, in general, be done by the land proprietors of the particular places, in a conjoint manner. There are, however, certain inſtances, in which individuals may proſecute the ſearch with propriety, and in the moſt beneficial manner. In doing which, the principal things to be guarded againſt are thoſe of misjudgment and impoſition. Hence the neceſſary prudence of endeavouring to procure perſons of ſkill and integrity for making ſuch ſearches; which are, in the firſt place, to be attempted by a cloſe inveſtigation of ſuperficial appearances, and then where thoſe are favourable in their nature, by the uſe of the boring rod or tool. It is ſuppoſed that, at preſent, there are none who are equal to ſuch undertakings, except thoſe who have been long converſant with the buſineſs of coal-works; men who have an intereſt in the exiſting collieries or works of that kind. On this account it is thought to become a matter of common prudence, in a given ſituation, to endeavour to procure an undertaker or overlooker from a diſtant work; or ſuch a one as can have no counter-intereſt to that of his employer; and then, cloſely to connect and bind them in one common intereſt. After having had different occaſions for conſidering the ſubject, and for beſtowing no ſmall thought upon it, the writer is of opinion that the moſt eligible plan of proceeding, in ſuch caſes, is that of agreeing with an overlooker, or undertaker, to pay him reaſonably, but not extravagantly, for his time, and for his actual expences in proſecuting the neceſſary ſearches; and, further, to agree to give him, in the event of ſucceſs, a reward ſufficient to call forth his beſt exertions; ſuch reward to be payable, not on finding coal, but whenever the work, to be eſtabliſhed in conſequence of the diſcovery, ſhall have cleared the amount. In this way the proprietor will feel himſelf ſecure, while the perſon employed has the moſt powerful ſtimulus to induſtry, attention, and the accompliſhment of the object of the undertaking.

Culm and coal have been met with and wrought in ſome degree, in Devonſhire, Suſſex, and ſome other of the ſouthern parts of the iſland; but they exiſt much more plentifully in the midland and more northern diſtricts, as well as in ſome places in Wales and Scotland. In Glouceſterſhire, coal abounds in moſt parts of the foreſt of Dean, and its vicinities, and probably to within a ſmall diſtance of the county-town, as at Newent and Pauntley, where pits are eſtabliſhed. Thoſe of the foreſt tracts are very numerous, but not fully wrought for want of ſufficient draining. Pits of this kind alſo exiſt in many places, in the lower vale part of the county. In this diſtrict, however, the coals are no where of the beſt quality.

In the counties of Salop and Somerſet, coals alſo prevail very much, various pits of them in both, being wrought to conſiderable extent. Thoſe in the northern part of the latter diſtrict, have ſtrata of them which form an inclination of the plane of about nine inches in the yard; and are nineteen in number. They are ſeldom wrought where leſs than fifteen inches in thickneſs, but they vary from ten inches to upwards of three feet. The working is performed at conſiderable depths, eſpecially ſince the eſtabliſhment of improved machinery, and other means for raiſing them. The

coal

coal is of the firſt quality, being pure and durable in burning, and from its firmneſs, largeneſs, and ſtrength of grain, capable of being conveyed to any diſtance without injury. At preſent the quantity raiſed in theſe pits, is from fifteen hundred to two thouſand tons weekly, but much greater ſupplies could be afforded, if they were wanted. The works are twenty-ſix in number, ſome of which afford a good profit.

The pits in the ſouthern part are upon a more limited ſcale of work. In them the ſtrata of coal form an inclination of the plane of from eighteen to thirty inches in the yard; but in ſome it is deſtroyed, and they deſcend in a perpendicular manner. There are, in number, twenty-five, which are in thickneſs from ſix inches to ſeven feet, being rarely wrought under eighteen inches. The depth of working is middling, but will be increaſed. The quality of the coal not the beſt, but tolerably good. The quantity now raiſed from theſe pits is from eight hundred to a thouſand tons in the week, which might be eaſily extended. The working profits are by no means great. There are pits in other parts, but they are not many, or much wrought.

Againſt the apprehenſion of pits of this nature being exhauſted or worn out in theſe places, it is contended that more than treble the preſent quantity is capable of being raiſed from the works already carried on, and that this increaſed quantity might be ſupplied for ſeveral hundred years to come.

The works and quantities of coals contained in the counties of Stafford, Derby, and Nottingham, are likewiſe very great, and moſtly of good kinds; pits of them being carried on in many places to vaſt extent.

Cheſhire, too, is a coal diſtrict, in which a great variety of works for raiſing it are eſtabliſhed in different parts, and much of it, which is of a very good quality, gotten up. The ſtrata of coal here in many caſes are ſeveral feet in thickneſs; about Wirrall the ſeam is five or ſix feet thick, and the works extenſive under the channel of the Dee. In ſome works the beds of coal lie at the depth of from ſeventy to one hundred yards below the ſurface of the ground, and are of different thickneſſes to ten feet or more.

In Lancaſhire, coal of good ſorts is moſt abundant. The beds of it run acroſs the county in ſomewhat three different parts, as towards the ſouth, nearly in the middle, and on the north-eaſt part. Thoſe in the two firſt are of conſiderable breadths and thickneſſes in different parts, but the third is much leſs broad and very thin in many places. They all run, in ſome degree, from the north-eaſt to the ſouth-weſt, conſtantly keeping ſomewhat the ſame direction, though occaſionally branching out in a lateral manner to ſome extent. The works on each of theſe different lines of coal ſtrata, eſpecially the two moſt towards the ſouth, are very numerous, and, in different inſtances, of very conſiderable extent. There are ſome alſo eſtabliſhed on the northern line, but they are of a far more limited nature. The layers or ſtrata of the coals are of various widths, from a few yards to a very great diſtance, and their depths or thickneſſes from a few inches to ſix or ſeven feet. They lie at very different depths from the ſurface of the earth, according to circumſtances and ſituation; on the eaſtern ſide of the county they ſometimes nearly appear on the top of the ground, while in the middle, and towards the ſouth-weſt, they are often a conſiderable number of yards deep. All about moſt of the large towns in the ſouthern parts of the diſtrict very extenſive works are eſtabliſhed, where immenſe quantities of coals are raiſed for home uſe, as well as being ſent coaſtways, and, in ſome caſes, for exportation. They are a ſort of material which is of vaſt importance to the manufacturing ſtate of the county, and which contributes greatly to its proſperity. The quantity is ſo great, when conſidered as a whole, that they would ſeem to be almoſt inexhauſtible.

The cannel coal, which is a ſort that has ſome reſemblance to fine black marble, is principally found and raiſed in the tract about Haigh, near Wigan, which is not more than a few miles ſquare. It lies in pretty thick ſtrata, at the depth of from five to ſeven or eight yards from the ſurface. It is of a very fine, hard, inflammable quality, being got up by ſharp picks, often with conſiderable labour, and for which there is much demand, for domeſtic uſe, in the neighbourhood.

Coals alſo abound in the neighbouring counties of Cumberland and Northumberland, being found in many parts of the eaſtern mountains, and, with not many exceptions, all along the tract, which extends in different degrees of breadth, from Sebergham to Whitehaven, and along the coaſt to Maryport, forming and comprehending a diſtrict of about one hundred ſquare miles, in the former. And they are met with in great plenty throughout the greateſt part of the latter county, particularly in the lower diſtrict of it; being of the beſt quality, and the moſt numerous, and thickeſt ſeams, in the ſouth-eaſt quarter; whence thoſe vaſt quantities are exported which ſupply the great conſumption of the London market, as well as the coaſting and foreign trade. A trade which is the foundation of the commerce of the country, and the principal ſource of its wealth, as well as a never failing nurſery for ſome of the beſt ſeamen of the Britiſh navy. The former county has likewiſe works which ſupply prodigious quantities, both for home conſumption and the coaſtways and export trade. Cannel coal is alſo raiſed in this diſtrict in pretty large ſupplies in the neighbourhoods of Caldbeck and Bolton.

Large portions of this article are likewiſe raiſed from the works in the county of Durham, which in ſome parts are carried on with much ſpirit and enterprize.

Coals are found, and raiſed in full ſupplies, in many places, in moſt of the counties of Scotland, ſo far as Perthſhire; but they have not been met with any farther towards the north in any ſufficient quantities. Where they exiſt, to any extent, in theſe ſituations, they are generally of good kinds, and capable of being got up without any great difficulty, ſeldom lying at any very great depth below the ſurface.

It has been contended by ſome, that the coals in the pits and other places, in this country, are inexhauſtible, while others maintain the contrary to be the caſe; as the matter relates to the county of Northumberland, we have the following calculations, on the authority of the writers of the Agricultural Report of that diſtrict. And they may perhaps equally apply to others. It is ſuppoſed, that towards elucidating this point, it may be of ſome uſe to eſtimate what number of acres are wrought yearly in the county to ſupply the neceſſary conſumption. In order to accompliſh this object, the thickneſs and number of workable ſeams of coal muſt be firſt aſcertained; for which purpoſe they have been favoured with ſections, exhibiting the thickneſs and depth of the various ſtrata, in ſome of the deepeſt pits in the county, one of which has a depth of two hundred and ſeven yards, with ſixteen ſeams of coals; the other a depth of two hundred and forty yards, with fifteen ſeams; conſequently, if the medium be taken betwixt the two, it will be nearly ſix yards thick of workable coal; from which may be formed, it is thought, a calculation of the quantity of coal in an acre of ground, ſuppoſing the aggregate thickneſs of the various ſeams amount to ſix yards.

An

An acre of ground contains -	4840	ſquare yards,
which, multiplied by the thickneſs	6	yards,
gives - - -	29040	cubic yards in an acre.
From which deduct ⅓d for waſte and the parts or pillars neceſſary to be left in working - -	9680	
there remains	19360	cubic yards to be wrought.

And as three cubic yards of coal, when wrought, afford a Newcaſtle chaldron, therefore

19360 = gives 6453 Newcaſtle chaldrons *per* acre,
divided by 3

The coals exported yearly from the rivers Tyne and Wear, with Hartley and Blyth, amount to about 825,000 chaldrons, which, with the home-conſumption of the two counties of Northumberland and Durham, will make the quantity of coals raiſed yearly about 1,000,000 chaldrons.

And the chaldrons raiſed yearly 1,000,000 divided by the chaldrons *per* acre 6453 = gives 155 acres nearly *per* year, cleared of coal ſix yards thick.

And by eſtimating the breadth occupied by the caking coals to be on the average eight miles broad, and twenty-five miles long in the two counties, it is found that there will be about two hundred ſquare miles, or 128,000 acres of coal proper for exportation.

From Newcaſtle	510,000 chaldrons.
—— Sunderland	315,000 ditto.
In all	825,000

Then the whole area 128,000 divided by the yearly conſumption - 155 = 825 years. The time before this ſpace will be wrought out.

It is, however, ſuggeſted, that there are ſome reaſons to ſuppoſe that a thickneſs of ſeam equal to ſix yards will not be obtained all over an extent of two hundred ſquare miles, probably not more, on an average, than four yards; in which caſe the coal will be exhauſted in five hundred and fifty years. And if the aggregate thickneſs of the ſeams to be obtained ſhould prove only three yards, then little more than four hundred will be the term of continuance; but it is probable, it is thought, that before the half of that time be elapſed, the price to the conſumer will be conſiderably increaſed from the increaſed expence of obtaining them, and the increaſed length of carriage from the pits to the rivers; this laſt, it is preſumed, may be reduced in ſome ſituations, by adopting canals inſtead of waggon-ways, which, it has often been wondered at, have never yet been attempted. From this inveſtigation, it is ſuggeſted, that the apprehenſions of exhauſtion are not ſo chimerical as they have been ſuppoſed and repreſented to be by ſome perſons. When, however, the vaſt extent of the working and unwrought tracts, in the different parts of the country, are conſidered, there cannot be any grounds for fear, in this reſpect, for a vaſt length of time yet to come.

Pits, ſome what of the quarry kind, are wrought in one diſtrict of this country, that of Cheſhire, for the raiſing of rock ſalt, in ſome of which large quantities of this material are procured, from different depths, and different thickneſſes of the ſtrata of it. In the getting of it different means are employed, as thoſe of blaſting, picking with implements, for the purpoſe of roofing, the uſing of horſes, and machinery wrought by ſteam, for forcing up the ſubſtance, and ſome others. The digging, raiſing, and working of this article, employs a great number of labourers, and it is of much importance to the county in many points of view.

But though this ſort of material is found in ſeveral different parts of the county, pits, or ſhafts of it, are at this time only wrought in the vicinity of the town of Northwich. This ariſes from a great many different cauſes, but principally from that of the want of water-carriage for the conveyance of the material from them. The number of pits or ſhafts, which there are at this time in work, for the purpoſe of raiſing this article, are about a dozen. They are by much the moſt commonly made in ſomething of the ſquare form, being ſecured on the ſides by means of ſtrong timber, but they have occaſionally a round form, and are walled on the ſides with bricks.

The beds of this material, that are to be raiſed, are wrought at various depths, the deepeſt being in general the moſt pure, and they vary equally in their thickneſs and directions, as ſuggeſted above. In ſome caſes the beds are of the greateſt thickneſs, the more they approach the north-eaſt, decreaſing in a gradual manner, in their courſe to the ſouth-weſt; and in ſome inſtances they incline from north-weſt to ſouth-eaſt, dipping at the rate of about three feet in twenty-ſeven or thirty.

The ſtrata, which are paſſed through in getting at and working the rock-ſalt, lie in a very regular manner, and conſiſt, in general, of a hard clayey ſubſtance and a ſort of gypſeous material in mixture in various ways and proportions, that of the latter kind being the moſt predominant as the pit or ſhaft approaches the rocky ſaline ſubſtance. In working, the clayey matter is deſignated by the name of *metal* of the ſeveral different colours belonging to that ſort of ſubſtance, and the other material by that of *plaiſter*. Theſe ſtrata are moſtly of a ſolid compact nature, but occaſionally broken in particular places, when the metal is termed *ſhaggy* by the workmen.

In the buſineſs of working the pits, and raiſing the rock-ſalt, the rocky beds are reduced into pieces of proper ſizes for the purpoſe, by means of blowing them with gunpowder, and thoſe of ſplitting and dividing them with hammers and proper wedges for ſuch uſes; a good ſecure headway or roofing being conſtantly provided in the firſt place, to the opening from which the ſalt-rock is to be taken, which is effected by the uſe of ſmall ſharp picks, carrying on the work in a plain ſimple chambering manner.

The workings are ſunk from theſe chamberings to different depths, as the nature of the beds of rock, and the quantity of the purer kind of rock-ſalt, or Pruſſian rock, as the workmen term it, may direct; but commonly about fifteen feet. Occaſionally the roofs or headways of the pits or ſhafts are ſupported by conſiderable ſquare pillars diſpoſed in a ſomewhat regular manner, but in other caſes they are wrought out in a ſort of long openings, according as the workmen are inclined.

In getting the rock-ſalt, the workmen are paid by the ton at the rate uſually of about two ſhillings, they finding the gunpowder and other tools.

In raiſing the ſalt from the pits or ſhafts, horſes were formerly entirely made uſe of, but within theſe few years, recourſe has been had to the improved ſteam-engine, as already noticed, though it is not yet generally employed at every pit. See ROCK-SALT, ROCK-SALT *Pits*, SALT, and SALT *Brine Springs*.

It is evident from the above account, that in whatever way they are conſidered, the quarries of different kinds in this country are of very material importance to its profperity

profperity and convenience; contributing largely to the carrying on of different ſorts of works and improvements. Without them much uſeful labour muſt be wholly at a ſtand; a variety of neceſſary buſineſſes be incapable of being carried on; and the effects of it upon various arts and manufactures, be much too ſerious to be thought upon. In ſhort, the numerous ſubſtances of different kinds, which are taken from the bowels of the earth in this country, conſtitute one great ſource of our national wealth and proſperity.

Quarries, *Pits*, &c. *Draining of*, the proper, moſt convenient, and appropriate means of rendering all ſuch ſorts of works dry, free from water, and in a fit ſtate to be wrought with eaſe and advantage. In the effectual performance of all kinds of undertakings of this nature, there is occaſion for the application of the ſame principles, which are ſpoken of and explained in conſidering the nature of draining land in general, and the particular manner which is neceſſary to be purſued in the practice of ſpring draining. See Draining *of Land*, and Spring-*Draining*.

There can be no doubt, indeed, but that the having recourſe to ſuch principles, and the modes of practice reſulting from them, will be equally expeditious, beneficial, and ſucceſsful, as well as in many ſituations of very material importance, in the various caſes of this ſort, as in thoſe which have been mentioned; by leading to and introducing the moſt ready and eaſy means of diminiſhing the quantities of water, which are frequently met with in the courſe of working them, and which not unfrequently obſtruct and hinder in a very high degree, but ſometimes wholly put a ſtop to the work which is carrying on in them. Such, at leaſt, is very often the caſe in quarries of the free-ſtone, lime-ſtone, flag-ſtone, marle, and other kinds, as well as in pits of the coal and other ſorts. The want of this ſort of knowledge, of courſe, is one great cauſe why ſuch a number of quarries and works of that kind, in different parts, often lie altogether, or for a great length of time, in an unwrought ſtate; which might otherwiſe be wrought to very great advantage.

As it is now well underſtood, that moſt ſprings and ſubterraneous collections of water are formed and ſupplied from ſuch grounds or lands as lie higher than that of the places where they are found or met with, which, on account of their being of an open or porous nature, admit that of rain and other ſorts of moiſture to filtrate and paſs freely through them, which ſinking and deſcending to very great depths, through ſuch open materials of the rocky, ſandy, gravelly, and other looſe qualities, before it becomes impeded and obſtructed by ſome ſort of impenetrable ſtratum or layer of an earthy or ſolid ſtony nature, ſuch for inſtance as thoſe of pure ſtiff clay or compact rock; it may happen, that in many ſuch caſes, in ſinking pits or ſhafts for ſtone, coal, or any other kind of ſubterraneous material near the bottoms of hills or high grounds, beds of quick-ſand will be met with, and dug into, which are ſo full of water, that to paſs through them becomes a moſt troubleſome, difficult, and expenſive piece of work, and ſometimes impoſſible to be performed, but which, from knowing that the water proceeds from the porous ground that lies above, it may often be practicable to intercept and cut off the greater part of the water, before it reaches ſuch ſand beds in the quarries, pits, and ſhafts, by the means of boring into and tapping the water at the *tail* of the banks of this nature, provided that the ground naturally declines lower than the place where the ſand is found in the quarries, pits, &c., and the whole or moſt of the water be drawn off, and diverted from them at a comparatively trifling expence to that which is employed as the common remedy in ſuch caſes and circumſtances.

In order to accompliſh this intention, it will be neceſſary, in aſcending from the quarry or pit, to carefully examine and aſcertain, if at any place higher on the declivity, any porous ſtratum, bed of rock, ſand, or gravel, *tails* out, which may conduct and convey the water contained in it to the ſand bed, which is below in the works; and where any ſuch bed is found, to cut or bore into it in ſuch a manner as to form a drain, that is capable of carrying away the whole or the greateſt part of the water, and of courſe to clear, or diminiſh the quantity contained in the quarry or pit, which would otherwiſe have continued to deſcend through ſuch porous ſubſtrata or beds, and have continued to fill the ſands, or quarries and pits.

But although this part of the buſineſs may have been accompliſhed, and the ſupply of water from the higher ground entirely cut off, a ſufficient quantity to injure, hinder, and inconvenience the working of the quarries or pits, may yet continue to drain and ooze from the ſides of the ſand beds, notwithſtanding they ſhould happen to *dip* towards the lower ground, in which caſes, however, that water may readily and with great eaſe be commonly drawn off at ſome particular point in it.

In order to effect this, and thereby remove the inconvenience of this filtrating water, in deſcending from the quarries or pits along the declivity, it ſhould be endeavoured to diſcover and aſcertain, at what particular point or place in the low ground, the ſand terminates or *tails* out, which is moſtly beſt accompliſhed by means of proper levelling; and if there ſhould be there any appearance of the waters having a natural outlet, it may, by means of making in it a deep drain, be far more readily and effectually drawn off and removed; as ſprings, for the moſt part, naturally paſs and flow through narrow, winding, convoluted openings, or perforations; of courſe, whenever the orifices or paſſages are opened, enlarged, or made lower than before, the diſcharge of water becomes greater and more expeditious. Where, however, there happens to be a deep impervious layer or covering of clay, or other matter of a ſimilar nature, placed above or upon the termination or tail of the ſand, the drain need only be cut down to it or a little way into it, as by means of boring through it, or the remaining portion of it, a ready and eaſy outlet or paſſage may be given to the whole of the water, that may be contained in the ſand-bed or other porous ſtratum.

This mode of draining quarries and pits may often be of great utility, advantage, and convenience, as it will alſo, in a great degree, remove, or at any rate relieve, the trouble and difficulty that would afterwards have attended the ſinking the quarry, pit, or ſhaft; as the water thus drawn or cut off, muſt of neceſſity diminiſh and reduce the quantity, which would have been found at a greater depth, the ſame body of it probably paſſing downwards from one ſtratum to another, as far as they continue to be porous, or capable of admitting it. Therefore, it is of very material importance to drain and lay dry all ſuch ground as is ſituated higher, but contiguous to quarries, pits, or other deep ſubterraneous works of the ſame kind, for the above ſtated reaſons. And it may, in general, be accompliſhed with but little trouble, difficulty, or expence, by adopting the ſame principles, and the ſame means.

But in regard to the removal of the water found and contained in the bottoms of ſuch quarries, pits, or deep works, it muſt be drained off and got rid of in quite a different manner, as the level of the ground may probably be, or decline, nowhere lower than the mouths or openings of ſuch quarries,

pits, &c.; as it is ſolely and particularly on the ſuppoſition, and in ſuch caſes as where the direction of the different ſtrata and ſand-beds have a *dipping* poſition with the natural inclination of the ſurface of the land, or lie nearly horizontally, that the method of proceeding which is ſtated above is practicable, or capable of being employed with any ſort of advantage. But ſhould they, for inſtance, lie in a reverſe or contrary direction, there is but little poſſibility or chance of accompliſhing the object, the removal of the water, unleſs by diſcovering or hitting on their terminations, ſomewhere on the oppoſite ſides of the hills or elevations, which in ſome caſes may very nearly or exactly be found out, by aſcertaining the preciſe inclination or direction of the materials of the quarries, pits, &c. and by a careful and exact uſe of the level. But this will be much better comprehended, and a more clear, full, and perfect notion of its nature be afforded, by the ſection figure in the plate on draining quarries, pits, &c. in agriculture, as given by Mr. Elkington, in his work on that ſubject.

This is the manner which is to be purſued in preventing the effects of water, or cutting off that which is met with in ſinking the quarries, pits, ſhafts, or other ſimilar works, before reaching or arriving at the ſtone, coal, or other ſort of material that may be wanted; but that which is found in the bottoms of theſe different kinds of undertakings, or which proceeds from the rocks or their ſides, or in other ways, in the courſe of working them, is commonly got quit of by means of ſome ſort of machinery, as that of the engine or other kind of pump, in order to aſſiſt in working of which, the water gained by cutting the drains already noticed may be particularly uſeful, eſpecially where the uſual ſtream for that purpoſe is inſufficient in ſaving the great expence of working ſuch machinery by the power of ſteam. But without the aid of a natural ſtream, which is capable of being converted to this purpoſe, it is rarely poſſible to find, by means of drains, or in any other way, a quantity of water ſufficient to drive ſuch weighty machinery, in a ſituation of proper height, to have the full and neceſſary command of it. However, in many caſes it may be an acquiſition of great utility and value. It is explained at *fig.* 2. in the ſame plate.

In ſome ſituations, where a full and proper command of water can be had, and where the entrance to the quarry, pit, ſhaft, &c. is alſo ſuitable for the purpoſe, the uſe to which it may be converted and applied is ſtill more important and advantageous, as the driving of machinery for bringing out the various kinds of materials, and at the ſame time working an engine-pump, in order to clear the works of the ſubterraneous water which flows from the cavities of the rocks, which are met with in working theſe ſorts of pits, &c.

It has been remarked in Mr. Elkington's work on draining, in theſe caſes, that the duke of Buccleugh's coal-works, near Langholm, in the county of Dumfries, afford a ſtriking example of this, as well as of the ſuperior powers of water and machinery, when properly combined, where a command of the former can be had, and when the latter is conſtructed on proper principles, and conducted with that care and ingenuity which are requiſite in ſuch difficult undertakings.

In working quarries of lime-ſtone, free-ſtone, and other ſorts of materials, it not unfrequently happens, that, at a certain depth, part of the rock or other body, which contains the water, is hit upon, by which they are ſoon ſo filled with it, as completely to put a ſtop to the work proceeding any deeper, where the beſt and often the greateſt part of the ſtone is ſituated. In all ſuch caſes, the moſt uſual remedies have been, either the erection of a wind-mill pump, to draw out part of the water, as the whole cannot be taken away by ſuch means, or the opening of a new quarry or pit contiguous to the other, which at the ſame depth moſtly meets with a ſimilar obſtruction, or the bringing up of a very deep cut, often at great expence, under the level of the water, from the neareſt declivity or hollow that can be met with. However, by the following method, all quarries of lime-ſtone, free-ſtone, marle, or other materials of the ſame nature, which are liable to ſuch ſort of obſtruction, may be completely and effectually cleared of the water at but little expence; while, at the ſame time, the drain which is made may ſerve the double purpoſe of that, and the laying of the wet ground, cauſed by the ſpring contained in the rock, which is found contiguous to it, dry.

There commonly lies, immediately under the rock, a bed of ſtrong, ſtiff, retentive clay, which upholds all the water received and retained by that rocky ſtratum, and which being, at the ſame time, bound round on each ſide by a covering of the ſame ſort of clayey material, or other ſtiff earthy ſubſtance, is not able to diſcharge itſelf, and of courſe conſtantly remains or ſtands full in the rock, ſo as to prevent the working or taking out the ſtone from the bottom.

In ſuch caſes it is neceſſary, in the firſt place, to endeavour to find to what ſide the rock *dips* or inclines, which, in general, may eaſily be aſcertained by the appearance of the ſurface, in examining the ſurrounding ground, and the aid of a proper level. When this has been diſcovered and fully aſcertained, a ſuitable drain muſt be cut through the clayey covering to the rock, by which the water will be drawn off, which, for want of a proper outlet, formerly ſtood pent up in the hollows and cavities of the ſtony ſtratum or body. This is further and more fully explained by *figs.* 3 and 4, in the ſame plate.

But, in ſome caſes, this ſort of evil or inconvenience may be removed and remedied in a different way. As it frequently happens that a bed or body of the ſame ſtone, which has a cloſe, compact nature or quality, is found lying under one which has a more open porous texture, with fiſſures and cracks in it, that are admiſſible of water, which obſtructs and keeps up the water in the upper bed or layer, in ſuch a manner, that not any of it can paſs or filtrate through it to an inferior, or ſtill deeper open ſtratum or bed; and on ſinking or cutting through this compact bed of ſtone, another layer is met with, which is of ſo open and porous a nature, as to admit the reception of any water from the above one, which may come upon it.

And ſometimes a bed of gravel or ſand is found under that of the cloſe ſtone, which being ſtill more capable of abſorbing or taking up any water that may be let down to it, is far better and more properly ſuited for the purpoſe of clearing the upper bed of ſtone from water, than a ſtratum of open ſtone itſelf.

Therefore, when this is diſcovered and aſcertained to be the caſe, and the water is *kept up* by the ſecond bed of ſtone, ſo as to be injurious and hurtful to the working of the upper bed, and which will be equally ſo in working the ſecond; the work may be greatly freed and relieved by boring through the cloſe bed of ſtone, and letting down the water into the more porous one below, or into a ſtratum or body of dry ſand or gravel, ſhould there be ſuch a one underneath it. But in place of boring, the ſinking of ſmall pits through the cloſe ſtone is a more effectual method of letting down the water, though a much more difficult one in the execution.

The methods of digging and boring, even in the bottoms of quarries, pits, and ſhafts, where pumps and other machinery of the ſame nature are made uſe of, as has been noticed above, may, in ſome caſes, not only be practicable, but advantageous for letting down the water which they contain into an inferior open ſtratum.

That

That of boring has been practiſed with complete ſucceſs in the caſe of a colliery in the county of York, which had been wrought many years, and in which the water was raiſed about ſixty yards by a ſteam-engine: the proprietors of which, on boring down from the bottom of the pit next to the engine-pit, to the further depth of about ten yards, in order to aſcertain the depth or thickneſs of a ſeam of coals, which was ſuppoſed to lie below thoſe then wrought; the workmen, on taking out the boring rods, found that the water from the works, which uſually ran acroſs the bottom of this pit to the engine-pump, now ran down the holes they had made. And that the ſteam-engine pump, on being ſet to work, contained little or no water, it having eſcaped through theſe holes, and continued to run through the ſame ever afterwards, rendering the pump uſeleſs. It is remarked, that this inſtance of water at ſo great a depth from the ſurface, finding a paſſage at a further depth of ten yards, or leſs, and immediately below, is extremely ſingular and ſtriking in its nature. The ſituation was much higher than the neareſt contiguous vallies, or the level of the ſea. Trials of this ſort can ſeldom be made, therefore the caſes are rare, uncommon, and curious. But in extenſive tracts of level land, where lakes or moraſſes have been formed, and which cannot be laid dry by cutting open drains, or driving levels through rocks, except at an expence for which the lands, when drained, would never compenſate, the above inſtances warrant the trial of experiments with boring rods, which, if not attended with ſucceſs, can be made at little expence.

In the county of Lancaſter, about the town of Ormſkirk, as well as in ſome other parts, ſtone quarries are cleared of water exactly in the manner which has been already pointed out, but which *fig.* 5. in the plate will explain much better.

The ſucceſs of the practice has likewiſe been farther ſhewn by the late T. Eccleſton, eſq. of Scarriſbrick-hall, an ingenious and extenſive proprietor of land in the ſame neighbourhood, who remarks, that in ſtone quarries thereabouts, wells or pits are occaſionally ſunk to the open bed, which have proved ſerviceable. This mode was practiſed in a ſtone delf near the above town in a very beneficial manner. But in order to lay the delf more effectually dry to a greater depth, Mr. Elkington, on viewing the ſurrounding ground, marked out where he thought the rock terminated, or tailed out, and at the loweſt level ſet out a drain to be cut and carried up to the rock, part of which work has been executed, and a very conſiderable flow of water comes from it; but on account of its great depth, ſixteen feet, the whole will not be finiſhed before he has ſeen the work again. The drain he has thus laid out is about ten feet lower than the bottom of the ſtone quarry, and when completed, will lay the head or body of ſtone dry lower than the preſent floor. All rocks, for the moſt part, where they terminate, are ſucceeded by broken looſe ſtones of the ſame nature as the rock, and they are frequently, nay almoſt always, ſucceeded by ſand, which, when in a thick bed, and of a running nature, ſuch us quickſand, often cauſe great expence in cutting through to the tail end of any rock. This is more fully explained in ſpeaking of the manner of draining in hilly lands, and where the ſoils are of a mixed nature. See SPRING-*Draining*.

Therefore, in all ſuch caſes as this, where there is any danger of meeting a quickſand, boring or ſinking pits through the bed of cloſe ſtone, is by much the moſt adviſeable, and at the ſame time the leaſt expenſive method that can be purſued.

The ſituations of marle pits are for the moſt part ſuch, that they require very extenſive cuts to be made through ſome parts of the ſurrounding banks or ſides of them, in order to carry or convey off the ſuperabundant quantity of water which prevents their being dug or wrought to advantage. This buſineſs might frequently be effected in a much leſs troubleſome and expenſive manner, by the method of letting the water down by means of ſinking pits or openings through the retaining and upholding ſtratum underneath the bed of marle, into ſome abſorbent porous body of materials lying ſtill deeper, which is capable of receiving it. Where the ſpace of ground that is occupied by the marle is of conſiderable ſize, ſeveral pits will be required, in order to effectually carry off the water; and where it is neceſſary that they ſhould be ſo deep as to be in danger of falling in, they ought to be walled round the ſides, or filled up to near the top with looſe ſtones, through which the water can ſettle and find its way. And any ſuch croſs drains or cuts as may be neceſſary for the purpoſe of collecting the water muſt be ſo formed and conducted as to lead into the pits. But in many caſes the water may be removed and got rid of in a ſtill more eaſy manner, eſpecially where the ſituation of the ground is favourable and ſuited to the purpoſe. In inſtances where the ſurrounding banks decline or fall on the oppoſite ſides *lower than the water*, by cutting drains into them, and boring with an horizontal auger into the tails of the ſtrata containing the water, it may be drawn off and brought down to a level lower than that of the bed or body of marle. And as this water is not unfrequently ſupplied by a ſpring which riſes in ſome part of the higher ground, and deſcends into the place where the marle is found, it will be neceſſary, in all ſuch caſes, to cut off the ſource of it, and divert the flow of water into ſome other channel; as by that means the quantity of water below will be leſſened, and more eaſily and readily carried off by the pits or drains which may have been formed.

Mines and ſhafts, for the purpoſe of raiſing different ſorts of metals, are often much impeded, or wholly prevented from being wrought by the water which is brought into them from a diſtance, by various kinds of mineral ſtrata. In many ſuch caſes, the water flowing in this way may be intercepted, by making cuts up to the loweſt banks of them, from ſome neighbouring water-courſe, or other convenient outlet, and then boring or digging pits in the bottoms of ſuch cuts, when the metals to ſuch depths or levels will be rendered free from water, and capable of being wrought. This will, however, be more amply ſhewn in conſidering the manner of draining, in ſome caſes of wetneſs, cauſed by ſprings ariſing in this way. See SPRING-*Draining*.

In removing the water, or freeing the bottoms of quarries and pits from it, where machinery is required, the writer of the work on "Landed Property" has remarked, that in caſes where *ſhaft-drains* are found to be impracticable, *well-drains* and pumps become neceſſary, and are the moſt proper; as they may be wrought by water, where ſtreams can be conducted to them; or by wind in high expoſed ſituations; or in works of conſequence, where fuel is moderately cheap, by ſmall ſteam-engines. However, in inſtances where large bodies of water are required to be raiſed and diſcharged at the height of a few feet only, marſh-mills, ſuch as are made uſe of in low marſh-land diſtricts, are found the readieſt and moſt uſeful kind of machinery for the purpoſe.

In ſome caſes of this nature, the bottoms of quarries, pits, and mines, may be cleared from water, ſimply by forming openings into them from ſome parts of the neighbouring ground where it falls lower than the levels of them, at ſufficiently ſhort diſtances, without any other more expenſive works being undertaken for the purpoſe. This ſhould always be fully conſidered before any means are reſorted to

for laying them dry, as it may occaſionally be the ſaving of much labour, trouble, and money.

QUARRY, in *Glaziery*, a pane, or piece of glaſs, cut in a lozenge, or diamond-form.

The word ſeems formed by corruption, from *quarrel*, (which ſee); unleſs we will ſuppoſe it to come immediately from the French *quarre*, *ſquare*.

Quarries, or quarrels of glaſs, are of two kinds; *viz.* ſquare and long, each of which is of different ſizes, expreſſed by the number of pieces which make a foot of glaſs; *viz.* 8ths, 10ths, 12ths, 15ths, 18ths, and 20ths; but all the ſizes are cut to the ſame angle, the acute angle being 77° 19′ in the ſquare quarries, and 67° 22′ in the long ones.

QUARRY, in *Falconry*, is the game, or fowl, which the hawk is in purſuit of, or has killed.

QUARRY, among *Hunters*, is ſometimes uſed for part of the viſcera of the beaſt taken; given by way of reward to the hounds.

QUARRY-*Cart*, a name commonly given to that ſort of cart which is principally employed in the work of quarries, and which is generally of a low, compact, ſtrong kind, in its nature, form, and manner of conſtruction, in order to ſuſtain heavy weights, and receive them without difficulty, or the danger of being deſtroyed. Carts for this purpoſe ſhould always be made of well-ſeaſoned wood, be well put together, and have ſufficient ſtrength of timber in thoſe parts where the main ſtreſs of the load is placed. See CART.

Some quarry counties have well-formed carts of this nature, as many of thoſe towards the northern boundaries of the kingdom.

QUARRY-*Waggon*, or *Truck*, a ſmall carriage of the low truck kind, which is much employed in the buſineſs of quarries, eſpecially thoſe of the ſlate kinds, for the purpoſe of holding and conveying the rough materials, which have been blown from the large maſſy rocks, or ſeparated in other ways, out of or from the quarries and pits in which they are ſituated and contained, to the places where they are to receive their different preparations and ſhapes.

It is formed and conſtructed on a frame ſomewhat ſimilar to that of the common barrow, and mounted on two low light iron wheels on the fore part, having two feet behind, projecting from the frame, bent ſomething in the manner of the letter S, and of ſufficient length to let it ſtand or reſt in a horizontal poſition while it is in the act of being loaded. Theſe feet are uſually made of iron, but they may be formed of other materials. A ſort of inclined plain is formed from the bottoms of the quarries or pits, up which it is forced, with great eaſe and facility, by the workmen, or ſmall animals of the horſe kind, after being filled with theſe ſorts of heavy materials. It is a very uſeful and convenient machine in this application, being met with in moſt of the ſlate quarries in the northern part of Lancaſhire, as well as in thoſe of many other diſtricts of the kingdom.

QUARRYING, the buſineſs of directing and conducting the nature and management of ſinking the different kinds of quarries, pits, and ſhafts, as well as of the different ſorts of work which are neceſſary to be undertaken, carried on, and performed, in the ſeveral different deſcriptions of them; ſuch as thoſe of ſeparating, getting up, and preparing the various ſorts of materials for uſe in the arts, or in other ways. It is a practice which requires conſiderable knowledge and experience, to be fully maſter of it in all its different bearings and intentions. See QUARRY, and QUARRYING *Slates and Stones*.

Almoſt every ſort of quarrying-work requires a different kind of management, not only in the opening and ſinking the quarries and pits in the grounds at firſt, but afterwards in the methods and practices of working them, and getting up the various ſorts of materials from them, as well as in the modes of preparing, trimming, and arranging them, after they have been raiſed. They are, however, moſtly well known and familiar to the quarry-men and pit-men who are uſually engaged in works of the ſeveral different kinds.

QUARRYING *Slates and Stones*, the methods of preparing and fitting them for their different uſes and applications at the quarries and pits where they have been raiſed. The former of theſe articles, particularly thoſe of the blue, green, and purple or blackiſh kinds, undergo ſeveral different ſorts of preparation in the quarrying, according to the purpoſes to which they are to be afterwards applied. They are ſeparated and divided into very thin pieces or ſlates, where light, neat coverings are required, or in much demand; but for more ſtrong and heavy coverings, in expoſed ſituations, or other places, they are ſplit into much thicker ſheets, layers, or ſlates, and are, of courſe, more clumſy in their appearance.

Each ſort in the buſineſs of quarrying is wrought in a ſeparate manner, and packed up by itſelf; the different ſorts having appropriate names, as has been already ſeen.

The white or brown ſlates are never divided and prepared in ſo fine a way as the other kinds, but ſeparated into much thicker flakes or laminæ, in this intention. The blue, green, and purple or darkiſh ſorts, are, for the moſt part, found capable of being ſplit into very thin laminæ or ſheets; but thoſe of the white, or browniſh free-ſtone kinds, can ſeldom be ſeparated or divided in any very thin manner, as the layers of the large maſſes of the ſtones are of a much thicker nature, they conſequently form heavy, ſtrong, thick coverings, proper for buildings in expoſed climates and ſituations, and of the more rough kinds, ſuch as barns, ſtables, and other ſorts of out-houſes.

In the different operations and proceſſes of this ſort of quarrying, ſlate knives, axes, bars, and wedges are chiefly made uſe of in the different intentions of ſplitting and cleaning the ſlates, they being ſeparated into proper thickneſſes by the axe, bar, and wedge, and afterwards chipped into their proper forms and ſhapes by the knife. All the different inequalities which may appear upon any part of them, are likewiſe removed by this laſt ſort of implement.

In the quarrying of the latter ſorts of materials, or thoſe of ſtones, the work is uſually performed in ſuch a manner as to ſuit the different uſes for which they are intended. Where flags are to be formed, they are ſplit or riven into ſuitable thickneſſes, and ſquared to different ſizes, ſo as to be adapted to different applications. Theſe operations are executed in rather a rough way, as they are afterwards to be finiſhed by the ſtone-maſon. When for ſteps, they have the proper breadths and depths given to them in a ſort of ſquaring manner, being left to be completed as they may be wanted for particular uſes and applications. Gate-poſts are, for the moſt part, quarried ſo as to have from about a foot to a foot and a half or more in the ſquare. Trough-ſtones have the quarrying performed ſo as to be formed into various proper-ſized ſquares or other forms, in a rough manner, being left in theſe ſtates to be afterwards hewn and hollowed out, in the intended parts, by the ſtone-maſons.

Stones for building purpoſes are uſually raiſed and quarried out roughly into ſomething of the ſquare ſhape, being left in that ſtate for the builders, who afterwards fit them ſo as to ſuit their own purpoſes and intentions.

In the quarrying of ſtones, the quarrymen commonly make uſe of large hammers, with cutting ends on one ſide, the other being formed in a plain manner; ſtrong, ſharp, crow-bars,

bars, and broad, ſharp, iron wedges; by which means theſe matters are, from the conſtant practice of the men, ſplit and torn into ſuch forms as are wanted with great eaſe and facility. See QUARRY.

QUARRYING *Tools*, the different ſorts of implements which are employed or made uſe of in the different works of this kind, as in the raiſing and preparing the various ſorts of materials of this nature. They are principally ſuch as thoſe which have been noticed already, and different deſcriptions of picks, mattocks, and jumpers, or boring implements, for the purpoſe of blaſting the various kinds of ſtone, and other hard materials. Theſe tools are individually deſcribed under their particular heads. See each of them.

QUARRYINGS, the ſmall pieces which are broken or chipped off from the different ſorts of materials which are found and wrought in quarries, while they are undergoing their different preparations for various uſes. Theſe ſubſtances, where they are of the hard kind, ſuch as thoſe of the blue and lime-ſtone, as well as ſome other ſorts, are extremely well calculated for the purpoſe of forming and repairing roads, as they are nearly, if not quite, in a ſtate fit for immediate application in this way. Materials of theſe kinds ought, therefore, where they can be conveniently had, never to be neglected by thoſe who have the care and management of roads, as they will ſave much expence and trouble, in a great number of inſtances. See ROADS.

QUART, *q. d.* fourth, in *Muſic*. See QUARTE.

QUART is particularly uſed for a diminutive meaſure, containing one-fourth, or quarter, of ſome other *meaſure;* which ſee.

The Engliſh quart is a fourth of a gallon, or two pints; the Roman quart, or quartarius, was the fourth part of their congius.

The committee appointed for examining the ſtandards of weights and meaſures, and aſcertaining thoſe that ſhall be uſed in this kingdom, delivered it as their opinion, in their report to the houſe of commons, A. D. 1814, that the gallon ought to contain 10 pounds of pure water, or 276.48 cubical inches; that the quart, or fourth part of the gallon, ought to contain 40 ounces of water, or 69.12 cubical inches; and that the pint, or half of the quart, ought to contain 20 ounces of water, or 34.56 cubical inches.

The French, from whom we borrow the word, beſides their quart, or pot of two pints, have various other quarts, diſtinguiſhed by the whole of which they are quarters; as *quart de muid*, and *quart de boiſſeau*. See MUID, and BUSHEL.

QUART *of Butter*, in *Rural Economy*, a name given to a lump which contains the quantity of three pounds; and which is a mode of ſelling it that is peculiar to ſome diſtricts, it being carried in this ſtate to the markets.

QUART *de Soupir*, in *Fr. Muſic*, is a reſt equal to a ſemiquaver. By a 4th part of a ſoupir is meant an equivalent to a double croche, or two quavers in French, and one crotchet in Engliſh. See TIME-TABLE, and VALUE *of* NOTES.

QUART *de Ton*, Fr., a quarter of a tone, an interval introduced into the enharmonic genus by Ariſtoxenus. We have neither ear nor harmonic calculations that can furniſh us with the exact interval or ratio of a quarter-tone; and when we conſider what nice geometric operations are neceſſary to ſettle it on the monochord, we are very apt to ſuſpect that this true quarter-tone never has been nor ever will be produced exactly in tune either vocally or inſtrumentally. Muſicians, however, call the difference between A♯ and B♭, a quarter-tone, an interval which, though in nature, is annihilated by temperament.

This quarter-tone is pretended to be of two kinds; the enharmonic major, in the ratio of 576 to 625, which is the complement of two minor ſemitones to a tone major; and the enharmonic minor, in the ratio of 125 to 128, which is the complement of the ſame two minor ſemitones to the minor tone. Rouſſeau.

QUARTAN, in *Medicine*, an ague or intermittent fever, the paroxyſms of which recur every third day, leaving two intervening days without fever. This is vulgarly called a *third-day* ague; but in medical language it is termed quartan, or *fourth-day* ague, becauſe if we reckon the day on which the diſeaſe commences as *one*, then the ſecond paroxyſm is on the *fourth* day, which again becomes *one* in relation to the ſucceeding paroxyſms. See FEVER, *Quartan*, and AGUE. See alſo TERTIAN.

QUARTARIUS, a meaſure among the ancients, being the fourth part of a ſextary, and nearly equal to a quarter of a pint of our wine-meaſure.

QUARTARO, in *Commerce*, a liquid meaſure at Venice. The amphora, which is a wine-meaſure, contains 4 bigoncio; a bigoncia 4 quartari, 16 ſeechie, or 256lb. Peſo groſſo; but a bigoncia of brandy is only 14 ſeechie, or 56lb. Kelly's Un. Cambiſt.

QUARTATION, in *Metallurgy*, is the ſeparation of ſilver from gold by means of aqua fortis or nitric acid; which is an operation that has ſomething ſingular in it.

If ſilver and gold are mixed together into a maſs, and the gold is not leſs than one-third part of the maſs in weight, the beſt aqua fortis poured upon it is not at all capable of diſſolving the ſilver; but if you add more ſilver to this maſs, by melting it again in the fire, with ſuch a neceſſary addition of that metal alone as ſhould bring the gold in the maſs to the proportion of leſs than one-third of the whole, and ſuffer it to cool, then aqua fortis poured on it will corrode the ſilver from it: this is alſo by ſo much the more ſtrongly performed, as the quantity of gold is leſs than in the proportion of one-third of the whole maſs; but experience has taught us, that aqua fortis diſſolves ſilver mixed with gold quickly enough when the gold conſtitutes but one, and the ſilver three parts of a mixed maſs of them; and in this caſe, if the ſolution is not too impetuouſly performed, the gold uſually remains in ſuch a proportion, in the ſame figure that the whole maſs had before the ſeparation of the ſilver by this menſtruum; ſo that, in this caſe, there is no reaſon to apprehend the gold's being torn into minute particles, and diſſipated in ſome meaſure; though this can hardly be prevented when the ſilver exceeds the three-quarter proportion, in regard to the gold in the maſs. The artificers, therefore, always make it their ſtudy to obſerve very exactly this proportion of the gold being one-fourth part of the mixture; and thence it is that the operation itſelf has been called quartation.

In order to aſcertain nearly the proportion of gold and ſilver in a maſs, the aſſayers rub this maſs upon a touch-ſtone, ſo as to leave a mark upon it; and they then make marks upon the ſtone with ſome of thoſe needles, called touch-needles, the colour of which they think comes neareſt to that of the maſs: by comparing the marks of theſe needles with the mark of the maſs, they diſcover nearly the proportion of the gold and ſilver in the maſs. The maſs of gold and ſilver to be quartered ought previouſly to be granulated, by melting it in a crucible, and pouring it into a large veſſel full of cold water, while at the ſame time a rapid circular motion is given to the water by quickly ſtirring it round with a ſtick or broom. The veſſels generally uſed for this operation are called parting-glaſſes. The aqua fortis muſt be purified for this purpoſe, and ſhould be ſo ſtrong as to be capable of acting ſenſibly on ſilver when cold, but not ſo ſtrong as to act violently. If it be very ſtrong, and the veſſels well

well cloſed, a ſmall quantity of the gold will be diſſolved along with the ſilver, which is to be guarded againſt. Little heat ought to be applied at the beginning, the liquor being apt to ſwell and riſe over the veſſel; but when the acid is nearly ſaturated, the heat may be ſafely increaſed. When the ſolution ceaſes, which may be known by the diſcontinuance of the effervescence, or emiſſion of air-bubbles, the liquor is to be poured off. If any grains appear entire, more aqua fortis muſt be added, that all the ſilver may be diſſolved. If the operation has been performed ſlowly, the remaining gold will have ſtill the form of diſtinct maſſes, which are to receive ſolidity and colour by putting them into a teſt under a muffle, and making them red-hot. If the operation has been performed haſtily, the gold will have the appearance of a black mud or powder, which after five or ſix waſhings with pure water, muſt be melted. The ſilver is uſually recovered by precipitating it from the aqua fortis by means of copper veſſels, into which the liquor is poured, or of plates of copper, which are thrown along with the liquor into glaſs veſſels. A conſiderable heat is required to accelerate this precipitation. Dr. Lewis obſerves, that when the aqua fortis has been perfectly ſaturated with ſilver, no precipitation is occaſioned by plates of copper, till a drop or two of aqua fortis is added to the liquor, and then the precipitation begins, and continues as uſual. The precipitated ſilver muſt be well waſhed in boiling water, and fuſed with ſome nitre, the uſe of which is to ſcorify any cupreous particles which may adhere to the ſilver.

Here we may add, that ſilver and gold may be parted from one another by the vitriolic acid, as effectually, though not ſo commodiouſly, as by the nitrous. If the compound be reduced into grains or thin plates, and boiled in about twice its weight of oil of vitriol to dryneſs, the ſilver will be ſo far corroded, as to be eaſily waſhed off by a little more of the acid: or if the maſs, after the corroſion, be melted in a crucible, the gold will ſeparate and ſubſide, the ſilver forming a ſcoria above it. Gold may be purified in the ſame manner from ſeveral other metallic bodies. M. Scheffer ſays, that this is the moſt direct way of ſeparating tin from gold. Lewis's Com. Phil. Techn. 95. 149, &c. See Assaying, Depart, and Gold.

QUARTAUT, in *Commerce*, a wine meaſure in ſome parts of France: thus, at Blois, 3.74 quartauts are equal to 100 Engliſh gallons, and each of them contains 6183 cubic inches; in Burgundy, 3.68 quartauts are equal to 100 Engliſh gallons, and each contains 6275 cubic inches. Kelly's Un. Cam.

QUARTE, Fr., *Quarta*, Ital., the 4th in muſic, and the third conſonance in point of perfection, according to the order in which concords are generated.

The 4th is a perfect concord; its ratio is 3 to 4. It is compoſed of three diatonic degrees, formed of four ſounds; whence it has its name of fourth. Its interval is compoſed of two tones and a half: a tone major, a tone minor, and a major ſemitone.

The 4th may be altered two ſeveral ways: 1ſt, by diminiſhing its interval a ſemitone, and then it is called the diminiſhed or falſe 4th; 2dly, by augmenting it a ſemitone, and then it is called a *tritonus*, or ſuperfluous 4th. (See Tritonus.) But the diminiſhed 4th is never uſed in harmony, and only touched now and then in melody as an appoggiatura, or note of refinement.

The 4th in thorough-baſe is accompanied by the $\frac{3}{5}$, and called by ſome the chord of the 11th.

Another chord is called the ſuperfluous 4th, or tritonus, by the French; which is what we call the chord of the $\frac{4}{2}$, or $\frac{6}{4}$, in which the diſcord is in the baſe; but it is not the chord of the tritonus, unleſs the 4th is ſharp. See Chord, and Accompaniment.

The ſucceſſion of two perfect 4ths is allowed in compoſition, even in ſimilar motion, provided they are accompanied by the 6th; but theſe are paſſages that muſt not be abuſed, or puſhed too far, as they are not authorized by the fundamental baſe. The Italians call a regular ſucceſſion of chords of the 6th *falſo bordone*; for which ſee Fourth.

QUARTEEL, in *Commerce*, a meaſure for train-oil at Hamburgh: it contains 2 tonnes, or 64 ſtubgen, and is reckoned at 2 centners, or 224 lbs. net weight. Kelly.

QUARTELOIS, Cartelois, or *Cortucæ*, ſurtouts, or upper garments, with coats of arms quartered on them, worn by the ancient knights in their military expeditions.

QUARTER, the fourth part of a whole, or integer divided into four equal portions.

In working of fractions, the quarter is expreſſed by $\frac{1}{4}$; three quarters by $\frac{3}{4}$.

Quarter, as a *Weight*, is a fourth part of the quintal, or hundred-weight.

The quarter is 28 pounds avoirdupois.

Quarter is alſo a dry meaſure, containing of corn eight buſhels ſtriked, or two ſacks, being that by which corn is generally ſold in the London market, and in large quantities in ſome diſtricts of the country; and the quarter of coals is the fourth part of a chaldron, called a vat.

"Quarterium frumenti conſtat ex octo buſſellis." Fleta, lib. ii. This ſeems to have ſignified originally the fourth part of a ton in weight, or capacity. See Weight.

Quarter, in *Aſtronomy*, the fourth part of the moon's period, or lunation, which is divided into four ſtages, or quarters; containing each from ſeven to eight days.

The firſt quarter is from the new moon to the quadrature; the ſecond thence to the full moon, &c.

Quarter, in *Heraldry*, is ſometimes uſed for an eſcutcheon, or coat of arms.

In this ſenſe there are ſixteen quarters required to prove nobility, in companies, or orders, where none but nobles are admitted.

The word quarters, required as a proof of nobility, is derived hence, that they uſed anciently to put the coats of arms of the father, mother, grandfather, and grandmother, on the four corners of the tomb of the deceaſed.

In Flanders and Germany we frequently ſee tombs that have eight, ſixteen, and even thirty-two quarters.

Quarter is alſo applied to the parts or members of the firſt diviſion of a coat that is quartered, or divided into four quarters. See Quartering.

The king of Great Britain, in the firſt quarter, bears gules three lions paſſant or, &c. In the ſecond quarter he bears azure three fleurs-de-lis, &c.

Quarter, *Franc*, is a quarter ſingle, or alone; which is to poſſeſs one-fourth part of the field.

This makes one of the honourable ordinaries of a coat. See Ordinary.

Quarter, in *Law*, *Quarterium Anni*, is the fourth part of a year.

Hence the days on which thoſe quarters ſtatedly commence, are called quarter-days.

Quarter-days are the 25th of March, called Lady-day; the 24th of June, called Midſummer-day; the 29th of September, called Michaelmas-day; and the 25th of December, or Chriſtmas-day.

Quarter, Fr., in old counterpoint, was proceeding in diſcant by a ſucceſſion of 4ths; which was called, in barbarous

barous Latin, *diateſſaronare;* of which we have inſtances in the "Micrologus" of Guido.

QUARTER, in *Navigation*. A quarter of a point, wind, or rhumb, is the fourth part of a cardinal point, wind, or rhumb; or of the diſtance between two cardinal points, winds, &c.

The quarter contains an arc of 11 degrees 15 minutes.

The quarter is what Wolfius, with regard to the other diviſions, calls a ſecondary point of the ſecond order.

QUARTER *of a Ship* is that part of the ſhip's ſide which lies towards the ſtern; or which is comprehended between the aftmoſt end of the main chains and the ſides of the ſtern, where it is terminated by the quarter-pieces. Although the lines by which the quarter and bow of a ſhip are determined, with reſpect to her length, are only imaginary, yet experience appears ſufficiently to have aſcertained their limits; ſo that if we were to divide the ſhip's ſides into five equal portions, the names of each ſpace would be readily enough expreſſed. Thus the firſt, from the ſtern, would be the quarter; the ſecond, abaft the midſhips; the third, the midſhips; the fourth, before the midſhips; and the fifth, the bow. Falconer.

QUARTER, *On the*, in *Sea Language*, may be defined an arc of the horizon, contained between the line prolonged from the ſhip's ſtern and any diſtant object, as land, ſhips, &c. Thus if the ſhip's keel lies on an eaſt and weſt line, the ſtern being weſtward, any diſtant object, perceived in the north-weſt or ſouth-weſt, is ſaid to be on the larboard or ſtarboard quarter.

QUARTER is alſo uſed for a canton, or diviſion of a city; conſiſting of ſeveral ranges of buildings, &c. ſeparated from ſome other quarter by a river, a great ſtreet, or by ſome other boundary.

Such are the twenty quarters of the city of Paris. Ancient Rome was divided ſeveral times, under its ſeveral augmentations, into quarters, which were called *regions;* as may be obſerved in the topographies of Aurelius Victor, Onuphrius Panvinius, Marillan, Pyrro Ligorio, Boiſſard, and other antiquaries.

In many cities there are commiſſaries of the quarter appointed to look to the policy of them. The prior of the Caporions accounts himſelf the chief and colonel of the fourteen regions, or quarters, of Rome. Muſcarat, p. 134.

QUARTERS, *Franchiſe of*. See FRANCHISE.

QUARTER, in *War*, the place allotted to certain forces to live, lodge, and encamp upon, during a ſiege, or the like. See CAMP.

The general's quarter, called the head-quarters of an army, is that where the general lodges and encamps in perſon. They uſed to make lines of communication, to join the ſeveral quarters together.

QUARTERS *at a Siege*, are the encampments on the principal paſſes about a place; ſerving to ſtop the avenues, and to prevent relief and convoys.

QUARTER is alſo uſed for any lodgment made in the field, or champaign, out of a ſiege. Thus they ſay, the general has extended his quarters a good way; the enemy coming by, made him contract his quarters.

QUARTERS, *Intrenched*, denote a place fortified with a ditch and parapet, to ſecure a body of troops.

QUARTERS, *Winter*, the place allotted troops to paſs the winter ſeaſon in. Wherein theſe differ from garriſons, ſee GARRISON.

Winter-quarters, when cold or moiſt, are productive of inflammatory diſorders, particularly hard coughs, with inflammations of the pleura or lungs. See BARRACKS.

QUARTERS, *Winter*, are alſo uſed for the time the troops continue in this lodgment; and for the advantage the captains make of it.

In Spain they have alſo ſummer quarters.

QUARTER *of Aſſembly*, is the place of rendezvous, where the troops are to meet and draw up, to march in a body.

QUARTERS *of Refreſhment*, denote ſome well-provided, fertile ſpot, to which troops, that have been much fatigued and haraſſed, are ſent to recover their ſtrength, or health; even during the ſeaſon of the campaign.

There are alſo quarters aſſigned for the huckſters, and their equipage.

QUARTER alſo denotes the ſafety and good treatment promiſed to perſons or troops that ſurrender, and lay down their arms. Thus we ſay, the enemy begged quarter.

The phraſe took its riſe from an agreement anciently made between the Dutch and Spaniards, that the ranſom of an officer, or ſoldier, ſhould be a quarter of his pay. Hence, to beg quarter was to offer a quarter of their pay for their ſafety; and to refuſe quarter was not to accept of that compoſition for their ranſom.

On an enemy's ſubmitting, and delivering up his arms, the victor cannot with juſtice take away his life. In a battle, quarter is to be given to thoſe who lay down their arms; and at a ſiege, a garriſon offering to capitulate are never to be refuſed their lives. If ſometimes, however, in the heat of action, the ſoldier refuſes to give quarter, it is always contrary to the inclination of the officers, who eagerly interpoſe for ſaving the lives of ſuch enemies as have laid down their arms. Nevertheleſs, there is one caſe, in which life may be denied to an enemy who ſurrenders, and alſo capitulation refuſed to a place. This is when the enemy has been guilty of ſome enormous breach of the law of nations, and particularly if it be at the ſame time a violation of the laws of war. This denial of quarter is no natural conſequence of the war, but the puniſhment of his crime; a puniſhment which the injured party has a right to inflict: but that the puniſhment may be juſt, it muſt fall on the guilty. When the war is with a ſavage nation, which obſerves no rules, and never gives quarter, it may be chaſtiſed in the perſons of any that are ſeized or taken, among the guilty; ſo that by this rigour they may be brought to conform to the laws of humanity. But wherever ſeverity is not abſolutely neceſſary, clemency is to be uſed. Corinth was utterly deſtroyed, for having violated the law of nations towards the Roman ambaſſadors. However, that ſeverity has been cenſured by Cicero, and other great men. He who has even the moſt juſt cauſe to puniſh a ſovereign as his enemy, will always incur the reproach of cruelty, if he ſhould cauſe the puniſhment to fall on the innocent people. There are other methods of chaſtiſing the ſovereign; as the depriving him of ſome of his rights, taking from him towns and provinces. The evil which a whole nation ſuffers is the participation inevitable to the members of a political ſociety. The learned Vattel expreſſes his aſtoniſhment that, in a knowing age, it could be conceived that it is lawful to puniſh with death a governor who has defended his place to the laſt extremity; or who, in a weak place, has preſumed to make a ſtand againſt a royal army. Yet, even in the 17th century, this notion was ſo common as to make an article in the law of war; and, at a later period, it is not wholly exploded. What a thought! to puniſh a brave man for having performed his duty. Very different were the principles of Alexander the Great, when he gave orders for ſparing ſome Mileſians, "on account of their courage and fidelity." It is in vain to object, that an obſtinate defence, eſpecially in a weak place, againſt a royal army, only cauſes a great effuſion of blood to no purpoſe; for this defence may ſave the ſtate, by delaying the enemy ſome days longer;

and,

and, beſides, courage ſupplies the want of fortifications. It is urged farther, that by threatening a commander with death, you may ſhorten the bloody ſiege, ſpare your troops, and gain a valuable opportunity. The anſwer is, ſays Vattel, that a brave man will deſpiſe your menace, or, provoked at ſuch ignominious uſage, will ſell his life at a dear rate, make you pay for your injuſtice, and bury himſelf under the ruins of his fort. Beſides, the menace of an unjuſt puniſhment is unjuſt in itſelf; it is an inſult and an injury. But to execute it, would be barbarous and horrible; and if it is not to take effect, it muſt be allowed to be vain and ridiculous. Nevertheleſs, juſt and lawful means may be uſed for inducing a governor not obſtinately to reduce himſelf to the laſt extremity; and this is at preſent done by all wiſe and humane generals. A governor is ſummoned to ſurrender, and in the progreſs of the ſiege an honourable and advantageous capitulation is offered him, with an intimation that if he ſtays too long, he will be admitted only to ſurrender as a priſoner of war, and at diſcretion: if he perſiſts, and is at length forced to ſurrender at diſcretion, all the ſeverity of the law of war may be uſed, both againſt him and his troops. But this right never extends ſo far as to deprive an enemy of life, who lays down his arms, unleſs he has been guilty of ſome proportionate crime towards the conqueror. See CAPITULATION, PRISONERS *of War*, and REPRISALS.

QUARTERS, in *Building*, thoſe ſlight, upright pieces of timber, placed between the punchions and poſts; uſed to latth upon. They are of two kinds, ſingle and double. The ſingle quarters are ſawn to two inches thick, and four inches broad; the double are four inches ſquare.

QUARTERS in a clock, are little bells, which ſound the quarters of an hour.

QUARTERS, in *Sea Language*, the ſeveral ſtations of a ſhip's crew in the time of action. See QUARTERING *the Men*.

QUARTER, in the *Manege*, to work from quarter to quarter, is to ride a horſe three times upon the firſt of the four lines of a ſquare; then changing your hand, to ride him three times upon the ſecond; and ſo to the third and fourth, always changing hands and obſerving the ſame order.

QUARTERS *of a Saddle*, the parts or pieces of leather, or ſtuff, which are made faſt to the lower part of the ſides, and which hang down below the ſaddle.

QUARTERS *of a Horſe, and other Animals*, the four principal parts of the animals; the fore-quarters conſiſt of the ſhoulders and the fore-legs; the hind-quarters, of the hips and the hind legs.

In the horſe, the fore-quarters or ſhoulders ſhould always fall in a neat manner backwards, where they join with the breaſt, and the hind-quarters be ſuitably long and well ſhaped towards the rump. Something of a ſimilarity of ſhape ſhould likewiſe prevail in the quarters of neat cattle, ſheep, and ſwine, but they ſhould be much more fleſhy downwards as they approach the thigh and leg parts. See LIVE-*Stock*, HORSE, SHEEP, and SWINE.

QUARTERS *of the Foot*, in horſes, are the ſides of the coffin, comprehended between the toe and the heel on both ſides; the inner quarters are thoſe oppoſite to one another, facing from one foot to the other; thoſe are always weaker than the outſide quarters, which lie on the external ſides of the coffin. A horſe is ſaid to have a *falſe* quarter, when the hoof has a kind of cleft occaſioned by the caſting the quarter and getting a new one, for then the horn becomes uneven, and alſo ſofter than the reſt of the hoof; and the foot ſhould be ſhod with ſome nicety. But if the cleft be conſiderable, and take up a fourth of the hoof, the horſe is worth little afterwards for any purpoſe.

QUARTER-*Caſt*, among horſes, is when for any diſeaſe in the coffin-bone or joint, one of the quarters of the hoof is caſt off, and when thus caſt, the reproduction of a new hoof or part takes place. It is a common occurrence among ſome horſes.

QUARTER-*Evil*, among domeſtic animals of the neat cattle kinds, is an affection which ſometimes takes place in the glands of the udders, and ſometimes in different parts of the feet.

QUARTERS, in *Gardening*, the large diviſions of garden grounds, or thoſe parts of them which are ſituated between the different walks, at a diſtance from the ſmall, narrow portions on the ſides uſually termed borders, and which form or conſtitute the principal ſpaces or compartments for the cultivation and growth of the various ſorts of the more uſeful culinary vegetables which are raiſed in large quantities; ſuch as peas, beans, cabbages, cauliflowers, broccoli, early potatoes, and many others.

It is neceſſary to have the quarters of garden grounds formed and laid out in ſuch a manner as to favour the growth of early and late crops of the ſeveral different ſorts, as much as poſſible; thoſe for the former having a ſouthern, or ſouth-weſtern expoſure, and thoſe for the latter, an eaſtern, or north-eaſtern aſpect. By theſe means, early crops are, in ſome meaſure, rendered more forward and fine, and thoſe of the more late kinds, in ſome degree, prevented from being injured or burnt up and deſtroyed by too full an expoſure to the heat of the ſun.

It is uſual during the winter ſeaſon to have the large quarters of garden grounds laid up in high ridges, in order to be expoſed to the influence and effects of froſt, by which the earth may be rendered more light and mellow, and be in a more fit ſtate for ſowing or planting in the ſpring months, on throwing them down and rendering them level for the purpoſe.

The large quarters of gardens ſhould likewiſe be kept as free and open as poſſible, not being incloſed and choaked up, as is too frequently the caſe by planting fruit-trees and ſhrubs on their ſides, either in the manner of eſpaliers or otherways, as by ſuch means the growths of the plants are much promoted, and they are prevented from being drawn up in a weak manner. See GARDEN.

All forms of garden grounds are found, except that of the ſquare, to derange the regularity of the quarters, and, of courſe, to render them highly troubleſome in digging and cropping. Where they are very large they may be ſubdivided into ſuitable ſizes, as one hundred feet in breadth, &c.; but their length does not ſignify, as it may be varied in different ways, as by rows of trees, buſhes, or which, in many caſes, are preferable, by trodden walks and the modes of cropping.

QUARTERS *of a Garden*, the ſeveral diviſions into which it is formed for the purpoſe of cultivating the different kinds of vegetables, fruits, &c. Thus, there are parts or quarters deſtined to the growth of kitchen vegetables, fruit, and other trees, forcing, &c.

QUARTERS *of a Field, or Farm*, in *Agriculture*, are the particular parts of them, which are under, ſet apart, or intended for any ſort of crops, or peculiar modes of cultivation and management. Farmers are frequently in the practice of dividing their lands or farms into different quarters or parts, according to the different ſorts of huſbandry which they are proper for, and the manner and ſucceſſion in which the various kinds of crops are to be grown upon them, and the ſame is often the caſe with large fields; four, five, ſix, and more diviſions or quarters, being common in ſuch inſtances.

inſtances. This plan of proceeding is ſuppoſed to give eaſe, facility, and diſpatch, to the work which is afterwards carried on, as well as to have ſeveral other advantages and conveniences. See FARM.

QUARTER-*Bill*, in *Sea Language*, a roll or liſt, containing the different ſtations, to which all the officers and crew of the ſhip are quartered, in the time of battle, and the names of all the perſons appointed to thoſe ſtations.

QUARTER-*Bullet*, a bullet quartered into four or eight parts.

QUARTER-*Chord*, in *Mining*, ſeven yards and a quarter, which the miner hath croſs-ways of his vein on either ſide, for liberty to lay his earth, ſtones, and rubbiſh on, and to waſh and dreſs up his ore.

QUARTERS, *Cloſe*, in a *Ship*. See CLOSE-*Quarters*.

QUARTER-*Cloths*, are long pieces of painted canvas extended on the outſide of the quarter-netting from the upper part of the gallery to the gang-way. They are generally decorated with martial inſtruments, or allegorical figures.

QUARTER-*Day*. See QUARTER.

QUARTER-*Deck* of a ſhip, is that aloft the ſteerage, reaching to the round-houſe; or that deck in ſhips of war which extends from the main-maſt to the ſtern, next above the upper-deck.

QUARTER, *Fat*, in a *Ship*, denotes the ſame with *broad*. Thus, if the truſſing in, or tuck of a ſhip's quarter under water be deep, they ſay, ſhe hath a *fat* quarter.

QUARTER-*Gallery*, a ſort of ſmall balcony, with or without balluſtrades, on the quarter of a ſhip; which generally communicates with the gallery on the ſtern, by means of a door paſſing from one to the other.

QUARTER-*Guard*. See GUARD.

QUARTER-*Gunner*, is an inferior officer under the direction of the gunner of a ſhip of war, whom he is to aſſiſt in every branch of his duty; as keeping the guns and their carriages in proper order, and duly furniſhed with whatever is neceſſary; filling the powder into cartridges; ſcaling the guns, and keeping them always in a condition ready for ſervice. The number of quarter-gunners in any ſhip is always in proportion to the number of her artillery; one quarter-gunner being allowed to every four cannon.

QUARTER-*Netting*, is a ſort of net-work, extended along the rails on the upper part of a ſhip's quarter. In a ſhip of war theſe are always double, being ſupported by iron cranes, placed at proper diſtances. The interval is ſometimes filled with cork or old ſails, but chiefly with the hammocks of the ſailors, ſo as to form a parapet to prevent the execution of the enemy's ſmall arms in an engagement.

QUARTER-*Pieces*, ſubſtantial pieces of timber, moſtly of fir, that form the outboundary of the ſtern, and connect the quarter-gallery to the ſtern and toffarel.

QUARTER-*Point of the Compaſs*. See POINT.

QUARTER-*Rails*, in a *Ship*, are narrow-moulded planks, generally of fir, reaching from the top of the ſtern to the gang-way. They are ſupported by ſtanchions, and ſerve as a fence to the quarter-deck, to prevent the men from tumbling into the ſea by the rolling of the ſhip, particularly in ſmall veſſels.

QUARTER-*Round*, in *Architecture*, is a term uſed by the workmen for any projecting moulding in general, whoſe contour is a perfect quadrant, or quarter of a circle, or which approaches near that figure.

The architects uſually call it *ovolo*; and Vitruvius, the *echinus*.

QUARTER-*Seſſions*, *General*, *Court of*. See COURT *of General Quarter-Seſſions*, and SESSIONS.

QUARTER-*Staff*, a long ſtaff, or pole, borne by foreſters, park-keepers, &c. as a badge of their office; and occaſionally uſed as a weapon.

QUARTER-*Wheeling*, or *Quarter of Converſion*, in the *Military Art*, is the motion by which the front of a body of men is turned round to where the flank was; this making the quarter of a circle.

If it be done to the right, the man in the right-hand angle keeps his ground, and faces about, while the reſt wheel; if to the left, the left-hand man keeps his place, &c.

QUARTER-*Wind*, at *Sea*, is a lateral, or ſide-wind; or a wind which does not blow in ſtern, but a little aſide of it.

Properly, the quarter-wind is that which comes in abaft the main-maſt ſhrouds, even with the quarter of the ſhip.

The quarter-wind is the beſt of all winds, as bearing into all the ſails; whereas a wind blowing full in ſtern, is kept off by the ſails of the mizen.

QUARTERA, in *Commerce*, a corn-meaſure in Spain, containing 12 cortanes: the ſalma contains 4 quarteras, or 48 cortanes; the carga, $2\frac{1}{2}$ quarteras, or 30 cortanes: $78\frac{1}{4}$ quarteras correſpond to 100 Caſtilian fanegas; and 100 quarteras Catalan to 128 Caſtilian fanegas; 39 quarteras Catalan contain 10 Engliſh quarters. The carga of wine and brandy is divided into 16 cortanes, 32 quarteras, or 128 quartillos.

At Barcelona 39.08 quarteras are equal to 10 Engliſh quarters, and a ſingle quartera contains 4401 cubic inches. Kelly's Un. Cambiſt.

QUARTERED, COUNTER. See COUNTER-QUARTERED.

QUARTERIDGE, money paid quarterly, or by the quarter.

QUARTERING *of Soldiers*, in *Military Language*, ſeems to have anciently differed very little from that now in uſe, except that they were indiſcriminately quartered upon all houſeholders, as was practiſed in England ſo late as in the rebellion of the year 1745. Rapin ſays, that William the Conqueror quartered almoſt all his troops upon the monaſteries, and obliged the monks to furniſh them with neceſſaries; by which means he maintained his army without any charge, and had ſpies in all their religious houſes, who watched the actions of the monks; theſe houſes were long after charged with finding carts and horſes for the carrying the baggage of the army; and there are ſtill extant many of the original returns from different monaſteries, ſtating the number of each they were able to furniſh for that purpoſe. About the time of Henry VII. we meet with a regulation that bears ſome reference to quarters: this is a coat and conduct-money; the firſt was a ſpecies of cloathing, probably for recruits; the money for which was advanced by the county in which they were raiſed;—conduct-money was an allowance for ſubſiſtence, to and from the army, according to the number of days which the ſoldiers had to march; a day's march being eſtimated ſometimes at 12 and ſometimes at 15 miles. Both the coat and conduct-money were occaſionally advanced by the different counties in which the troops were quartered, under the promiſe of being repaid by government. Towards the latter end of the reign of king James II. and even after the acceſſion of king William III. ſoldiers uſed to oblige the inhabitants of the towns in which they were quartered, not only to furniſh them with diet and lodging, but alſo to advance them their daily ſubſiſtence. After the revolution, by the mutiny-act, paſſed the 23d day of December, in the year 1689, other laws and regulations reſpecting quarters were enacted.

By the petition of right in the third of Charles I. it is enacted and declared, that the people of the land are not by the laws to be burthened with the ſojourning

of ſoldiers againſt their wills; it is alſo enacted by the 31 Car. II. c. 1. that no officer, military or civil, nor any other perſon whatſoever, ſhall preſume to place, quarter, or billet any ſoldier on any ſubject or inhabitant of this realm, of any degree, quality, or profeſſion whatſoever, without his conſent; and every ſuch ſubject or inhabitant may refuſe to ſojourn or quarter any ſoldier, notwithſtanding any command, order, warrant, or billeting whatever. The preſent mode of quartering our troops is ſettled by the Mutiny Act, renewed annually, with little or no alteration. Accordingly by the mutiny act, 49 Geo. III. c. 12. ſ. 41. the conſtables and other chief officers and magiſtrates of cities, towns, villages, and other places, and in their default or abſence, any one juſtice inhabiting in or near ſuch place, and no other, ſhall and may, during the continuance of this act, quarter and billet officers and ſoldiers in inns, livery ſtables, alehouſes, victualling houſes, and the houſes of ſellers of wine by retail to be drank in their own houſes or places thereunto belonging, (other than perſon's canteens held under the authority of the commiſſioners for the affairs of barracks, and other than perſons who keep taverns only, being free of the vintners' company in London,) and all houſes of perſons ſelling brandy, ſtrong waters, cyder, or metheglin, by retail to be drank in houſes, (other than the houſes of diſtillers who keep places of diſtilling brandy and ſtrong waters, and of ſhopkeepers whoſe principal dealings ſhall be more in other goods than in brandy and ſtrong waters, and who do not permit tipling in their houſes,) and no other, and in no private houſes whatſoever; nor ſhall any more billets be ordered than there are effective ſoldiers; which billets when made out ſhall be delivered to the commanding officer preſent: and if any conſtable, or ſuch like officer or magiſtrate as aforeſaid, ſhall preſume to billet any ſuch officer or ſoldier in any private houſe without the conſent of the owner or occupier, ſuch owner or occupier ſhall have his remedy at law againſt ſuch magiſtrate or officer, for damages; and if any military officer ſhall take upon him to quarter ſoldiers otherwiſe than by this act, or ſhall offer any menace or compulſion to any mayor, or other civil officer before-mentioned, tending to diſcourage any of them from doing their duty, he ſhall on conviction before any two juſtices by the oath of two witneſſes be *ipſo facto* caſhiered and diſabled to hold any military employment; provided the conviction be affirmed at the next quarter ſeſſions, and a certificate thereof be tranſmitted to the judge advocate, who ſhall certify the ſame to the next court martial. And if any perſon ſhall be aggrieved by having more ſoldiers billeted than in proportion to his neighbours, on complaint thereof to one juſtice of the diviſion, &c. where quartered, or if the perſon ſo billeting them be a juſtice, then on complaint to two juſtices they may relieve him.

Note.—The clauſe above recited, relating to ſhopkeepers, might as well be now omitted out of the act; for that by the 17 Geo. II. c. 17. no ſhopkeepers, as ſuch, are allowed to retail any ſpirituous liquors, but only thoſe who keep taverns, victualling houſes, inns, coffee-houſes, or alehouſes.

By ſ. 43. No juſtice, having any military command, ſhall be concerned in quartering ſoldiers under his immediate command; but all things done by him therein ſhall be void.

By ſ. 50. of this act, an officer taking money for excuſing the quartering, ſhall be caſhiered.

By ſ. 51. If any high conſtable or other officer or any perſon whatſoever ſhall neglect to quarter any officers or ſoldiers, provided ſufficient notice be given him before their arrival, or if he receive or agree for any reward in order to excuſe any perſon from receiving ſuch officer or ſoldier, or if any victualler, &c. having any officer, &c. billeted upon him, refuſe to receive him, or refuſe to furniſh him as herein provided by this act, and ſhall be thereof convicted by one juſtice of the county, &c. where ſuch offence was committed, on confeſſion of the oath of one witneſs, he ſhall forfeit not more than 5*l.* nor leſs than 40*s.* to be levied by diſtreſs; which ſum ſhall be applied firſt to ſatisfy ſuch ſoldier for the expence thereby occaſioned to him, and the remainder to the overſeers of the poor of the pariſh where the offence was committed.

By ſ. 56. If any officer, military or civil, ſhall quarter any of the wives, children, or ſervants of officer or ſoldier, in any houſe, againſt the conſent of the owner; if he be an officer, he ſhall on proof made thereof to the commander in chief of the army or judge advocate, be *ipſo facto* caſhiered; and if a civil officer, he ſhall forfeit to the party grieved 20*s.* on proof thereof to the next juſtice by diſtreſs.

By ſ. 53. Officers and ſoldiers, billeted as aforeſaid, ſhall be received and furniſhed with diet and ſmall beer, paying for the ſame as hereafter mentioned, out of their ſubſiſtence-money.

By ſ. 54. If any perſon ſhall chooſe rather to furniſh non-commiſſioned officers or private men, with candles, vinegar, and ſalt, *gratis*, and allow them the uſe of fire and the neceſſary utenſils for dreſſing and eating their meat, and ſhall give notice thereof to the commanding officer, and ſhall furniſh the ſame accordingly; in ſuch caſe they ſhall provide their own victuals and ſmall beer, and the officer who receives their pay ſhall pay the ſums after mentioned out of the ſubſiſtence-money for diet and ſmall beer to them, and not to the perſons on whom they are quartered.

By ſ. 55. Every officer receiving the pay or ſubſiſtence-money, either for a regiment, or particular troops and companies, or otherwiſe, ſhall immediately, upon each receipt of each ſum, give public notice thereof to all on whom officers or ſoldiers are quartered; and ſhall alſo appoint ſuch perſons to repair to their quarters, at ſuch times as they ſhall appoint, for the payment of the ſaid pay or ſubſiſtence-money to the officers or ſoldiers, which ſhall be within four days at the fartheſt after the receipt of the ſame, as aforeſaid; and ſuch perſons ſhall then and there acquaint ſuch officer with the accounts or debts between them and the officers and ſoldiers quartered; which accounts the ſaid officer is to accept of, and immediately pay the ſame, before any part of the pay or ſubſiſtence be diſtributed: provided the ſaid accounts exceed not, for a commiſſion officer of horſe being under the degree of a captain, for ſuch officer's diet and ſmall beer, *per diem*, 2*s.*; nor for one commiſſion officer of dragoons, being under the degree of a captain, for ſuch officer's diet and ſmall beer, *per diem*, 1*s.*; nor for one commiſſion officer of foot, under the degree of a captain, for ſuch officer's diet and ſmall beer, *per diem*, 1*s.*; nor for each horſe quartered under this act, for hay and ſtraw, *per diem*, 6*d.*; nor for one light horſeman's diet and ſmall beer, *per diem*, 7*d.*; and hay and ſtraw for his horſe, *per diem*, 6*d.*; nor for one dragoon's diet and ſmall beer, *per diem*, 7*d.*; and hay and ſtraw for his horſe, *per diem*, 6*d.*; nor for one foot ſoldier's diet and ſmall beer, *per diem*, 5*d.*: and if ſuch officer ſhall not ſo give notice and ſhall not immediately upon producing ſuch account ſtated ſatisfy the ſame; upon complaint on oath by two witneſſes, at the next quarter ſeſſions for the county or city where ſuch quarters were, the paymaſter of the guards, garriſons, and marines, are authorized (upon certificate of the ſaid juſtices before whom ſuch oath was made, of the ſum due upon ſuch accounts and the per-

ſons to whom the ſame is owing) to pay the ſaid ſums out of the arrears due to the ſaid officer, upon pain of ſuch paymaſter forfeiting his place, and being incapacitated from holding it again. The act then ſtates what courſe is to be purſued if there be no arrears due, or no ſubſiſtence-money remitted, and is directory of the courſe to be purſued by the paymaſter.

By ſ. 49. The commanding officer may exchange any men or horſes quartered in any place with another man or horſe quartered in the ſame place, provided the number of men and horſes do not exceed the number at that time billeted on ſuch houſe.

By ſ. 47., And where any horſe or dragoon ſhall be quartered upon any perſon who hath no ſtables, upon his complaint to two juſtices of the diviſion, &c. and his making ſuch allowance as ſuch juſtices ſhall think reaſonable, they may order the men and their horſes, or the horſes only, as the caſe may be, to be removed and quartered upon ſome other perſon who hath ſtables, and may order and ſettle a proper allowance to be made by the perſon having no ſtables, in lieu of his quartering ſuch horſe or dragoons, and order payment thereof to the perſon to whom the removal is made, for or to be applied for the furniſhing of quarters for ſuch men and their horſes.

By 49 Geo. III. c. 37. It is enacted that every non-commiſſioned officer and private ſoldier who ſhall be furniſhed with diet and ſmall beer by the perſons on whom they are quartered, ſhall pay for the ſame 1*s.* 4*d.* *per* day, in like manner as by the firſt act is enacted as to the 7*d.* *per* day.

By ſ. 2. Where the innholder, &c. furniſhes certain articles in lieu of diet and ſmall beer, as in the former act mentioned, he ſhall have one halfpenny *per* day for each non-commiſſioned officer, &c.

By ſ. 3. 1*s.* 3*d.* *per* day is to be paid for each horſe, inſtead of 6*d.* *per* day.

By ſ. 4. The proviſions in the former act relating to the dieting on a march or recruiting are repealed.

By ſ. 5. All non-commiſſioned officers and ſoldiers ſhall receive their diet and ſmall beer at the above rates while on the march and on the day of arrival at the place of their final deſtination, and on the two ſubſequent days, unleſs either of the two be a market day for the place where billeted, or within two miles thereof; in which caſe the innkeeper, &c. ſhall diſcontinue on and from ſuch market-day the diet and ſmall beer, and furniſh in lieu thereof the articles in the ſaid former act ſpecified, and at the rate in this act preſcribed.

By ſ. 6. If any perſon liable to have ſoldiers quartered on him ſhall pay any ſum to any non-commiſſioned officer or ſoldier on the march in lieu of the diet and ſmall beer, he may be proceeded againſt and fined as if he had refuſed to furniſh according to the former act the things to be furniſhed to non-commiſſioned officers and ſoldiers ſo quartered as aforeſaid.

By ſ. 7. The proviſions of ſ. 5. are extended to halting on a march.

By ſ. 8. But if the halt be for longer than one day, and the day after the arrival be market-day as aforeſaid, there is to be no diſcontinuance of diet and ſmall beer.

By ſ. 9. Non-commiſſioned officers and private men employed in recruiting, and the recruits by them raiſed, ſhall, while on the march, and for two days after the day of their arrival at any recruiting ſtation, be entitled to the ſame benefits as before provided for troops on the march; but no recruit enliſted after the two days ſubſequent to the arrival of the party at their recruiting ſtation, ſhall be entitled to be ſupplied with diet and ſmall beer at the rate herein-before preſcribed, except at the option of the party where quartered. Provided that in caſe any recruiting party, with the recruits by them raiſed, ſhall remove from their ſtation, and after a time ſhall return to the ſame place, they and the recruits ſhall not be again entitled to the diet and ſmall beer for two days, unleſs the time of abſence exceeded 20 days. This act to continue to 25th March 1810.

By ſ. 52. Any juſtice within his county, &c. may command any conſtable or other officer who ſhall billet any ſoldiers, to give an account in writing to him of the number of officers and ſoldiers billeted by them, and the names of the perſons on whom quartered, and an account of the place where they dwell, and of their ſigns, if any. See MARTIAL *Law*, and SOLDIERS.

But by the 50 G. III. c. 96. ſ. 1. it is enacted, that after the 25th of June 1810, every non-commiſſioned officer and private ſoldier who ſhall be furniſhed with diet and ſmall beer within the parts of the united kingdom mentioned in the 50 G. III. c. 28. by the innholders or other perſons on whom ſuch non-commiſſioned officers or private ſoldiers ſhall be quartered and billetted by virtue of the ſaid act, ſhall pay and allow for the ſame, the ſum of eight-pence *per diem* inſtead of one ſhilling and four-pence *per diem*, as in the ſaid act ſpecified; and that for ſuch allowance of eight-pence, the innkeeper or other perſon ſhall furniſh one meal; *videlicet*, a hot dinner if required in each day to each non-commiſſioned officer, trumpeter, drummer, and private ſoldier quartered and billetted on him, to conſiſt of ſuch quantities of diet and ſmall beer as ſhall be ſpecified and fixed in and by any regulations made or to be made from time to time by his majeſty in that behalf, but not to exceed one pound and a quarter of meat previous to being dreſſed, one pound of bread, one pound of potatoes or other vegetables previous to being cooked, and two pints of ſmall beer, and vinegar, ſalt, and pepper.

And by ſ. 2. of the ſame act, the mutiny act, and the ſaid 50 G. III. c. 28. ſhall be applied for the enforcing ſuch regulations as to the diet of ſoldiers and the payment of and accounting for the allowances for the ſame.

QUARTERING *of Traitors*, in *Law*. See TREASON.

QUARTERING, in the *Sea Language*. When a ſhip under ſail goes at large, neither by a wind nor before a wind, but, as it were, betwixt both, ſhe is ſaid to go quartering.

The term is alſo uſed when a ſhip ſails with quarter-winds.

QUARTERING *the Men*, the diſpoſing of the ſhip's company at the time of an engagement in ſuch a manner, that each may readily know where his ſtation is, and what he is to do: as, ſome to the maſter, for the management of the ſails; ſome to aſſiſt the gunners to traverſe the ordnance; ſome for plying the enemy with ſmall ſhot; ſome to fill powder in the powder-room; others to carry it from thence to the gunners in cartridges, &c.

The number of men appointed to manage the artillery is always in proportion to the nature of the guns, and the number and condition of the ſhip's crew. They are in general as follow, when the ſhip is well manned, ſo as to fight both ſides at once occaſionally:

To a	42-pounder	-	15 men.
	32	- -	13
	24	- -	11
	18	- -	9
	12	- -	7
	9	- -	6
	6	- -	5
	4	- -	4
	3	- -	3

This number, to which is often added a boy to bring powder to every gun, may be occaſionally reduced, and the guns nevertheleſs well managed.

The number of men appointed to the ſmall arms, on board his majeſty's ſhips and ſloops of war by order of the admiralty, are,

Rate of the Ship.	Number of Men.
1ſt - -	150
2d - -	120
3d of 80 guns -	100
— of 70 guns -	80
4th of 60 guns -	70
— of 50 guns -	60
5th - -	50
6th - -	40
ſloops of war -	30

The lieutenants are uſually ſtationed to command the different batteries, and direct their efforts againſt the enemy. The maſter ſuperintends the movements of the ſhip, and whatever relates to the ſails. The boatſwain and a ſufficient number of men are ſtationed to repair the damaged rigging: and the gunner and carpenter whatever may be found neceſſary, according to their reſpective offices. The marines are generally quartered on the poop and forecaſtle, or gangway, under the direction of their officers: although, on ſome occaſions, they aſſiſt at the great guns, particularly in diſtant cannonading. Falconer. See ENGAGEMENT.

QUARTERING, in *Gunnery*, is when a piece of ordnance is ſo traverſed, that it will ſhoot on the ſame line, or on the ſame point of the compaſs, as the ſhip's quarter bears.

QUARTERING, in *Heraldry*, the act of dividing a coat into four or more quarters, or quarterings, by parting, couping, &c. *i. e.* by perpendicular and horizontal lines, &c. See QUARTER and QUARTERLY.

The king of Great Britain quarters with Great Britain, France, Ireland, Brunſwick, &c.

Colombiere reckons twelve ſorts of quartering; but other authors give us more—*viz.* party per pale, dividing the eſcutcheons from top to bottom. See PALE.—Party per croſs, dividing it from ſide to ſide. See CROSS.—Party of ſix pieces, when the eſcutcheon is divided into ſix parts, or quarters.—Party of ten; of twelve; of ſixteen; of twenty; and of thirty-two; when there are ſo many partitions reſpectively.

Others give the diviſions in another manner: as—Party per croſs—per pale—per chief—per pale inclave—per bend dexter—per bend ſiniſter—per chevron—barry bendy of eighty pieces—paleways of ſix pieces—barry of ſix pieces—barry of eight pieces—bendy of ſix—checky—fuſilly, or lozengy—pale bendy, or bendy lozengy—barry bendy lozengy, or bend lozengy—gyronny—barry lozengy counterchanged—waved of ſix pieces—barry nebule of ſix pieces—party per ſaltier—and party per pale in point. See farther under their reſpective articles.

Counter-quartering a coat, is when the quarters are quartered over again, or ſubdivided each into four. See COUNTER-QUARTERED.

There are counter-quartered coats which have twenty or twenty-five quarters.

QUARTERING is alſo applied to the partitions or compartments themſelves, that is, the ſeveral coats borne on an eſcutcheon, or the ſeveral diviſions made in it, when the arms of ſeveral families are to be placed on the ſame ſhield, on account of intermarriages, or the like.

Colombiere obſerves, that thirty-two is the greateſt number uſed in France; but that the Engliſh and Germans ſometimes extend to forty: as a teſtimony of the truth of which, he ſays he ſaw the eſcutcheon of the earl of Leiceſter, ambaſſador extraordinary in France in the year 1639, divided into the number of forty: and ſome, he affirms, do go on to ſixty-four ſeveral coats.

But a multitude of quarters make a confuſion; and, accordingly, all the writers of armoury exclaim againſt it as an abuſe. The firſt inſtance of quartering, of which we have any account, is ſaid to be in the arms of Renatus, king of Sicily, &c. in the year 1435, who quartered the arms of Sicily, Arragon, Jeruſalem, &c.

William Wickly obſerves, that ſuch quarterings are much more proper for a pedigree, to be locked up in a cheſt, and occaſionally produced as an evidence for the clearing or aſcertaining of alliances of families, and titles to lands, &c. than to be borne as a cognizance.

In blazoning, when the quartering is performed per croſs, the two quarters a-top are numbered the firſt and ſecond: and thoſe at the bottom the third and fourth; beginning to tell on the right ſide. When the quartering is by a ſaltier, &c. the chief and point are the firſt and ſecond quarters, the right ſide the third, the left the fourth.

QUARTERING is ſometimes alſo uſed for the diſtinguiſhing of younger brothers from elder. See DIFFERENCE.

QUARTERIZATION, QUARTERING, part of the puniſhment of a traitor, by dividing his body into four quarters.

"Walſingham, in Ric. II. Auditum et confeſſum turpiſſima ſcelera tractationi, ſuſpendio, decollationi, exenterationi, et quarterizationi adjudicavit."

QUARTERLY, in *Heraldry*, a perſon is ſaid to bear quarterly, when he bears arms quartered.

The king of Great Britain bears quarterly of four; in the firſt quarter gules, &c. Great Britain; in the ſecond, azure, &c. Ireland, &c.

QUARTER-MASTER, an officer in the army, whoſe buſineſs it is to look after the quarters of the ſoldiers; their clothing, bread, ammunition, firing, &c. Every regiment of foot and artillery has a quarter-maſter, and every troop of horſe one, who are only warrant-officers, except in the blues. Whereof there are ſeveral kinds; *viz.* the

QUARTER-MASTER *General*, whoſe buſineſs is to provide good quarters for the whole army.

QUARTER-MASTER *of Foot*, he who is to provide quarters for a regiment of foot.

QUARTER-MASTER *of Horſe*, he who is to provide quarters for a troop of horſe.

QUARTER-MASTER, in a *Ship*, is an inferior officer, appointed by the maſter of a ſhip of war to aſſiſt the mates in their ſeveral duties; as ſtowing the ballaſt and proviſions in the hold, coiling the cables on their platforms, overlooking the ſteerage of the ſhip, and keeping the time by the watch-glaſſes.

QUARTERN, QUARTERON, a diminutive of quart, ſignifying a quarter of a pint, as a quart does a quarter of a gallon.

QUARTIER, in *Commerce*, a liquid meaſure in Germany, which, according to a regulation of 1713, made in Hanover, muſt hold 2lb. of ſpring water, and the contents of which are 49 French, or 59¼ Engliſh cubic inches. A fuder of wine contains 4 exhofts, 6 ahms, or 15 eimers; an ahm, 4 ankers, 40 ſtubgens, 80 kannes, 160 quartiers, or 320 noſſels. Hence 36 ſtubgens, or 144 quartiers, = 37 Engliſh wine gallons. A faſs of beer at Lubec contains 42 ſtubgens, or 168 quartiers. Kelly's Un. Cambiſt.

QUARTILE, an aſpect of the planets when they are three ſigns, or 90 degrees diſtant from each other.

The

The quartile aſpect is marked thus □. See ASPECT.

QUARTILLO, in *Commerce*, a liquid meaſure in Spain. At Barcelona, 128 quartillos are equal to 32 quarteras. (See QUARTERA.) A moyo of wine contains 16 arrobas; an arroba 8 azumbres, or 2 quartillos. The arroba of wine contains 34lb. of river water (Caſtilian weight), and meaſures 1237½ Spaniſh, or 981 Engliſh cubic inches; hence four ſuch arrobas are equal to 17 Engliſh wine gallons. The arroba of oil meaſures 966⅔ Spaniſh, or 771 Engliſh cubic inches; ſo that three ſuch arrobas correſpond to 10 Engliſh gallons: this arroba is divided into 4 quartillos, or 100 quarterones, or panillas. A Spaniſh botta contains 30 arrobas of wine, or 38½ of oil; a pipe is 27 arrobas of wine, or 34½ of oil; thus the botta is = 127½ Engliſh gallons, and the pipe = 114¾. Kelly. See *Tab.* XXXII. *of* MEASURES.

QUARTO, or 4*to.* a book whereof four leaves, or eight pages, make a ſheet.

QUARTO, in *Commerce*, a money of account in Spain. See REAL.

QUARTO *Dell Torri*, in *Geography*, a town of Naples, in Capitanata; 12 miles W. of Salpe.

QUARTO *die poſt*, in *Law*, denotes the fourth day incluſive beyond the return of a writ, in which thoſe that are ſummoned are allowed to make their appearance. See ESSOIGN *day of term.*

QUARTO-DECIMANS, QUARTO-DECIMANI, in *Eccleſiaſtical Hiſtory*, an ancient ſect in the church, who maintained, that Eaſter was always to be celebrated, conformably to the cuſtom of the Jews, on the fourteenth day of the moon in the month of March, whenſoever that day fell out.

And hence their name Quarto-decimani, *q. d.* Fourteenthers.

The Aſiatics were mightily attached to this opinion, pretending that it was built on the authority of St. John, who was their apoſtle; and pope Victor could never bring them to obedience in this article, though he was upon the point of excommunicating them: but it is more probable he contented himſelf with menaces. See EASTER.

QUARTUM *par conſtringens*, in *Anatomy*, a name given by Spigelius and ſome others to the muſcle called by Albinus and Riolanus orbicularis oris; and by Cowper and ſome others, conſtrictor labiorum.

QUARTUS *hyoidis muſculus*, a name given by Veſalius, Fabricius, and many other anatomiſts, to a muſcle now generally called the coracohyoidæus.

QUARTUS *oculum movens*, a name given by Veſalius to one of the muſcles of the eye, called by ſome rectus inferior, and by others humilis.

It is the depreſſor oculi of Albinus, being one of the quatuor recti oculi of that author.

QUARTZ, in *Mineralogy*. No ſubſtance in the mineral kingdom is more abundantly diſtributed than quartz. Grains of quartz generally compoſe a conſiderable part of the ſands on the ſea-ſhore, and of the ſand-ſtones of the ſecondary ſtrata. Rolled pieces of quartz, or pebbles and boulders, are widely ſcatterred over alluvial diſtricts. Quartz is diſſeminated through granite, gneiſs, mica-ſlate, and other compound rocks which conſtitute the loftieſt mountains on the globe; it alſo forms veins of vaſt extent interſecting theſe mountains, and ſometimes entire ſimple rocks are compoſed of this mineral. Quartz has a conſiderable degree of hardneſs, always ſtriking fire with ſteel when the fragments have ſufficient ſolidity to reſiſt the ſhock. Powdered quartz feels harſh, and, when rubbed on poliſhed ſteel, or on glaſs, ſcratches the ſurface. Quartz is infuſible by the common blowpipe. Theſe two qualities, hardneſs and infuſibility, are the eſſential characters of all the varieties of quartz, whatever forms or colours they may preſent, whether maſſive or cryſtallized.

Quartz has moſt commonly a conchoidal fracture, but ſometimes the fracture is undulated, foliated, or ſplintery. The luſtre is vitreous. Quartz has various degrees of tranſparency; from a perfectly pellucid colourleſs ſtate, it paſſes by different gradations to opacity: but all the varieties, except ſinople, admit light through the very minute fragments. The colours are various, owing to the impregnation or intermixture with foreign ſubſtances. The ſpecific gravity of quartz is from 2.58 to 2.65. It yields a phoſphoreſcent light when rubbed, and is not ſoluble in any of the acids except the fluoric. According to Vauquelin, powdered quartz gives a green colour to tincture of violets. Cryſtallized quartz preſents the phenomenon of double refraction, when an object is ſeen through one ſide of the pyramid that terminates the cryſtals, and the oppoſite ſide of the hexagonal priſm on which it is placed, in the moſt common variety of the ſecondary forms of theſe cryſtals.

The ſubſtances found imbedded in quartz are, ores of titanium, antimony, gold, ſilver, copper, and lead, arſenic, and micaceous iron ore, with chlorite, hornblende, felſpar, garnet, and fluat of lime. It is alſo penetrated by fibres of aſbeſtus, and by minute laminæ of mica and epidote: the latter ſubſtance is ſometimes ſo intimately diffuſed through quartz as to give it an homogeneous green colour. This variety of quartz is called praſe.

Quartz cryſtallizes diſtinctly: ſome of the cryſtals are of conſiderable ſize.

In the imperial cabinet of Vienna, there is ſaid to be a cryſtal of quartz ſeven feet in length. The forms of cryſtalline quartz are various; they have been reduced by modern mineralogiſts to ſix or ſeven principal varieties. The moſt common is a ſix-ſided priſm, terminated by a ſix-ſided pyramid, or two ſix-ſided pyramids joined at their baſes. The ſides of theſe pyramids are iſoſceles triangles, having the vertical angle 40°, and each of the angles at the baſe 70°. The ſides of the upper and lower pyramids are inclined to each other at an angle of 104°. According to Haüy, the primitive form of the cryſtal is a rhomboid, varying little from the cube, the angles being 94° and 86°. The primitive rhomboid is rarely found in nature; it occurs ſometimes in red hematite, coated with that mineral, and in chalcedony.

Bubbles containing air, water, and bitumen, are ſometimes ſeen in quartz cryſtals, and have given riſe to much ſpeculation reſpecting their formation. Siliceous earth, of which theſe cryſtals are compoſed, is inſoluble in water, by artificial means; but in the great laboratory of nature, its ſolution is effected probably by the effect of heat and compreſſion, as ſilex exiſts in the boiling fountains of Iceland and the Azores, and in the hot ſprings of Bath, Italy, and various parts of the world. It has been ſuppoſed that the ſiliceous earth was held in ſolution by ſoda; but Klaproth, who analyſed the waters from the Reikum, in Iceland, thinks the quantity of alkali too ſmall to have diſſolved the ſilex. One hundred cubic inches contained nine grains of ſilex, three of carbonate of ſoda, eight of common ſalt, and five of ſulphate of ſoda. If rock cryſtals were formed in an aqueous ſolution greatly heated and compreſſed, it would not be difficult to conceive how volatile matter might be involved in the ſubſtance of the cryſtal during its formation; but our knowledge of the ſubterranean operations of nature is at preſent too limited to enable us to aſcertain, or even to form any rational conjecture in what manner ſome of her more myſterious proceſſes are effected. Thoſe who have frequent opportunities of exploring mines, will not be diſpoſed to deny that ſiliceous ſtalactites, and cryſtals, are now forming at the common temperature of the earth, as they are obſerved

ſerved on the roofs and ſides of artificial excavations, and paſſages which have been undiſturbed for ſome years. According to Chaptal, a quartzoſe or a ſiliceous paſte is formed by tranſudation on ferruginous rocks at Chamillat, near Planches les Mines, in Franche Compté, and where this is waſhed and depoſited by water, rock cryſtals are formed. Siliceous ſtalactites have not unfrequently been ſeen coating the wood which has been left in mines.

Pſeudomorphous cryſtals of quartz, or falſe cryſtals of this mineral, are frequently found in mines; they are tarniſhed and opaque, and their edges are blunted. They aſſume the forms of cubic cryſtals of fluor, and the pyramidal and other forms of calcareous and other cryſtals. Theſe falſe cryſtals are evidently moulded in the cavities which the former have once occupied. Quartz alſo occurs filling up the cavities of ſhells in a ſimilar manner, and the pores of wood and other organic ſubſtances.

Cellular quartz with polyhedral cavities, appears to have been formed round cryſtals of other minerals which are ſubſequently decompoſed. The internal cryſtals are frequently thoſe of the metallic ſulphurets. Brongniart ſays this concluſion is founded on direct obſervation, as the remains found in theſe cavities are ſulphur, native gold, and oxyd of iron, all ſubſtances which originally formed part of the decompoſed ſulphurets. Such is the cellular quartz at Schemnitz in Hungary, and Joachimſthal in Bohemia. The cellular quartz at Berezof, in Siberia, is ſo porous that it is lighter than pumice.

Rock cryſtal, or *Mountain cryſtal*, is the pureſt variety of quartz, differing from common quartz by its tranſparency, and the more regular form of its cryſtals; the fracture is alſo more perfectly conchoidal. According to ſome analyſes, rock cryſtal contains 98 parts of ſilex, with 2 parts of water. Bergman found in one ſpecimen only

Silex -	93
Alumine	6
Lime -	1

Amethyſt is a purple variety of rock cryſtal. See AMETHYST.

Cairngorum ſtones are rock cryſtals, from the mountains of Cairngorum, in Scotland. They are valued by jewellers on account of their purity and colour. Clove-brown quartz cryſtals are known by the name of the ſmoke topaz. According to Karſten, the ſpecific gravity of this variety is 2.88. Coloured rock cryſtals loſe their colour, when carefully expoſed to a gentle heat, but retain their tranſparency. The yellow and orange-yellow varieties are the moſt eſteemed.

Milk quartz, called by ſome mineralogiſts roſe quartz, and by others the Bohemian ruby, as it is frequently of a beautiful roſe-red colour, which it derives from manganeſe. By expoſure to the light the intenſity of its colour is diminiſhed. It is uſed in jewellery, and takes a good poliſh; it is ſometimes ſold for the ruby, but is leſs hard, nor has it the tranſparency and brilliancy of that gem. Roſe quartz is found at Rabenſtein, in Bavaria, in conſiderable maſſes, and in a vein of manganeſe which traverſes a coarſe-grained granite. It occurs alſo in Sweden, Greenland, Saxony, in the iſland of Coll, one of the Hebrides, and in Ireland. Some varieties are of a milk-white colour, others pearl-grey.

Irideſcent quartz, *Quarz hyalin iriſé*, preſents on its ſurface, or in its interior, the various colours of the rainbow: it ſometimes derives this property from a thin pellicle of metallic oxyd which covers the ſurface, and ſometimes from minute fiſſures in the ſubſtance of the cryſtal. Theſe colours may be given to quartz by heating it and expoſing it ſuddenly to a cold temperature.

Avanturine quartz (ſee AVANTURINE) owes its brilliancy to minute particles of mica diſſeminated through it, and ſometimes to minute fractures. Avanturines may be formed artificially, in ſome varieties of quartz, by heat.

Blue quartz, *Quarz hyalin ſaphain*, has been found in Spain, Bohemia, and Bavaria.

Black quartz is found, mixed with carbonate of lime, in the department of Iſere in France, in Bohemia, and at Cappe Nuova, on the road to Sienna. Brongniart Mineralogie.

Cat's-eye, *Quarz hyalin chatoyant*, ſo called becauſe it reflects a pearly variety of colours, according as the light falls upon it in different directions: this property is owing to the fibrous texture of this mineral, which may be obſerved in the beſt characterized ſpecimens. It contains 95 parts of ſilex, and according to Brongniart is a variety of quartz, and ought not to be claſſed with felſpar. The geological ſituation of this ſtone is not known. The cut and poliſhed ſpecimens ſeen in cabinets come from Malabar and Ceylon. It is ſaid, alſo, to occur in Egypt and Arabia.

Green quartz, *Praſe*, *Quarz hyalin verd obſcur*. The colour is a leek green; it is ſeldom cryſtallized; the form of the cryſtals are thoſe of common quartz. Praſe has been ſaid to owe its colour to an intimate intermixture with actynolite, but Klaproth is of opinion that this is not well aſcertained.

Sinople is claſſed, by ſome mineralogiſts, with quartz. It is of a deep blood-red colour, and perfectly opaque, or barely tranſmits light on the edges. It reſembles red jaſper, but has a vitreous luſtre, and conchoidal fracture, and is ſometimes cryſtallized.

Ferruginous quartz conſiſts of ſmall cryſtals, or of granular quartz, intimately mixed with oxyd of iron, and has a brown ochre-yellow, or red colour. From the iron which it contains it becomes magnetic when heated. It is harder than pure quartz.

Certain properties, beſide colour, have given names to ſome varieties of quartz.

Fat quartz is ſo called becauſe it has a greaſy appearance, as if the ſurface had been rubbed with oil.

Fetid quartz differs from common quartz, by emitting an odour, when rubbed, like that of ſulphuretted hydrogen gas. When this foſſil is heated below a red heat, it loſes its fetid odour on cooling, and when plunged into water becomes tranſparent. When fetid it is nearly opaque. It is found in the vicinity of Nantes and Chantiloub, in the department of Haute Vienne, forming a conſtituent part of the granitic mountains of that diſtrict. It occurs alſo in the iſland of Elba.

Elaſtic quartz is a ſiliceous ſand-ſtone, found in the Brazils, compoſed of oblong laminæ of quartz, arranged in one direction, and ſo interlocked together as to form a kind of hinge with each other, from whence it poſſeſſes a certain degree of pliability, like that of a ſtiff piece of leather. In appearance, elaſtic quartz reſembles ſome of the ſlaty ſand-ſtones in the northern counties of England. According to Klaproth its conſtituent parts are

Silex - -	96.50
Alumine - -	2.50
Oxyd of iron and loſs	1

The uſe of quartz in the arts is principally confined to the manufactures of glaſs, enamels, porcelain, and earthenware. The finer cryſtallizations are employed by the jewellers, and before the diſcovery of glaſs, ornaments and veſſels of great value were made by the ancients from rock cryſtal. Stones in which quartz forms the principal ingredient, are beſt fitted for purpoſes of durable architecture, and in the economy

economy of nature this mineral gives ſtability to the ſolid fabric of the globe, enabling thoſe rocks and mountains in which it abounds to reſiſt the decompoſing effects of air and moiſture, and to brave for ages the impetuous fury of the ocean. For the properties of ſilex, of which quartz is compoſed, ſee SILEX.

QUARTZ *Rock*, in *Geology*. Entire rocks and even mountains are compoſed of quartz in various parts of the world, in the vicinity of granitic diſtricts. The quartz is granular, and ſometimes intermixed with a ſmall portion of mica. Werner claſſes quartz rock as a diſtinct order of primary rocks, but it would be perhaps more conſonant with a natural arrangement, to conſider this rock as a conſtituent of granite on a large ſcale, certain cauſes having ſeparated the quartz, mica, and ſelſpar into diſtinct maſſes. Entire mountains of theſe three ſubſtances are ſaid to occur in the Uralian chain, preſenting the materials of granite on a large ſcale. Quartz rocks are met with in Scotland. In the highlands the ſummits of ſome of the mountains are formed of white quartz, and appear as if covered with ſnow. The two beautiful conical mountains, called the *Sugar-loafs*, in the vicinity of Dublin, are compoſed of granular quartz, of a ſimilar kind to what forms veins in the gneiſs and mica ſtate of the ſurrounding mountains nearer Dublin.

QUARTZOSE, in *Mineralogy*, a term applied to thoſe rocks or minerals which are principally compoſed of quartz.

QUASHING, in *Law*, the overthrowing and annulling a thing. Thus, pleas in *abatement* (which ſee), when the ſuit is by original, conclude to the writ or declaration; by praying "judgment of the writ, or declaration, and that the ſame may be quaſhed," *caſſetur*, made void or abated; but if the action be by bill, the plea muſt pray "judgment of the bill," and not of the declaration; the bill being here the original, and the declaration only a copy of the bill. See PLEA, DILATORY *Pleas*, and CERTIORARI.

QUASI-CONTRACT, in the *Civil Law*, an act which has not the ſtrict form of a contract, but yet has the force of it.

In a contract there muſt be the mutual conſent of both parties; whereas, in a quaſi-contract, one party may be bound or obligated to the other, without having given his conſent to the act by which he is obliged.

For an example: I have done your buſineſs in your abſence, without your procuration; and it has ſucceeded to your advantage; I have then an action againſt you for the recovery of what I have diſburſed; and you an action againſt me, to make me give an account of my adminiſtration; which amounts to a quaſi-contract. See CONTRACT.

QUASI-CRIME, or QUASI-DELICT, the action of a perſon who does damage, or evil, involuntarily.

The reparation of quaſi-crimes conſiſts in making good the damages, with intereſt.

QUASI-MODO SUNDAY, *Low Eaſter-Sunday*, or the next ſunday after Eaſter; thus called from the initial words of the introit of the maſs for the day, *Quaſi modo geniti infantes*.

In the ancient deeds theſe words are ſignified by *q. m. g.*

QUASS, the name of a liquor in Ruſſia, which ſerves the natives not only for drink, but alſo for ſauce to a number of diſhes; and is the baſis of the favourite cold ſoup of the North, which is made by adding cold meat cut in pieces, with cucumbers ſalted after a peculiar manner, or with onions, or garlick, to a bowl of this ſubacid liquor. The common Ruſſian quaſs is prepared by putting into a large pot full of cold water as much rye-flower as will make a thin dough; this is then placed in an oven moderately heated, for three hours, and afterwards taken out and thrown into a tub of cold water; the mixture is worked with a machine like a chocolate mill till it froths. To this liquor are added two baſons of the grounds of old quaſs, leaven, or a piece of their ſour bread; and the tub is covered with a cloth, and laid by till the liquor has acquired a ſouriſh taſte, which marks its being ready for uſe.

There is a better ſort of quaſs, which is prepared as follows. Take a chetverik (about 35 pounds Ruſſ. or 30 pounds Engl.) of barley-malt, two or three handfuls of rye-malt, and a like quantity of unbolted rye-meal; mix them all together in earthen pots, then pour boiling water upon it, and ſtir the whole till it acquires the conſiſtence of a thin pap. The pots muſt be full to within an inch of the brim. Upon this mixture muſt now be poured about an inch in height of the huſks of oats, from which groats are made. Set the pots in a heated oven, in which ſome glowing coals are ſtill remaining, which muſt be heaped about the pots. This done, cloſe the oven, and leave the pots in it four-and-twenty hours. This time being elapſed, take them out; again pour boiling water in till they are brimfull, and ſtir all well together. Now pour it all into a wooden veſſel or tub, provided with a ſpiggot and foſſet, firſt covering the bottom with a layer of ſtraw, as is uſually done in brewing beer; then add warm water, more or leſs, according to the quantity of quaſs you want; let it ſtand an hour, and afterwards draw it off into veſſels. In every veſſel a ſlice of coarſe rye bread muſt be put, in order to make it ferment. Set the veſſels in a cellar, and after four-and-twenty hours the quaſs is fit for drinking.

In making quaſs, barley-malt alone may be uſed. The rye-malt is added only from neceſſity, when the former, by itſelf, would be too poor, and not be ſufficiently ſweet. But the rye-meal is abſolutely neceſſary.

From the quantity of malt and meal above ſtated, is obtained about ſix or ſeven kilderkins, or two ankers of quaſs. The Ruſſians in the ſummer ſeaſon put the veſſels of quaſs immediately in the cellar, but in the winter they let them ſtand a whole night in a warm room, for the quaſs to ferment.

QUASSE, in *Geography*, a town of Africa, in Benin. N. lat. 6° 20′. E. long. 3° 30′.

QUASSIA, in *Botany*, received that name from Linnæus. He called it ſo in honour of Quaſſi, a negro at Surinam, who diſcovered the virtues of the wood of this tree, in curing the malignant fevers of that country, to which ſo many Europeans fell a ſacrifice, and who communicated this valuable diſcovery to his patron governor Dahlberg. Hence it became known in Europe; particularly by means of a diſſertation printed in the Amœnitates Academicæ, firſt publiſhed in 1763.—Linn. Gen. 212. Schreb. 288. Willd. Sp. Pl. v. 2. 567. Mart. Mill. Dict. v. 4. Ait. Hort. Kew. v. 3. 42. Juſſ. 282. Lamarck Illuſtr. t. 343. Gærtn. t. 70.—Claſs and order, *Decandria Monogynia*. Nat. Ord. *Magnoliis affine*, Juſſ.

Gen. Ch. *Cal.* Perianth inferior, very ſhort, of five ovate, permanent leaves. *Cor.* Petals five, ſeſſile, equal, lanceolate, elongated, oblique, converging. Nectary of five ovate villous ſcales, attached to the inſide of the filaments at the baſe. *Stam.* Filaments ten, thread-ſhaped, equal, the length of the corolla; anthers oblong, incumbent. *Piſt.* Receptacle fleſhy, elevated, orbicular, broader than the germen. Germen ovate, compoſed of five ſeparate ones; ſtyle thread-ſhaped, with five furrows, the length of the ſtamens; ſtigma with five angles. *Peric.* Drupas five, diſtant, horizontal, ovate, obtuſe, ſplitting into two parts, all ſtanding on a fleſhy pentagonal receptacle. *Seeds* ſolitary, globoſe or oval.

Obſ. Some flowers have abortive germens, others imperfect anthers.

Eſſ. Ch.

Eſſ. Ch. Calyx of five leaves. Petals five. Nectary of five ſcales. Drupas five, diſtant, two-valved, ſingle-ſeeded, placed on a fleſhy receptacle.

1. Q. *amara*. Bitter Quaſſia. Linn. Sp. Pl. 553. Suppl. 235. Amoen. Acad. v. 6. 416. t. at page 429. Willd. n. 1. Ait. n. 1. Curt. Mag. t. 497. Woodv. Med. Bot. t. 77.—Flowers all perfect. Leaves pinnate; leaflets oppoſite, ſeſſile; common ſtalk jointed, winged. Flowers racemoſe.—Native of Surinam. Introduced in 1790, by Mr. Alexander Anderſon, to the ſtoves at Kew, where it flowers in June and July. A *ſhrub* rather than a tree, whoſe wood is intenſely bitter. *Leaves* alternate; of two pair of *leaflets*, with an odd one, all elliptic-lanceolate, pointed, entire, veiny, very ſmooth, two or three inches in length, on a linear winged ſtalk, abrupt and jointed at the inſertion of each pair. *Cluſters* long, drooping one way. *Flowers* numerous, above an inch long, not much expanded, of a rich ſcarlet, as well as their ſtalks. The younger Linnæus errs in ſaying, in the Supplement, that the branch figured in Am. Acad. does not belong to the flowers.

This is the true original Quaſſia, whoſe wood is more powerful than that of the other ſpecies; but being very rare, and of ſmall bulk, its place is ſaid to be uſually ſupplied by *Q. excelſa* hereafter deſcribed.

2. Q. *Simaruba*. Wing-leaved Quaſſia. Linn. Suppl. 234. Willd. n. 2. Ait. n. 2. Woodv. Med. Bot. t. 76. (Simarouba amara; Aubl. Guian. v. 2. 859. t. 331, 332.)—Flowers monoecious. Leaves pinnate; leaflets alternate, not quite ſeſſile; common ſtalk naked. Cluſters panicled.—Native of various parts of the Weſt Indies, in a ſandy ſoil, flowering in November and December. It was ſent to Kew in 1787, by Mr. Alexander Anderſon, but has not bloſſomed there. This is a tall and ſtout tree, whoſe wood is hard, white, without any peculiar flavour. *Leaves* alternate, with ſix, ſeven, or eight alternate obovate, rather narrow, entire, ſtalked *leaflets*, two inches long, whitiſh beneath; their common ſtalk ſimple, roundiſh. *Flowers* yellowiſh-white, much ſmaller than the preceding, either monoecious, or, as ſome ſay, dioecious, in branched or panicled cluſters. The bark of the *root* is bitter, and much celebrated as a cure for the dyſentery. Dr. Wright has given a full hiſtory of the plant, with a plate, in the Tranſactions of the Royal Society of Edinburgh, vol. ii. It is known in Jamaica by the name of Mountain Damſon, Bitter Damſon, and Stave-wood. In that iſland, according to Dr. Wright, the male flowers are never found on the ſame tree with the female.

3. Q. *excelſa*. Lofty Quaſſia. Swartz in Stockh. Tranſ. for 1788. 302. t. 8. Ind. Occ. v. 2. 742. Willd. n. 3.—Flowers polygamous. Stamens five. Leaves pinnate; leaflets oppoſite, ſtalked; common ſtalk naked.—Native of rather mountainous woods, in Jamaica and the Caribbean iſlands. The Engliſh commonly call it bitter wood, or bitter aſh. The *tree* is lofty, with a very ſtraight trunk; the wood whitiſh, moderately cloſe-grained, very bitter; frequently ſold by the druggiſts for the true *Quaſſia amara*, and found uſeful in intermittent fevers, debility of the ſtomach, worms, dropſy, and chloroſis. It is alſo uſed for making cabinets, for preſerving inſects, or other natural curioſities; this wood being ſuppoſed inacceſſible to worms. The *leaves* are larger than the laſt, and compoſed of from four to ſix pair of oppoſite, elliptical, pointed, firm, entire, ſmooth leaflets, on ſhort partial ſtalks. *Cluſters* panicled, bearing very numerous, ſmall, pale *flowers*, ſome male, the reſt hermaphrodite, in the ſame cluſter. Swartz deſcribes the *nectary*, of five minute villous ſcales, contrary to the remark of Willdenow, under his *Zwingera*, Sp. Pl. v. 2. 569, where it is ſaid to be wanting in this ſpecies of *Quaſſia*. The *ſtamens* are moſtly five, rarely four or ſix. *Germens* from two to four.

Quassia *Amara*, bitter quaſſia, in the *Materia Medica*. The root, bark, and wood of this tree are all comprehended in the catalogues of the Materia Medica; and it is obſerved that the leaves, flowers, &c. poſſeſs ſimilar qualities. The roots, being perfectly ligneous, may be medically conſidered in the ſame light with the wood, which is now moſt generally employed, and ſeems to differ from the bark in being leſs intenſely bitter; ſo that the latter is thought to be a more powerful medicine. The wood is ſent to this country from Jamaica and the Caribbean iſlands in billets; and is reduced to chips, or raſped by the druggiſts. Quaſſia has no ſenſible odour; its taſte is that of a pure bitter, more intenſe and durable than that of any other ſubſtance. It imparts its virtues more completely to watery than to ſpirituous menſtrua, and its infuſions are not blackened by the addition of martial vitriol. When the infuſion is evaporated to dryneſs, it leaves a browniſh-yellow, ſomewhat tranſparent, brittle extract, which has been regarded as a vegetable conſtituent *ſui generis*, and named the bitter principle. (Edinb. Phil. Tranſ. iii. 207.) The infuſion is rendered muddy by nitrate of ſilver, and a ſoft, flaky, yellow precipitate is formed; acetate of lead occaſions a copious white precipitate; and hence it has been inferred that theſe ſalts are incompatible in formula with it. The watery extract is from a ſixth to a ninth of the weight of the wood; the ſpirituous about a twenty-fourth.

Quaſſia derived its name, as has been already obſerved, from a negro named Quaſſi (by Fermin written Coiſſi, and by Rolander, Quaſs), who employed it with uncommon ſucceſs as a ſecret remedy in the malignant, endemic fevers, which frequently prevailed at Surinam. In conſequence of a valuable conſideration, this ſecret was diſcloſed to Daniel Rolander, a Swede, who brought ſpecimens of the quaſſia-wood to Stockholm in the year 1756; and ſince that time the effects of this drug have been very generally tried in Europe, and numerous teſtimonies of its efficacy publiſhed by many reſpectable authors. Its antiſeptic powers have been ſubmitted to various trials, from which it has been concluded, that it has conſiderable influence in retarding the tendency to putrefaction; which, in profeſſor Murray's opinion, cannot be attributed to its ſenſible qualities, as it poſſeſſes no aſtringency whatever, nor to its bitterneſs, as gentian is much more bitter, but leſs antiſeptic. The medicinal virtues aſcribed to quaſſia are thoſe of a tonic, ſtomachic, antiſeptic, and febrifuge: it has been found very effectual in reſtoring the tone of the ſtomach, producing appetite for food, aſſiſting digeſtion, expelling flatulency, and removing habitual coſtiveneſs, produced from debility of the inteſtines, and common to a ſedentary life. Dr. Lettſom obſerves, that in hyſterical atony, to which the female ſex is ſo prone, the quaſſia affords more vigour and relief to the ſyſtem than the Peruvian bark, eſpecially when united with the vitriolum album, and ſtill more with the aid of ſome abſorbent. In dyſpepſia, ariſing from hard drinking, and alſo in diarrhœas, he exhibited the quaſſia with great ſucceſs. Although he does not concur in opinion with Linnæus, who ſays, "me quidem judice chinchinam longé ſuperat;" yet he has met with ſeveral inſtances of low remittent and nervous fevers, the ſymptoms of which the bark uniformly aggravated, though adminiſtered in intermiſſions the moſt favourable to its ſucceſs, in which quaſſia, or ſnake-root, was ſucceſsfully ſubſtituted. In ſuch caſes, he moſtly obſerved that there was great congeſtion in the hepatic ſyſtem, and the debility at the ſame time diſcouraged copious evacuations. And in many fevers, without evident

remiſſions

remiſſions to warrant the uſe of the bark, whilſt, at the ſame time, increaſing debility began to threaten the life of the patient, the doctor found that quaſſia, or ſnake-root, ſingly or combined, upheld the vital powers, and promoted a critical intermiſſion of fever, by which an opportunity was offered for the bark to effect a cure. Dr. Cullen ſays, (Mat. Med. vol. ii. p. 174.) "I believe quaſſia to be an excellent bitter, and that it will do all that any pure and ſimple bitter can do; but our experience of it in this country does not lead us to think it will do more; and the extraordinary commendations given of it are to be aſcribed to the partiality ſo often ſhewn to new medicines." It is ſaid to have been given, combined with nitric acid, with evident benefit in typhus, and alſo in fluor albus. It may be given in infuſion, which is the beſt form of adminiſtering it; or in pills made from the watery extract. It may alſo be given in ſubſtance in doſes of from grs. x to ʒj three or four times a day. The officinal preparations are the "infuſum quaſſiæ" of the London Pharmacopeia, and the "tinctura quaſſiæ" of that of Dublin. The infuſion is prepared by macerating for two hours in a lightly covered veſſel a ſcruple of quaſſia-wood, chipped, in half a pint of boiling water, and ſtraining. In hyſteria, this may be combined with purgatives and tincture of valerian; in atonic gout, with aromatics; and in dyſpeptic affections, with chalybeates, ſulphate of zinc, or mineral acids. The doſe is from fʒj to fʒiij, given twice or thrice a day. The tincture is prepared by digeſting for ſeven days an ounce of chips of quaſſia-wood in two pints of proof ſpirit; and then ſtraining. This may be uſed in the ſame caſes as the infuſion.

It is aſſerted that the brewers have, of late years, uſed quaſſia-wood inſtead of hops. Beer made with it certainly does not keep, ſays Thomſon, but ſoon becomes muddy and flat, has a mawkiſh taſte, and runs into the acetous fermentation. It is conſequently leſs nutritious and wholeſome than that which is properly hopped. Wood. Mat. Med. Thomſon's Lond. Diſp.

Quassia *Simaruba*. See Simaruba.

QUATCHEOU, in *Geography*, a town of Aſia, in the country of Hami; 30 miles E. of Tche-tcheou. N. lat. 40° 28′. E. long. 94° 27′.

QUATER-COUSINS, Quatre-Cousins, fourth couſins, or the laſt degree of kindred.

Hence, when perſons are at variance, it is ſaid they are not quater, or cater-couſins.

QUATERNA Folia, among *Botaniſts*. See Leaf.

QUATO, in *Zoology*. See Simia *Paniſcus*.

QUATORZIEME, Fr., the 14th, or double octave of the 7th. It is called the 14th, becauſe 14 ſounds muſt be formed to paſs diatonically from one of its terms to the other.

QUATOTOMOMI, in *Ornithology*, the name of an American bird of the wood-pecker kind, having a red creſt on its head, and two white lines running down the ſides of the neck to the breaſt. It is called by Nieremberg *Picus imbrifætus*; which ſee.

QUATOZTLI. See Tanagra *Leucocephala*.

QUATRE Facardins, *Les*, in *Geography*, four ſmall iſlands in the South Pacific ocean, ſo named by M. Bougainville, in the year 1768. S. lat. 18° 40′. W. long. 140° 30′.

QUATREFOIL, a decoration reſembling a roſe with four leaves, which conſtantly occurs in pointed architecture.

QUATRE-NATIONS, *q. d. Four Nations*, the denomination of a college founded in 1661, by cardinal Mazarin, for the education and maintenance of ſixty children, natives of the four countries conquered by Lewis XIV., *viz.* fifteen for Pignerol and Italy, fifteen for Alſatia, twenty for Flanders, and ten for Rouſſillon.

QUATRICHROMA, in the *Italian Muſic*, is what we call a *demi-ſemi-quaver*, thirty-two of which make a bar in common time. See Time, and Triple.

QUATRO CASE, in *Geography*, a town of Italy, in the department of the Mincio; 17 miles S.E. of Mantua.

QUATROL, a ſmall iſland in the gulf of Siam, near the coaſt of Camboja. N. lat. 10° 13′. E. long. 103° 25′.

QUATROS, Coronados, *Los*, an iſland in the Pacific ocean, diſcovered by Quiros in 1606. S. lat. 18° 40.

QUATTRINO, in *Commerce*, a copper coin at Florence; alſo a money of account, 60 quattrini being equal to 12 crazie, 1½ paoli, or 2 lira. At Rome, the ſcudo is divided into 3½ teſtoni, 500 quattrini, or 1000 mezzi quattrini; ſo that 5 quattrini make 1 paolo, and 3 paoli 1 teſtone. See Scudo.

QUATUOR, Lat., a name given to any muſical compoſition, vocal or inſtrumental, in four parts, and in dialogue, or *a parte equale*, when each have ſolo parts alternately. The Italians ſometimes call a quatuor *quartello*, but more frequently *quartto*, and the Engliſh *quartet*.

A vocal quartet, ſays Rouſſeau, is more difficult for the poet to write, as well as for the compoſer to ſet, than a trio or chorus,

In the vocal quartet of a muſical drama, four diſtinct characters ſhould be ſupported both in the words and muſic, according to the ſituation and ſtate of mind of the ſeveral perſonages who have petitions or complaints to make, or anſwers to give.

The inſtrumental quartets of Haydn have been the delight of all that have performed, or heard them performed, for full 30 years, and bid fair to continue to afford delight for at leaſt 30 years more.

Quatuor *Principalia Artis Muſicæ*, the title of a MS. in the Bodleian library at Oxford (Digby 90.), which has been aſcribed to ſeveral authors. Anthony Wood gives it to Tewkeſbury, to whom it is likewiſe aſcribed in the Oxford Catalogue of MSS., with very little foundation. Biſhop Tanner has honoured Dr. John Hambois with this production, a writer on muſic, who flouriſhed more than a century after this MS. was finiſhed, as appears from the teſtimony of the ſcribe himſelf.

There is, however, at Oxford, among the MSS. another volume of Muſical Tracts (Bodl. 515.), which had not been ſufficiently examined by any of the catalographers who have mentioned it: for, on a careful peruſal and collation, we found in it, beſides two other tracts by Simon Tunſtede, or Tuſtede, a duplicate of the Quatuor Principalia; and as no doubt has been thrown upon Tunſtede having been the author of the two firſt tracts in the volume, it ſeems as if we might venture, without doubt or heſitation, to aſſign to him this ample, and, for the time when it was written, excellent treatiſe. That Simon Tunſtede was a man of ſcience, and an able muſician, as well as a doctor of divinity, appears at the end of MS. Digby 90. After ſaying that the book was finiſhed in 1351, we have the following paſſage: "Ille autem anno regens erat inter minores Oxoniæ fratres, Simon de Tunſtede, doctor ſacræ theologiæ, qui in muſica pollebat, et eciam in ſeptem liberalibus artibus." Pits, Bale, Tanner, and all our biographical writers, ſpeak of him as a learned muſician; and Pits enumerates the Quatuor Principalia among his writings. (De illuſt. Angl. Script.) Simon Tunſtede, a Franciſcan friar, born at Norwich, was in ſuch favour for his learning and piety, as to

be unanimouſly choſen provincial maſter of all England. He died at Bruzard, in Suffolk, in 1369.

The title of the tracts in the Oxford Catalogue of MSS. has occaſioned the great diverſity of opinions about the writer of the Quatuor Principalia; for N° 515 is entitled "De Muſica continua et diſcreta, cum Diagrammatibus, per Simonem Tunſtede, A.D. 1351." However, in the beginning of the volume, the author propoſes to treat "De quatuor Principalibus in quibus tocius Muſica radices conſiſtunt," &c. which exactly agrees with the other MS.; and there is no difference from the beginning to the end, except in the omiſſion of a kind of prologue, or argument to the work, which appears in the tract aſcribed to Tewkeſbury (Digby 90.), beginning "Quemadmodum inter Triticum," and is omitted in that to which the name of Tunſtede is prefixed. Bodl. 515.

What the author calls the "Four Principals of Muſic," will beſt appear from his own manner of dividing the work. In the firſt part or principal, conſiſting of nineteen chapters, he treats of muſic in general, its conſtituent parts and diviſions. II. Of its invention, intervals, and proportions, twenty-four chapters. III. Of plain chant, and the eccleſiaſtical modes, fifty-eight chapters. IV. Of meaſured muſic, or time; of diſcant, and their ſeveral diviſions. This laſt principal is divided into two ſections, of which the firſt contains forty-one chapters, and the ſecond forty-nine. The whole treatiſe fills a hundred and twenty-four folio pages; the diagrams, which are very numerous, are beautifully written, and illuminated with different coloured inks; and it ſeems to be in all reſpects the moſt ample and complete work of the kind which the fourteenth century can boaſt.

QUATUOR *Hominis Prepoſiti.* See PREPOSITI.

QUATUOR-VIR, in *Antiquity*, frequently written IIII. VIR, a Roman magiſtrate, who had three colleagues joined with him in the ſame adminiſtration.

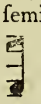
To the quatuor-vir was committed the charge of conducting and ſettling the colonies ſent into the provinces.

Upon unlucky accidents, and other dangerous affairs, it was uſual to create quatuor-viri, with commiſſion to take care *ne quid detrimenti reſpublica caperet, that the republic were not prejudiced.*

There were alſo quatuor-viri appointed to inſpect and take care of repairs, &c.

QUAUCHOCHOPITLI, in *Ornithology*. See PICUS *Tricolor*.

QUAVER, in *Muſic*, a meaſure of time, equal to one-half of the crotchet, or one-eighth of the ſemi-breve.

The quaver is marked by the character 

The Engliſh quaver makes what the French call *crochue*, crotchet, becauſe of the hook at bottom. See CROTCHET.

The quaver is divided into two ſemiquavers, noted  and four demiſemiquavers, marked  . See CHARACTERS.

QUAVERING, the act of trilling, or ſhaking; or the running a diviſion with the voice.

QUAUHAYOHUATLI, in *Botany*, a name by which ſome authors have called the tree, whoſe fruit is the caſſia fiſtula of the ſhops. Hern. p. 87.

QUAUHCILUI, in *Ornithology*. See MEROPS *Cinereus*.

QUAUHIOYAMATL, in *Zoology*. See SUS *Tajaſſu*.

QUAUHTECALLOTLQUAPACHTLI. See SCIURUS *Variegatus*.

QUAUHTECHALOTT-THLITTIC. See SCIURUS *Niger*.

QUAUHTLA-COYMATL. See SUS *Tajaſſu*.

QUAUHTZONECOLIN, in *Ornithology*, the American name for a bird called by moſt a quail, but eſteemed by Nieremberg a ſpecies of partridge.

It is of the ſize of the European partridge, and of a browniſh colour, and ornamented with a creſt upon its head.

There are alſo in America two other ſpecies of partridge much allied to this: the one with a yellow body, and black and white head; the other ſmall and brown, and without a creſt. See TETRAO *Criſtatus*.

QUAUHYAC OCUILENSIUM, in *Botany*, the name of a very large Indian tree, bearing leaves reſembling thoſe of the citron. The bark is aſtringent, heating, drying, and of a ſtrong ſmell: it reſtrains a diarrhœa, and excites a ſweat. The juice, ſnuffed up the noſe, cauſes ſneezing, purges the head, and thus removes fevers, and pains in the head: for which reaſons, it is preſerved in families as a popular remedy. Nieremberg.

QUAVITL, a name given by ſome authors to the cocoa-tree. Hern. p. 79.

QUAUTOTOPOTLI, in *Ornithology*. See PICUS *Canadenſis*.

QUAY, KAY, a ſpace of ground paved on the ſhore of a river, or port, deſtined for the loading and unloading of merchandize. See KAY and WHARF.

QUEAGA, in *Geography*, a town of Pegu, on the Ava; 18 miles S. of Lundſey.

QUEBEC, a city of America, the capital of the lower province of Canada, as Niagara is of the upper, was founded by the French in the year 1608, and is ſituated on a very lofty point of land, on the N.W. ſide of the river St. Lawrence, at its confluence with the river St. Charles, about 320 miles from the ſea. Nearly facing it, on the oppoſite ſhore, there is another point; and between the two the river is contracted to the breadth of three-quarters of a mile; but after paſſing through this ſtrait, it expands to the breadth of five or ſix miles, taking a great ſweep behind that point on which Quebec ſtands. The city derives its name from the word Quebec, or Quebeio, which, in the Algonquin tongue, ſignifies a ſudden contraction of a river. The wide part of the river, immediately before the town, is called "the Baſon," and it is ſufficiently deep and ſpacious to float upwards of 100 ſail of the line. Quebec is divided into two parts, called the upper and the lower towns. The upper town is ſituated on a rock of limeſtone, on the top of the point; and the lower town, built round the bottom of the point, cloſe to the water, on land which has been gradually gained from the river. The rock on which the upper town ſtands riſes, in ſome places towards the water, nearly perpendicularly, ſo as to be totally inacceſſible; in other places it is not ſo ſteep as to prevent a communication between the two towns, by means of ſtreets winding up the ſide of it; though here the aſcent is ſo great, that there are long flights at one ſide of the ſtreets, for the accommodation of foot-paſſengers. The lower town lies very much expoſed to an enemy, being defended merely by a ſmall battery towards the baſon, which, at the time of high tides, is nearly on a level with the water; and by barriers towards the river, in which guns may be planted, when there is any danger of an attack.

The upper town is a place of immenſe ſtrength. Towards the water it is ſo ſtrongly guarded by nature, that

ſlight

ſlight walls are a ſufficient defence; and in ſome places, where the rock is inacceſſible, no walls are neceſſary. Here, however, are ſeveral redoubts and batteries. The principal battery, which points towards the baſon, conſiſts of twenty-two 24-pounders, two French 36-pounders, and two large iron mortars: this battery is flanked by another of ſix guns, that commands the paſſes from the lower town. On the land ſide the fortifications are ſtupendous. When general Wolfe attacked this place, he thought it a vain attempt to make an aſſault on the ſide of the town which lies towards the water, where the rock is ſo ſteep, and ſo eaſily defended. In order to carry on the attack on the land ſide, he firſt attempted to land his troops ſome miles below the town, near the Falls of Montmorenci; but here he was repulſed by a large diviſion of the French forces with loſs. Foiled in his firſt attempt to get on ſhore, the brave Wolfe formed the bold deſign of aſcending to the top of the banks above Quebec, commonly called the Heights of Abraham. After previous preparation, the ſoldiers clambered up the heights with great difficulty, and the guns were hauled up by means of ropes and pullies fixed round the trees, with which the banks are covered from top to bottom. At the top the plain commences, and extends cloſe under the walls of the city. Here the memorable battle was fought, in which the much lamented general fell, at the moment when all his noble exertions were about to be crowned with the ſucceſs which they ſo eminently merited. The ſpot where the illuſtrious hero breathed his laſt is marked with a large ſtone, on which a true meridional line is drawn. Although the great Wolfe found it ſo difficult a taſk to gain poſſeſſion of Quebec, and it has been rendered much ſtronger ſince his time, the people of the United States imagine, that, in caſe of a rupture with Great Britain, it might be eaſily taken; and yet at the cloſe of the year 1775, and the commencement of 1776, an attempt was made by American troops, under the command of Arnold and Montgomery, without ſucceſs. On this occaſion Montgomery fell, and Arnold's attempt, on the practicability and ſucceſs of which he had previouſly boaſted, proved fruitleſs. St. John's gate, which he endeavoured to force, and the adjoining walls, are ſtupendous; and the mere ſight of them may convince any perſon, that an attempt to ſtorm them muſt be altogether ineffectual, without the aid of heavy artillery, with which the Americans were not provided.

Independently of its fortifications, and ſituation on the ſummit of a rock, Quebec owes much of its ſtrength and ſecurity to the long duration and extreme ſeverity of the winter; as in that ſeaſon it is wholly impracticable for a beſieging army either to carry on any works, or to blockade the town. Mr. Weld ſays, that 5000 ſoldiers are neceſſary to man the works at Quebec completely. A large garriſon is always kept in it, and abundance of ſtores of every deſcription. The troops are lodged partly in barracks, partly in block-houſes near Cape Diamond, which is the moſt elevated part of the point, and is reckoned to be upwards of 1000 feet above the level of the river. The Cape is ſtrongly fortified, and may be conſidered as the citadel of Quebec: it commands the town in every direction, and alſo the plains on the outſide of the walls. The evening and morning guns, and all ſalutes and ſignals, are fired from hence. Notwithſtanding the great height of the rock above the river, water may be readily obtained even at the very top of it, by ſinking wells of a moderate depth; and in ſome particular places, at the ſides of the rock, it guſhes out in large ſtreams; and the water is of a very good quality. It is ſuppoſed, ſays Mr. Weld, that including the upper and lower towns and ſuburbs, there are at leaſt 2000 dwellings; and the number of inhabitants, allowing ſix to a houſe, may be eſtimated at 12,000. Mr. Heriot ſays, that, in 1806, the number of inhabitants amounted to 15,000; and if this ſtatement be correct, the increaſe muſt have been very rapid, for, in the year 1784, Quebec contained only 6472 inhabitants. About two-thirds of the inhabitants are of French extraction. The ſociety is agreeable, and very extenſive for a place of its ſize, which is owing to its being the capital of the lower province, and therefore the reſidence of the governor, different civil officers, principal lawyers, &c. The large garriſon always maintained in it contributes to make it gay and lively.

The lower town is moſtly inhabited by the traders who are concerned with the ſhipping, and it is a very diſagreeable place. The ſtreets are narrow and dirty, and, on account of the height of the houſes in moſt of them, the air is much confined; and in the ſtreets next the water, there is an intolerable ſtench from the ſhore when the tide is out. The upper town, on the contrary, is extremely agreeable; from its elevated ſituation, the air is very pure, and the inhabitants are never oppreſſed with heat in ſummer; it is, however, far from being well laid out, the ſtreets being narrow and very irregular. The houſes are generally built of ſtone, and, except ſome few, built of late years, ſmall and inconvenient. The chateau, in which the governor reſides, is a plain building of common ſtone, ſituated in an open place, the houſes round which form three ſides of an oblong ſquare. It conſiſts of two parts. The old and the new are ſeparated from each other by a ſpacious court. The former ſtands juſt on the verge of an inacceſſible part of the rock; behind it, on the outſide, there is a long gallery, from whence, if a pebble were let drop, it would fall at leaſt ſixty feet perpendicularly. This old part is chiefly taken up with the public offices, and all the apartments in it are ſmall and ill contrived; but in the new part, which ſtands in front of the other, facing the ſquare, they are ſpacious, and tolerably well finiſhed, but none of them can be called elegant. This part is inhabited by the governor's family. The chateau is built without any regularity of deſign, neither the old nor the new part having even an uniform front. It is not a place of ſtrength, as commonly repreſented. In the garden adjoining to it is merely a parapet wall along the edge of the rock, with embraſures, in which a few ſmall guns are planted, commanding a part of the lower town. Every evening during ſummer, when the weather is fine, one of the regiments of the garriſon parades in the open place before the chateau, and the band plays for an hour or two, at which time the place becomes the reſort of numbers of the moſt genteel people of the town, and has a very gay appearance.

Oppoſite to the chateau there is a monaſtery belonging to the Recollets, or Franciſcan friars; a very few only of the order are now left. Contiguous to this building is the college belonging to the Jeſuits, whoſe numbers have diminiſhed even ſtill faſter than that of the Recollets.

The nunneries are three in number, and as there is no reſtriction upon the female religious orders, they are all well filled. The largeſt of them, called L'Hoſpital General, ſtands in the ſuburbs, outſide of the walls; another, of the order of St. Urſule, is not far diſtant from the chateau.

The engineer's drawing-room, in which is kept a variety of models, together with plans of the fortifications of Quebec and other fortreſſes in Canada, is an old building, near the principal battery. Adjoining to it ſtands the

houſe where the legiſlative council and aſſembly of repreſentatives meet, which is alſo an old building, that has been plainly fitted up to accommodate the legiſlature.

The armoury is ſituated near the artillery barrack, in another part of the town. About ten thouſand ſtand of arms are kept in it, arranged in a ſimilar manner with the arms in the Tower of London, but, if poſſible, with greater neatneſs and more fancy.

The artillery barracks are capable of containing about five hundred men, but the principal barracks are calculated to contain a much larger number; they ſtand in the market-place, not far diſtant from the ſquare in which the chateau is ſituated, but more in the heart of the town.

The market of Quebec is extremely well ſupplied with proviſions of every kind, which may be purchaſed at a much more moderate price than in any town viſited by Mr. Weld in the United States. It is a matter of curioſity to a ſtranger to ſee the number of dogs yoked in little carts, that are brought into this market by the people who attend it. The Canadian dogs are found extremely uſeful in drawing burthens, and there is ſcarcely a family in Quebec or Montreal, that does not keep one or more of them for that purpoſe. They are ſomewhat ſimilar to the Newfoundland breed, but broader acroſs the loins, and have ſhorter and thicker legs; in general they are handſome, and wonderfully docile and ſagacious; their ſtrength is prodigious. A ſingle dog will draw a man for a conſiderable diſtance, that could not weigh leſs than ten ſtone. People, during the winter ſeaſon, frequently perform long journeys on the ſnow with half a dozen or more of theſe animals yoked in a cariole or ſledge.

An attempt was made in 1711 by the Engliſh and Americans, under the command of brigadier Hill, to ſurpriſe Quebec; but it proved abortive. In 1759 it was taken by the Engliſh, under the command of the valiant Wolfe, who ſacrificed his life in the engagement; and by the peace, in 1763, it was ceded, with the reſt of Canada, to the conquerors, in whoſe poſſeſſion it has ſince continued.

The ſcenery that is exhibited to the view from various parts of the upper town of Quebec, ſurpaſſes for grandeur, beauty, and diverſity, any other, as Mr. Weld ſays, that he has ſeen, either in America, or in any other part of the globe. In the variegated expanſe that is laid open before you, ſtupendous rocks, immenſe rivers, trackleſs foreſts, and cultivated plains, mountains, lakes, towns, and villages, in turn ſtrike the attention, and the ſenſes are almoſt bewildered in contemplating the vaſtneſs of the ſcene. Nature is here ſeen on the grandeſt ſcale; and it is ſcarcely poſſible for the imagination to paint to itſelf any thing more ſublime than are the ſeveral proſpects preſented to the ſight of the delighted ſpectator. From cape Diamond, ſituated one thouſand feet above the level of the river, and the loftieſt part of the rock on which the city is built, the proſpect is conſidered by many as ſuperior to that of any other ſpot. A greater extent of country opens upon you, and the eye is here enabled to take in more at once, than at any other place; but it appeared to Mr. Weld, that the view from the cape is by no means ſo fine as that, for inſtance, from the battery; for in ſurveying the different objects below you from ſuch a ſtupendous height, their magnitude is in a great meaſure loſt, and it ſeems as if you were looking at a draft of the country, more than at the country itſelf. It is the upper battery that Mr. Weld alludes to, facing the baſon, and is about three hundred feet above the level of the water. Here, if you ſtand but a few yards from the edge of the precipice, you may look down at once upon the river, the veſſels upon which, as they ſail up to the wharfs before the lower town, appear as if they were coming under your very feet. The river itſelf, which is between five and ſix miles wide, and viſible as far as the diſtant end of the iſland of Orleans, where it loſes itſelf amidſt the mountains that bound it on each ſide, is one of the moſt beautiful objects in nature, and on a fine ſtill ſummer's evening it often wears the appearance of a vaſt mirror, where the varied rich tints of the ſky, as well as the images of the different objects of the banks, are ſeen reflected with inconceivable luſtre. The ſouthern bank of the river, indented fancifully with bays and promontories, remains nearly in a ſtate of nature, cloathed with lofty trees; but the oppoſite ſhore is thickly covered with houſes, extending as along other parts of the river already mentioned, in one uninterrupted village, ſeemingly, as far as the eye can reach. On this ſide the proſpect is terminated by an extenſive range of mountains, the flat lands ſituated between and the villages on the banks not being viſible to a ſpectator at Quebec, it ſeems as if the mountains roſe directly out of the water, and the houſes were built on their ſteep and rugged ſides.

Beautiful as the environs of the city appear when ſeen at a diſtance, they do not appear leſs ſo on a more cloſe inſpection; and in paſſing through them the eye is entertained with a moſt pleaſing variety of fine landſcapes, whilſt the mind is equally gratified with the appearance of content and happineſs that reigns in the countenances of the inhabitants. Indeed, if a country as fruitful as it is picturesque, a genial and healthy climate, and a tolerable ſhare of civil and religious liberty, can make people happy, none ought to appear more ſo than the Canadians. There are, however, in the vicinity of Canada two ſcenes, more particularly deſerving of attention than any others: theſe are the falls or cataracts of the rivers *Chaudiere* and *Montmorency;* which ſee reſpectively. N. lat. 46° 48′ 38″. W. long. 71° 5′ 29″. Weld's Travels, vol. i.

QUEBITEA, in *Botany*, a name which ſeems to have been whimſically extracted by Aublet, from the Caribbean appellation of this plant, *Daquejoabite*. Aubl. Guian. v. 2. 838. t. 327. This has many creeping *roots*, and a twiſted, decumbent, hairy *ſtem*, with alternate, elliptical, broad, entire, hairy *leaves*, three or four inches long, on hairy *footſtalks*. *Flowers* minute, in ſhort, denſe, axillary, ſtalked *ſpikes*, with a ſmall ſcale at the baſe of the ſtalks. Aublet did not inveſtigate the ſtructure of theſe flowers, but he ſuſpects the plant to be nearly akin to *Dracontium*, under which genus it is accordingly noticed by Juſſieu. The roots, when chewed, are very acrid. The bruiſed herb is uſed externally, to cure the bite of ſerpents. It grows on the banks of rivulets in Guiana.

QUEBRANTAHUESSOS, in *Ornithology*. See Procellaria *Gigantea*.

QUEÇALA, in *Geography*, a town of Mexico, in the province of Mechoacan; 105 miles S.S.E. of St. Luis de Potoſi.

QUECHUA, in *Literary Hiſtory*. See Peru.

QUEDA, a ſea-port city on the W. coaſt of the peninſula of Malacca, the capital of a kingdom, tributary to Siam, with a good harbour at the mouth of a river that will admit a veſſel drawing 12 or 14 feet water on the ſprings over the bar, which is gravel and mud. The town contains about 400 houſes, inhabited by Chineſe and Malays. The environs are agreeable and fertile; the woods abound in elephants and other animals, and in ſome places are mines of lead, which ſupply large quantities of thoſe metals for exportation to Hindooſtan, Arabia, and Perſia. The go-

vernment is monarchical, under a Malay Mahomedan prince, who, like many other Malay princes, engroſſes almoſt the whole foreign trade of the port, excepting that of an annual Chineſe junk, which pays a certain ſum only as duty, and then has leave to trade freely with the inhabitants. This junk imports immenſe quantities of coarſe China-ware, thin iron pans, and many other articles from that country, and exports biche de mer, called ſwallow, ſharks' fins, edible bird's neſts, rattans, tin, rice, dammer, tortoiſe-ſhell, deer's ſkins and ſinews, bullocks and buffalos' hides and horns, jerked beef, and many other coarſe articles. At Queda there is great plenty of rice, bullocks, buffalos, and poultry; but not ſuch abundance of fruit and vegetables as at Acheen. The territory of Queda is a flat country, favourable for the cultivation of rice; a hill north of the town and inland, called the Elephant, favours the navigator's approach; alſo the ſmall iſlands called Peers, 20 miles weſt of the bar, covered with trees, and good regular mud ſoundings, a great way off, even by night, indicate the diſtance to the mariner; 300 miles E.N.E of Acheen. N. lat. 6° 20′. E. long. 100° 18′.

QUEDENAU, a town of Pruſſia, in Samland; three miles N. of Königſberg.

QUEDLINBURG, a town of Weſtphalia, in the principality of Halberſtadt, on the Boda, which divides it into the Old and New Towns. It has ſeveral churches, a hoſpital, and a college. Near this town is a princely abbey, ſituated on a hill: it was founded by king Henry I. between the years 932 and 936, and ſince enriched by various endowments. In 1539 it embraced Lutheraniſm, and obliged itſelf, by ſolemn oaths, to maintain that form of religion. It lately conſiſted of four dignitaries, *viz.* of the lady abbeſs and three others, diſtinguiſhed by the titles of provoſt, dean, and canon. In 1802, the abbey and its revenues were voted to the king of Pruſſia, as an indemnity; and by the treaty of Tilſit, transferred to the kingdom of Weſtphalia. The town of Quedlinburg is ſeven miles S.S.E. of Halberſtadt. N. lat. 51° 48′. E. long. 11° 20′.

QUEDLITZ, a town of Pruſſia, in the province of Ermeland; four miles S. of Wartenburg.

QUEECE, in *Agriculture*, a term ſometimes provincially applied to the wood-pigeon, or birds of that kind.

QUEECHY, in *Geography*, a river of Vermont, which runs into the Connecticut at Hartland.

QUEEN, Regina, a woman who holds the crown of a realm ſingly, and by right of blood.

The word queen is derived from the Saxon *cwen*, *uxor*, *the wife of any one*, but applied, by way of excellency, to the wife of the king only; whence ſhe was anciently called the *king's queen;* the Weſt Saxons having no other name for a queen but the *king's wife*. (Aſſer de Ælfred, rebus, &c.) She was alſo called *lady*, in Saxon *wlæfdig;* juſt as *madame*, *mademoiſelle*, were uſed in France, for the wife and daughter of the duke of Orleans.

The name queen is alſo given, by way of courteſy, to her that is married to the king; called, by way of diſtinction, *queen conſort*. In reſpect of whom the former is called *queen regnant*, or regent.

The widow of a king is alſo called queen, but with the addition of *dowager*.

In the firſt ſenſe, queen is, in all conſtruction, the ſame with king; and has the ſame powers, prerogatives, rights, dignities, and duties that the king has. This is expreſsly declared by ſtatute 1 Mar. I. ſt. 3. c. 1.

The *queen conſort* is inferior, and a perſon diſtinct from, and a ſubject of, the king. In England, though ſhe be a feme-covert, yet may ſhe ſue, and be ſued, in her own name; and may make leaſes, and grants, &c. as a feme-ſole.

She has ſeveral other prerogatives. Though an alien, ſhe may purchaſe lands in fee-ſimple, without either naturalization, or denization; ſhe may preſent to a benefice; nor is plenarty a bar againſt her more than againſt the king. She is alſo capable of taking a grant from the king, which no other wife can do from her huſband; and ſhe may have a ſeparate property in goods as well as lands, and has a right to diſpoſe of them by will. She pays no toll, and ſhall not be amerced, if ſhe be nonſuited in any action; and may not be impleaded till firſt petitioned.

To conſpire her death, or violate her chaſtity, is high treaſon. She has an ancient peculiar revenue, called *queen-gold;* beſides a very large dower, with a royal court, and officers, diſtinct from the king's; and her attorney and ſolicitor-general are entitled to a place within the bar of his majeſty's courts, together with the king's counſel.

Another ancient perquiſite belonging to the queen conſort, mentioned by all our old writers, and, on this account only, worthy of notice, is this, that on the taking of a whale on the coaſts, which is a royal fiſh, it ſhall be divided between the king and queen; the head only being the king's property, and the tail of it the queen's. One reaſon of this whimſical diviſion, as aſſigned by our ancient records, was to furniſh the queen's wardrobe with whalebone.

The *queen dowager*, as the widow of the king, enjoys moſt of the privileges belonging to her as queen conſort. But it is not high treaſon to conſpire her death; or to violate her chaſtity, becauſe the ſucceſſion to the crown is not thereby endangered. Yet ſtill, *pro dignitate regali*, no man can marry a queen dowager without ſpecial licence from the king, on pain of forfeiting his lands and goods. She has alſo this particular, that ſhe loſes not her dignity, though ſhe marry a private gentleman; as peereſſes dowager do their peerage, when they marry commoners. Thus queen Catherine, widow of Henry V. being married to Owen ap Tudor, eſq. maintained an action as queen of England. Much leſs does a queen regnant follow her huſband's condition, or is ſubject to other queens; but ſhe is ſovereign to her own huſband, as queen Mary was to king Philip, and queen Anne to prince George of Denmark; unleſs it be otherwiſe appointed by parliament. The huſband may be guilty of high treaſon againſt her; but in the inſtance of conjugal infidelity, he is not ſubject to the ſame penal reſtrictions. For which the reaſon ſeems to be, that if a queen conſort is unfaithful to the royal bed, this may debaſe or baſtardize the heirs to the crown; but no ſuch danger can be conſequent in the infidelity of a huſband to a queen regnant.

Queen Caroline, in *Biography*, when princeſs of Wales, is told in the dedication of the opera of Julius Cæſar to her royal highneſs, that the firſt muſical ſounds which her highneſs heard, were thoſe produced by the voice of the celebrated Piſtocio, the father of good taſte, then in the ſervice of his illuſtrious ſire, at the court of Anſpach.

Muſic doubtleſs was a ſerious part of her majeſty's education, as it is, and has ever been, of all the princes and princeſſes of Germany; who have likewiſe frequent opportunities of hearing great performers and ſplendid performances; yet we do not recollect having heard that her majeſty was a performer herſelf, or even an admirer or patroneſs of the art. This princeſs died in November 1737.

Queen Mary. (See Mary.) During the ſhort reign of this bigoted and intolerant princeſs, eccleſiaſtical muſic was again

again transferred to Latin words and the maſs, both of which had been excommunicated during the reign of her brother, Edward VI. But metrical pſalmody had not yet been generally received in our parochial churches. Mary was herſelf a performer on the virginal and lute, as appears by a letter ſent to her by her mother, queen Katherine, after her ſeparation from the king, in which "ſhe encourages her to ſuffer chearfully, to truſt to God, and keep her heart clean. She charged her in all things to obey the king's commands, except in matters of religion. She ſent her two Latin books, the one 'De Vita Chriſti,' and the other the 'Epiſtles of St. Jerom;' in them, (ſays the queen,) I truſt you ſhall ſee good things. And ſometimes, for your recreation, uſe your virginals or lute, if you have any."

Fuller tells us, that "eight weeks and upwards paſſed between the proclaiming of queen Mary and her aſſembling the parliament; during which time two religions were together ſet on foot, *Proteſtantiſme* and *Poperie;* the former hoping to be continued, the latter labouring to be reſtored; —and during this interim the churches and chapels in England had a mongrel celebration of their divine ſervices betwixt reformation and ſuperſtition. For the obſequies for king Edward were held by the queen in the Tower, Auguſt 7th, 1553, with the dirige ſung in Latin, and on the morrow a maſſe of requiem, and on the ſame day his corps were buried at Weſtminſter with a ſermon ſervice, and communion in Engliſh."

In October following the laws of her predeceſſor, Edward, concerning religion, were all repealed. And in November 1554, biſhop Bonner "ſet up the old worſhip at Paul's, on St. Katherine's day; and it being the cuſtom, that on ſome holydays, the quire went up to the ſteeple to ſing the anthems, that fell on that night:—and the next day, being St. Andrew's, he did officiate himſelf, and had a ſolemn proceſſion."

After this period, during the ſubſequent years of Mary's reign, the public ſervice was every where performed in the Roman Catholic manner, throughout the kingdom; and we may imagine that the numerous compoſitions to Latin words, which have been preſerved of Dr. Tye, White, Tallis, Bird, and the reſt of our moſt eminent harmoniſts, were produced and performed at this time, while the Romiſh religion had the aſcendant. And indeed it appears by a record, now in the poſſeſſion of the Antiquarian Society, that the liſt of Mary's chapel eſtabliſhment contains nearly the ſame names as that of her brother Edward.

Queen Elizabeth. (See Elizabeth.) In ſpeaking of muſic during the long and proſperous reign of queen Elizabeth, our nation's honour ſeems to require a more diffuſe detail than at any other time: for perhaps we never had ſo juſt a claim to equality with the reſt of Europe, where muſic was the moſt ſucceſsfully cultivated, as at this period; when indeed there was but little melody any where. Yet, with reſpect to harmony, canon, fugue, and ſuch laboured and learned contrivances as were then chiefly ſtudied and admired, we can produce ſuch proofs of great abilities in the compoſitions of our countrymen, as candid judges of their merit muſt allow to abound in every kind of excellence that was then known or expected.

Elizabeth, as well as the reſt of Henry VIII.'s children, and indeed all the princes of Europe at that time, had been taught muſic early in life. For Camden, in giving an account of her ſtudies, ſays, that "ſhe underſtood well the Latin, French, and Italian tongues, and (was) indifferently well ſeen in the Greek. Neither did ſhe neglect muſicke, ſo far forthe as might become a princeſſe, being able to ſing and play on the lute prettily and ſweetly."

There is reaſon to conclude, that ſhe continued to amuſe herſelf with muſic many years after ſhe aſcended the throne. Sir James Melvil gives an account of a curious converſation which he had with this princeſs, to whom he was ſent on an embaſſy by Mary, queen of Scots, in 1564. After her majeſty had aſked him how his queen dreſſed? What was the colour of her hair? Whether that or her's was beſt? Which of them two was faireſt? And which of them was higheſt in ſtature? "Then ſhe aſked, what kind of exerciſes ſhe uſed?" I anſwered, ſays Melvil, "that when I received my diſpatch, the queen was lately come from the Highland hunting: that when her more ſerious affairs permitted, ſhe was taken up with reading of hiſtories: that ſometimes ſhe recreated herſelf in playing upon the lute and virginals. She aſked if ſhe played well? I ſaid, reaſonably for a queen."

"The ſame day, after dinner, my lord of Hunſden drew me up to a quiet gallery, that I might hear ſome muſic, (but he ſaid, that he durſt not avow it,) where I might hear the queen play upon her virginals. After I had hearkened a while, I took by the tapeſtry that hung before the door of the chamber, and ſeeing her back was toward the door, I entered within the chamber, and ſtood a pretty ſpace hearing her play excellently well. But ſhe left off immediately, ſo ſoon as ſhe turned about and ſaw me. She appeared to be ſurpriſed to ſee me, and came forward, ſeeming to ſtrike me with her hand; alleging, ſhe uſed not to play before men, but when ſhe was ſolitary, to ſhun melancholy. She aſked how I came there? I anſwered, as I was walking with my lord Hunſden, as we paſſed by the chamber door, I heard ſuch a melody as raviſhed me, whereby I was drawn in ere I knew how; excuſing my fault of homelineſs, as being brought up in the court of France, where ſuch freedom was allowed; declaring myſelf willing to endure what kind of puniſhment her majeſty ſhould be pleaſed to inflict upon me for ſo great offence. Then ſhe ſate down low upon a cuſhion, and I upon my knees by her; but with her own hand ſhe gave me a cuſhion, to lay under my knee; which at firſt I refuſed, but ſhe compelled me to take it. She enquired whether my queen or ſhe played beſt. In that I found myſelf obliged to give her the praiſe."

If her majeſty was ever able to execute any of the pieces that are preſerved in a MS. which goes under the name of "Queen Elizabeth's Virginal Book," ſhe muſt have been a very great player: as ſome of theſe pieces, which were compoſed by Tallis, Bird, Giles, Farnaby, Dr. Bull, and others, are ſo difficult, that it would be hardly poſſible to find a maſter in Europe, who would undertake to play one of them at the end of a month's practice.

Beſides the lute and virginals, Elizabeth was a performer on the violin, and on an inſtrument ſomething like a lute, but ſtrung with wire, and called the *poliphant*. A violin of a ſingular conſtruction, with the arms of England, and the creſt of Dudley, earl of Leiceſter, this queen's favourite, engraved upon it, was purchaſed at the ſale of the late duke of Dorſet's effects. The date of its make, 1578. It is very curiouſly carved; but the ſeveral parts are ſo thick and loaded with ornaments, that it has not more tone than a mute, or violin with a ſordine; and the neck, which is too thick for the graſp of the hand, has a hole cut in it for the thumb of the player, by which the hand is ſo confined, as to be rendered incapable of ſhifting, ſo that nothing can be performed upon this inſtrument, but what lies within the reach of the hand in its firſt poſition. Playford

tells us, that "Queen Elizabeth was not only a lover of this divine ſcience (muſic), but a good proficient therein; and I have been informed, (ſays he,) by an ancient muſician, and her ſervant, that ſhe did often recreate herſelf on an excellent inſtrument, called the *poliphant*, not much unlike a lute, but ſtrung with wire."

Among the Sloane MSS. in the Britiſh Muſeum, No 1520, there is a liſt of the officers of the court of revenue in this reign; in which is included the muſical eſtabliſhment of her majeſty's houſehold, about the year 1587.

Muſytyons.

		£	s.	d.
The ſervant - -	Fee	24	6	8
Trompeters ſixteen.	Fee to every of them	24	6	8

Lutes, harps, and fingers.

Chief luter - -	Fee	40	0	0
Chief harper -	-	20	0	0
Reſt of the luters -	-	19	0	0
The other of the harps -	-	9	0	0
And - -	-	8	0	0
Bagpiper - -	Fee	12	13	4
Minſtrels nine, whereof ſeven at	-	18	5	0
every of them; one at -	-	24	6	0
and thother at -	-	66	0	8
Six children to ſing				
Rebeck two - -	Fee	28	6	6
Sackbutt ſix, whereof five having	-	24	6	8
by the year, and one at -	-	36	10	0
Vialls eight, whereof ſix at	-	30	8	4
one at - -	-	20	0	0
and thother at -	-	10	0	0
Players on the virginalls three, one at	-	50	0	0
and thother two at -	-	30	0	0
a piece.				
Muſitions ſtraungers ſeven, whereof ſix have		30	10	0
and one - -	-	38	0	0
Drumſleds three, every of them	-	18	5	0
Players on the flute two, at	-	18	5	0
a piece.				
Makers of inſtruments: Regall-makers -		20	0	0
Players of enterludes eight, every of them p. ann.		66	0	8
Organ-maker - -		20	0	0

Her majeſty's chapel eſtabliſhment was nearly the ſame, in number and ſalaries, as that of her brother and ſiſter, Edward and Mary. Indeed, it ſeems as if the religious ſcruples of muſicians had been conſiderably diminiſhed by the ſeverity with which Teſtwood had been treated in the time of Henry VIII., and the peril into which Marbeck's zeal for reformation had involved him. For in comparing the chapel eſtabliſhments of Edward, Mary, and Elizabeth, we find, that however the creeds of theſe monarchs differed, their muſicians had conſtantly tuned their conſciences to the court pitch: *i. e.* in perfect uniſon with the orders of their ſovereign, the ſupreme head of the church.

Camden ſays, that "the Romiſh religion remained a full moneth and more after the death of queen Mary, in the ſame ſtate as before." For Elizabeth, who began her reign November 17th, 1558, had a ſolemn ſervice performed for her ſiſter Mary at Weſtminſter, December 5th, and another December 20th, for the emperor Charles V.; and theſe, as well as her own coronation, were celebrated in the Romiſh manner.

Burnet ſays, that "Elizabeth had been bred up from her infancy with a hatred of the Papacy, and a love to the Reformation; but yet as her firſt impreſſions in her father's reign were in favour of ſuch old rites as he had ſtill retained; ſo in her own nature ſhe loved ſtate, and ſome magnificence, in religion as well as in every thing elſe."

We have no other muſic printed expreſsly for the cathedral ſervice to Engliſh words during the reign of Edward VI. than that of Marbeck, which was mere canto fermo, without counterpoint; but the year after the publication of the Engliſh Liturgy by queen Elizabeth, the following choral work appeared: "Certaine notes ſet forth in foure and three partes, to be ſong at the Morning Communion, and Evening Prayer, very neceſſarie for the Churches of Chriſte to be frequented and uſed: and unto them be added divers Godly Prayers and Pſalmes, in the like forme, to the honour and praiſe of God. Imprinted at London, over Alderſgate, beneath St. Martins, by John Day, 1560." The authors of theſe compoſitions were Tallis, Cawſton, Johnſon, Oakland, Shepherd, and Taverner.

In 1565, our eccleſiaſtical compoſers, encouraged probably by the reception of the former publication, and favour of the queen, printed another collection of offices, with muſical notes, under the following title: "Morning and Evening Prayer and Communion, ſet forthe in foure partes, to be ſong in Churches, both for Men and Children, with divers other Godly Prayers and Anthems, of ſundry Mens dayngs."

The muſicians who contributed to this collection were Thomas Cawſton, Heath, Robert Haſleton Knight, Johnſon, Tallis, Oakland, and Shepherd.

Theſe two publications by John Day, fixed, for near a century, the ſtyle of our choral muſic; of which the movement was grave, the harmony grateful, and the contrivance frequently ingenious.

The great muſicians of queen Elizabeth's reign were Dr. Tye, John White, Thomas Tallis, William Bird, Dr. Bull, and Thomas Morley. And theſe, as eccleſiaſtical compoſers, were perhaps equal in learning and genius to the greateſt contemporary contrapuntiſts on the continent of Europe.

We muſt not terminate our account of the cultivation and progreſs of muſic by queen Elizabeth and her ſubjects, without making honourable mention of her majeſty's "Virginal Book," and referring for a ſummary account of its contents to Bird, William. In all our enquiries after muſical curioſities throughout Europe, we have met with no pieces ſo elaborate and difficult for the harpſichord, as thoſe by our ingenious countrymen.

This book, equally valuable for its antiquity and contents, was purchaſed by Bremner at Dr. Pepuſch's ſale, 1762, whoſe property it was to the time of his death. After which it paſſed into the hands of viſcount Fitzwilliams, in whoſe poſſeſſion, we believe, it ſtill continues.

It is a magnificent folio MS. curiouſly bound in red Morocco, with gilt leaves. There are nearly 70 pieces by Dr. Bull in this volume. The writing is ſmall, but uncommonly neat, upon ſix lines. The compoſitions are in general extremely elaborate and difficult; particularly thoſe by Bird, Dr. Bull, and Giles Farnabie, who have all contributed largely to the furniſhing of this volume, which contains near three hundred pieces. The firſt movement in the book is an old Engliſh tune, called "Walſingham," beginning in C natural, and ending in A major, which Dr. Bull has varied in a moſt full and complicated ſtyle, thirty different ways. Signora Margarita, the wife of Dr. Pepuſch, when ſhe quitted the Opera ſtage, applied cloſely to the practice of the harpſichord; upon which inſtrument ſhe became a great proficient. However, with all her own diligence and talents, aſſiſted by the ſcience and experience of

of her huſband, ſhe was never able to vanquiſh the difficulties of this piece, by Dr. Bull. And ſeveral of Dr. Pepuſch's friends and pupils, who went frequently to his apartments at the Charter-houſe, have aſſured us, that though this manuſcript was conſtantly open upon her harpſichord deſk, ſhe never advanced to the end of the variations; as ſeems likewiſe manifeſt from the colour, as well as wear and tear, of the leaves, which are much more clean and entire in every other part of the book, than at the firſt ſtrains of this compoſition.

Queen Mary II. joint ſovereign with William III., ſeems to have done little more for muſic, than patroniſe Mrs. Arabella Hunt, and the old Scots tune of "Cold and raw the wind doth blow." See Mary.

Queen Anne, in *Geography*, a poſt-town of America, in Prince George county, Maryland, ſituated on the W. ſide of Patuxent river, acroſs which is a wooden bridge. This ſmall town is laid out on a regular plan, at the foot of a hill. It contains a few ſtores, and warehouſes for the inſpection of tobacco; 25 miles E.N.E. of Waſhington.

Queen Anne's, a county of Maryland, bounded W. by Cheſapeak bay, and N. by Kent county; containing 16,648 inhabitants. Its chief town is Centerville. Belonging to this county is Kent iſland, 14 miles long from N. to S. and $6\frac{1}{2}$ broad from E. to W. It is low, but the land is fertile, and its eaſtern ſide is bordered with ſalt marſh.

Queen Catherine's *Foreland*, the northernmoſt point of Terra del Fuego, at the eaſt entrance into the ſtraits of Magellan, diſcovered by Frobiſher in 1576.

Queen Charlotte's *Foreland*, the S.E. extremity of New Caledonia. N. lat. 22° 15′. E. long. 167° 14′.—Alſo, the S.W. point of New Hanover, in the Eaſt Indian ſea, ſo called in 1767 by Capt. Carteret. The land about it is remarkable for a number of little hummocke, or hills. S. lat. 2° 29′. E. long. 148° 27′.

Queen Charlotte's *Iſland*, an iſland in the Pacific ocean, about ſix miles long, and one broad, diſcovered in the year 1767, by captain Wallis. It is deſcribed as ſandy and level, full of trees, without underwood, and abounding with ſcurvy-graſs. The canoes of this iſland appeared to be about 30 feet long, 4 feet broad, and $3\frac{1}{2}$ deep. The inhabitants were of a middle ſtature, and dark complexion, with long black hair, hanging looſe over their ſhoulders. The men were well made, and the women handſome. Their garments were a kind of coarſe matting, faſtened about their middle, and capable of being brought round their ſhoulders. The men who landed ſaw no appearance of any kind of metal, but obſerved ſeveral tools made of ſhells and ſtones, ſharpened and fitted into handles, like adzes, chiſſels, and awls. They ſaw ſeveral repoſitories of the dead, in which bodies were left to putrefy, under canopies, and not depoſited in the ground. The iſland was taken poſſeſſion of by captain Wallis and his crew, in the name of his Britannic majeſty. They alſo left ſome hatchets, nails, glaſs bottles, beads, ſhillings, ſixpences, and halfpence, as preſents to the natives. S. lat. 19° 18′. W. long. 138° 4′.

Queen Charlotte's *Iſlands*, a group of iſlands, diſcovered in 1767 by Capt. Carteret, conſiſting of Egmont's iſland or New Guernſey, Lord Howe's iſland or New Jerſey, and ſeveral others. A quarrel having occurred in conſequence of the imprudent conduct of the maſter of Capt. Carteret's ſhip, between the crew and the natives, ſeveral of the latter were killed, and four of the former died in conſequence of their wounds. This unfortunate event prevented any intercourſe with the inhabitants of theſe iſlands. *Egmont iſland*, ſays Capt. Carteret, who called it by this name in honour of the earl, is the ſame with the *Santa Cruz* of the Spaniards; and the place in which the ſhip had lain he called *Swallow bay*; about ten miles W. from this bay is a ſmall iſland, near the coaſt, called *Portland's iſland*; and to the bay farther weſt, where the ſhip's cutter had been attacked by the Indians, he gave the name of *Bloody bay*. In this bay is a ſmall rivulet of freſh water, and here were ſeen many houſes, and near the water-ſide, one much longer than any of the reſt, which ſeemed to be a kind of common hall, or council-houſe, and was neatly built and thatched. The ſides and the floor of this edifice were covered with a kind of fine matting, and bundles of arrows were hung up in it ready for uſe. At this place there were alſo many fine gardens and plantations, incloſed by a fence of ſtone, and planted with cocoa-nut trees, bananas, plantains, yams, and other vegetables. About three miles W. of this town was another of conſiderable extent, in the front of which, near the water, was a breaſt-work of ſtone, about four feet ſix inches high, angularly formed like a fortification; from which, and from other circumſtances, there is reaſon to believe that the natives have frequent wars among themſelves. At the diſtance of two or three miles farther weſtward was found a ſmall bight, receiving a river, which was called *Granville's river*, and weſtward of it is a point, to which was given the name of *Ferrar's point*. From this point the land forms a large bay, near which is a town of great extent, and apparently very populous. About ſeven miles W. of Ferrar's point is another, that was called *Carteret's point*, from which a reef of rocks, that appears above water, runs out to the diſtance of about a cable's length. To the W. of this was another large town, fronted like the laſt, and the people who thronged to the beach while the ſhip was paſſing, performed the ſame kind of circular dance with thoſe of the former place. They were furniſhed with a number of canoes of different ſizes. The inhabitants of Egmont iſland are extremely nimble, vigorous, and active, and ſeem as well qualified to live on the water as on the land, for they were in and out of their canoes almoſt every minute. With their bows and arrows they do execution at an incredible diſtance. Their arrows were pointed with flint, nor was there ſeen among them any appearance of metal. The country, in general, is woody and mountainous, intermixed with many vallies; ſeveral ſmall rivers flow from the interior part of the country into the ſea, and upon the coaſt there are many harbours. S. lat. 9° 50′ to 11° 20′. E. long. 163° 30′ to 165° 10′. Hawkeſworth's Voyages, vol. i. p. 349, &c.

Queen Charlotte's *Iſlands*, called by Capt. Gray, of the United States, who viſited them in 1789, and by American navigators, "Waſhington iſlands," a group of iſlands on the N.W. coaſt of America. See *Queen* Charlotte's *Iſland*.

Queen Charlotte's *Sound*. See *Queen* Charlotte's *Sound*. Mr. Anderſon, who viſited this ſound four times, has made the following remarks on the country near it. The land is every where uncommonly mountainous, riſing immediately from the ſea into large hills, with bluntcd tops. At conſiderable diſtances are vallies, or rather impreſſions on the ſides of the hills, which are not deep, each terminating towards the ſea in a ſmall cove, with a pebbly or ſandy beach, behind which are ſmall flats, where the natives generally build their huts, at the ſame time landing their canoes upon the beaches. The baſes of theſe mountains, at leaſt towards the ſhore, are conſtituted of a brittle, yelloviſh ſand-ſtone, which acquires a blueiſh caſt, where the ſea waſhes it. It runs, in ſome places, in horizontal, and, at other places, in oblique ſtrata; being frequently divided, at ſmall diſtances, by thin veins of coarſe quartz. The mould, or ſoil, which covers this, is of a yelloviſh caſt, not unlike marle, and is commonly

monly from a foot to two or more in thickneſs. The quality of this ſoil is beſt indicated by the luxuriant growth of its productions: the hills being one continued foreſt of trees, owing the ſtrength of their vegetation partly to the ſoil, and partly alſo to the agreeable temperature of the climate. In February, correſponding to our Auguſt, the thermometer was not higher than 66°; and in June, correſponding to our December, the mercury never fell lower than 48°. The weather is, in general, good; but ſometimes windy, with heavy rain, which, however, never laſts above a day; nor is it ever exceſſive. Among the trees, which covered the hills, and which are of two ſorts, one ſupplied the place of ſpruce in making beer, for which purpoſe a ſtrong decoction of its leaves was fermented with treacle or ſugar. The other ſort of tree reſembled a maple, and its wood ſerved for fuel. On the ſmall flat ſpots behind there is a great variety of trees. Among other plants that were uſeful, may be reckoned the wild celery, which grows plentifully almoſt in every cove, and one that was called ſcurvy-graſs, though very different from the plant to which we give that name. Both ſorts were boiled every morning, with wheat ground in a mill, and with portable ſoup for the people's breakfaſt, and amongſt their peaſe-ſoup for dinner. Sometimes they were uſed as ſallad, or dreſſed as greens. There is another plant, which produces a fine ſilky flax, of which the natives make their garments. A ſpecies of long pepper is alſo found in great plenty. The birds are almoſt entirely peculiar to the place. The principal fiſh caught with the ſeine were mullets and elephant-fiſh, with a few ſoles and flounders; but thoſe which the natives moſtly ſupplied were a ſort of ſea-bream, of a ſilver colour, with a black ſpot on the neck, large conger-eels, and a fiſh in ſhape like the bream, but ſo large as to weigh five, ſix, or ſeven pounds, and called "Mogge" by the natives. Of all the ſorts of fiſh, which are here numerous, the mogge, ſmall ſalmon, and colour fiſh, as the ſeamen called it, though different from ours, are ſuperior to the reſt. The rocks furniſh a great variety of ſhell-fiſh. Inſects are very rare. In this extenſive land there are not even traces of any quadruped, excepting only a few rats, and a ſort of fox-dog, which is a domeſtic animal with the natives. Neither is there any mineral worth notice, but a green jaſper or ſerpent-ſtone, of which the New Zealanders make their tools and ornaments.

The natives do not exceed the common ſtature of Europeans, and, in general, are not ſo well made. Their colour is of different caſts, from a deep black to a yellowiſh or olive tinge; and their features are alſo various, ſome reſembling Europeans. But in general their faces are round, with their lips full, and alſo their noſes towards the point; though the firſt are not uncommonly thick, nor the laſt flat. Their teeth are generally broad, white, and well ſet; and their eyes large, with a very free motion, which ſeems the effect of habit; their hair is black, ſtraight, and ſtrong; commonly cut ſhort on the hind part, with the reſt tied on the crown of the head: but ſome have it curling, and of a brown colour. In the young, the countenance is generally free or open; but in many of the men it has a ſerious caſt, and ſometimes a ſullenneſs or reſerve, eſpecially if they are ſtrangers. The women are in general ſmaller than the men; but have few peculiar graces. The dreſs of both ſexes is alike; and conſiſts of an oblong garment, about five feet long and four broad, and made of the ſilky flax before mentioned. This ſeems to be their moſt material and complex manufacture, and is executed by knotting; and their work is often ornamented with pieces of dog-ſkin, or checquered at the corners. They bring two corners of this garment over their ſhoulders, and faſten it on the breaſt, with the other part which covers the body; and about the belly it is again tied with a girdle made of mat. Sometimes they cover it with large feathers of birds, (which ſeem to be wrought into the piece of cloth when it is made,) or with dog-ſkin; and that alone ſometimes worn as a covering. Over this garment many of them wear mats, which reach from their ſhoulders to their heels. But the moſt common outer covering is a quantity of ſedge-plant, badly dreſſed, which they faſten on a ſtring to a conſiderable length, and throwing it about the ſhoulders, let it fall down on all ſides, as far as the middle of the thighs. By way of ornament, they fix in their heads feathers, or combs of bone or wood, adorned with pearl-ſhell, or the thin inner ſkin of ſome leaf; and in the ears both of men and women, which are pierced, or rather ſlit, are hung ſmall pieces of jaſper, bits of cloth, or beads, when they can get them. A few alſo have the ſeptum of the noſe bored in the lower part. They wear long beards, but are fond of having them ſhaved. Some are punctured or ſtained in the face, with curious ſpiral and other figures, of a black or deep blue colour; but it is doubtful whether this be ornamental, or intended as a mark of peculiar diſtinction: and the women who are marked ſo, have the puncture only on their lips, or a ſmall ſpot on their chins. Both ſexes often beſmear their faces and heads with a red paint, which ſeems to be a martial ochre, mixed with greaſe; and the women ſometimes wear necklaces of ſhark's teeth, or bunches of long beads, which ſeem to be made of the leg-bones of ſmall birds, or a particular ſhell. They live in ſmall coves, in companies of forty or fifty, or more; and ſometimes in ſingle families, building their huts contiguous to each other; which are in general miſerable lodging places. The beſt was about thirty feet long, ſixteen broad, and ſix high; built exactly in the manner of an Engliſh barn. They ſeemed to have no other furniture than a few ſmall baſkets or bags, in which they put their fiſhing-hooks and other trifles. They live chiefly by fiſhing, making uſe either of nets of different kinds, or of wooden fiſh-hooks, pointed with bone; but ſo oddly made, that a ſtranger would be at a loſs to know how they can anſwer ſuch a purpoſe. Their boats are well built of planks, raiſed upon each other, and faſtened with ſtrong withes, which alſo bind a long narrow piece on the outſide of the ſeams, to prevent their leaking. Some are fifty feet long, and ſo broad as to be able to ſail without an outrigger; but the ſmaller ſort commonly have one; and they often faſten two together by rafters, forming a double canoe. They carry from five to thirty men, or more; and often have a large head, ingeniouſly carved, and painted with a figure at the point, which ſeems intended to repreſent a man with his features diſtorted by rage. Their paddles are about four or five feet long, narrow, and pointed; with which, when they keep time, the boat is puſhed along pretty ſwiftly. Their ſail, which is ſeldom uſed, is made of a mat of a triangular ſhape, having the broadeſt part above. Their method of feeding correſponds with the naſtineſs of their perſons, which often ſmell diſagreeably, from the quantity of greaſe about them, and their clothes never being waſhed. We have ſeen them eat the vermin with which their heads are plentifully ſtocked. They alſo uſed to devour with the greateſt eagerneſs large quantities of ſtinking train oil, and blubber of ſeals, which we were melting at the tent, and had kept near two months; and on board the ſhips they were not ſatisfied with emptying the lamps, but actually ſwallowed the cotton and fragrant wick with equal voracity. Theſe people manifeſt as much ingenuity, both in invention and execution, as any uncivilized nations under ſimilar circumſtances. For, without the uſe of any metal tools, they make every thing by which they procure their ſubſiſtence, clothing, and warlike

weapons, with a degree of neatneſs, ſtrength, and convenience for accompliſhing their feveral purpoſes. Their chief mechanical tool is formed exactly after the manner of our adzes, and is made, as are alſo the chiſſel and goudge, of the jaſper already mentioned, or of a black, ſmooth, and very ſolid ſtone. But their maſter-piece ſeems to be carving, which they uſe for various purpoſes, even the moſt trivial. Their ſubſtitute for a knife is a ſhell, a bit of flint or jaſper: and as an auger, they fix a ſhark's tooth in the end of a ſmall piece of wood. They have alſo a ſmall ſaw made of ſome jagged fiſhes' teeth, fixed on the convex edge of a piece of wood, nicely carved: but this, they ſay, is only uſed to cut up the bodies of their enemies whom they kill in battle. No people have a quicker ſenſe of injury done to them, and none are more ready to reſent it. Their temper is ſuſpicious and miſtruſtful; and they are ſo diſhoneſt, that they ſteal every thing upon which they can lay their hands. Such conduct may be expected, where little ſubordination exiſts, and where no man's authority ſeems to extend further than his own family. Their public contentions are frequent, or rather perpetual, and it appears, from their number of weapons, and dexterity in uſing them, that war is their principal profeſſion. Theſe weapons are ſpears, patoos, and halberts, or ſometimes ſtones. The firſt are made of hard wood, pointed, from five to twenty, or even thirty feet in length. The ſhort ones are uſed for throwing as darts. The "patoo," or "emeete," is of an elliptical ſhape, about eighteen inches long, with a handle made of wood, ſtone, the bones of ſome ſea animal, or green jaſper, and ſeems to be their principal dependence in battle. The halbert, or long club, is about five or ſix feet long, tapering at one end with a carved head, and at the other broad or flat, with ſharp edges. Before they begin the onſet, they join in a war-ſong, to which they all keep the exacteſt time, and ſome raiſe their paſſion to a degree of frantic fury, attended with the moſt horrid diſtortion of thier eyes, mouths, and tongues, to ſtrike terror into their enemies: which, to thoſe who have not been accuſtomed to ſuch a practice, makes them appear more like demons than men, and would almoſt chill the boldeſt with fear. To this ſucceeds a circumſtance, almoſt foretold in their fierce demeanour, horrid, cruel, and diſgraceful to human nature; which is, cutting in pieces, even before they are perfectly dead, the bodies of their enemies, and, after dreſſing them on a fire, devouring the fleſh, not only without reluctance, but with peculiar ſatisfaction. And yet theſe ſavages lament the loſs of their friends, with a violence of expreſſion, which indicates the moſt tender remembrance of them. The children are initiated, at a very early age, into all the practices, good and bad, of their fathers. They not only join in the war-ſong, but they likewiſe ſing, with ſome degree of melody, the traditions of their forefathers, their actions in war, and other indifferent ſubjects; of all which they are immoderately fond, and ſpend much of their time in theſe amuſements, and in playing on a ſort of flute. Their language is far from being harſh or diſagreeable, though the pronunciation is frequently guttural; and whatever qualities are requiſite in any other language to make it muſical, certainly obtain to a conſiderable degree here, if we may judge from the melody of ſome ſorts of their ſongs. It is alſo ſufficiently comprehenſive, though, in many reſpects, deficient, if compared with our European languages, which owe their perfection to long improvement. Mr. Anderſon has given a ſpecimen of it. (Cook's Third Voyage, vol. i.) In the year 1770 Capt. Cook left among the inhabitants a boar and two ſows, with ſome vegetables for cultivation. In 1773 he ſaw one of the ſows, and underſtood that the other and the boar were both living. The ſheep and goats did not ſucceed; the latter having been killed by one of the natives, and the ram having ran into the ſea.

Queen's, the middle county of Long iſland, New York, about 30 miles long, and 12 broad, containing ſix townſhips, and 19,336 inhabitants. Jamaica, Newtown, Hampſtead, in which is a handſome court-houſe, and Oyſter bay, are the principal towns in this county.

Queen's, a county of Nova Scotia, comprehending a part of the lands on the cape, on the S. ſide of the bay of Fundy. The ſettlements are as follow; *viz.* Argyle, on the S. ſide of the bay of Fundy, where a few Scots and Arcadians reſide: next to this is Yarmouth, ſettled chiefly by emigrants from New England; Barrington, within the iſland, called cape Sable, ſettled originally by Quakers from Nantucket. Beſides theſe are Port Raiſoir, ſo called by the French, and originally ſettled by the North Iriſh; Liverpool and Roſeway, ſettled and inhabited by emigrants from New England.

Queen's *County*, a county of Ireland, eſtabliſhed in the reign of the firſt Mary, which comprehended the old diſtrict of Leix. Both the county and chief town, Maryborough, received their names in compliment to the ſovereign. It is ſituated on the S.W. of Kildare, from which it is partly divided by the river Barrow, and is of a very compact form, being 25 Iriſh (nearly 32 Engliſh) miles in length, and as many in breadth. The ſuperficial contents are about 235,300 acres, or 367 ſquare miles, equal to 378,023 acres, or about 590 ſquare miles Engliſh. There are 50 pariſhes, 26 only of which have churches, and a population of 82,000 according to Dr. Beaufort, and about 90,000 as the medium of various calculations. The high and ſteep mountains of Sliebh-bloom (called alſo Ard-na-Erin, which in the Iriſh language ſignifies the height of Ireland) form ſo impracticable a barrier between the King's and Queen's counties, that in a range of fourteen miles they afford but one, and that a very difficult and narrow paſs into the King's county, called the "Gap of Glandine." In this great ridge are the ſources of the Barrow and the Nore; the Barrow running N.E. to Monaſterevan, where it changes its direction to the S., and the Nore croſſing the Queen's county by a ſouthern courſe into Kilkenny. The Dyſart hills in the eaſtern diviſion are conſpicuous and pictureſque, ſtanding rather ſingly than connected. From theſe eminences, through the viſtas formed by their particular ſituation, is commanded the view of a fine and beautiful country, highly adorned with rich plantations and magnificent demeſnes. The reſt of the county is rather flat, but lies high. The whole is watered with rivers and numerous mountain ſtreams, and according to ſir Charles Coote, its ſuperficial appropriations may be thus eſtimated.

	Acres.
Arable lands, paſture, and meadow	210,000
Woods and plantations -	1,300
Water - - -	1,000
Bog, mountain, and waſte -	21,000
Roads - - -	2,000
	235,300

The map belonging to the grand jury, reckons 244,938 acres, and of theſe 60,000 bog and mountain.

Almoſt every deſcription of ſoil is found in this county, and it varies from a very ſtiff clay to a ſandy loam, which, though light, is yet fertile; a ſtrong gravelly ſoil, very favourable to corn, is alſo prevalent. Lime-ſtone is ſo common, that there are rich quarries of it in almoſt every townland. The

ſoil

ſoil of the Sliebh-bloom mountains is variable, the ſurface inclining to a black and alternately yellow ſtiff clay, of unequal depths, covering a looſe, rotten rock, or a gritty gravel, with occaſionally a little appearance of lime-ſtone. The weſtern ſide, more generally, inclines to a ſtrong red clay, not unlike the nature of the ſoil in ſome of th northern counties in Ireland, where oats and potatoes only are ſown; but it generally is, throughout, ſpongy, wet, and boggy to the ſummit, and very rocky. Through the whole of the county, except in the ſouth-eaſtern corner, near Carlow, where the collieries are extenſive, bog is well interſperſed, and is the general fuel. The depth of theſe bogs is various, and in ſome parts undiſcovered, the beſt fuel lying in ſome a few ſpades depth below the ſurface, in others very deep. The moors are a ſhallow bog, with a ſtratum of gravel or clay, under one or two ſpades depth; this particular kind is eaſily reclaimed, and becomes the beſt and ſureſt land in the county, and the coſt is here but trifling, indeed often repaid in one year, having all the materials within themſelves.

Amongſt the mineral productions of this county, ſir Charles Coote, the author of the Statiſtical Survey, enumerates "coal, iron, copper, manganeſe, mica, lime-ſtone, marble, free-ſtone, ochre, marle, fuller's-earth, and a great variety of clays valuable in every branch of pottery." Such an enumeration is of little uſe; being recommended neither by detail of facts and places, nor by accuracy of information. The coal diſtrict is in another part of the ſame work more fully noticed; but the reader who wiſhes for information, is more likely to find it in the report of Mr. Griffith, mining engineer of the Dublin Society, which is ſhortly to be publiſhed. The coal is of that deſcription called *ſtone coal*, the *glance-coal* of Jameſon, and beſt known by the name of Kilkenny coal. The Queen's county collieries ſeem to have laboured under many diſadvantages, from want of capital or of proper exertion; but a proſpect is opening upon us of more attention to this ſource of wealth. There is a very ſmall quantity of old timber in the Queen's county. There are, indeed, leaſes ſtill in exiſtence, by which the tenant was obliged to cut, burn, or deſtroy ſo many acres of wood, to clear the land for the plough; a ſyſtem which, if neceſſary to the eſtabliſhment of order in the county, was the cauſe of reducing it to the bare ſtate with reſpect to timber, with which the Engliſh traveller is ſo often ſtruck. The Barrow and the Nore are the principal rivers which water this county. The latter is not navigable, though, being a fine deep and ſpacious river, it might be eaſily rendered ſo, by levelling the numerous weirs, that are of great detriment to the adjoining lands, and throw up a conſiderable quantity of back water.

The Barrow is navigable throughout from Portarlington, near which it beautifully expands and winds through extenſive and fertile banks. There are no lakes which deſerve notice. Maryborough is the county town, near which, as well as Mountmelich and Mountrath, there was a conſiderable woollen manufacture of ſtuffs, &c. which has declined. For any particulars reſpecting the towns, the reader is referred to the reſpective articles. Beſides thoſe mentioned, Portarlington is a place of ſome importance, and Stradbelly a neat town. The county is repreſented in parliament by two knights of the ſhire, and by one member for the borough of Portarlington. Maryborough and Ballynekill were diſfranchiſed at the union. Sir C. Coote's Statiſtical Survey. Beaufort's Memoir.

Queen's *Creek*, a river of America, in North Carolina, which runs into the Atlantic, N. lat. 34° 37'. W. long. 77° 28'.

Queen's *River*, a river of the iſland of Dominica, which runs into the ſea near Roſeau.

Queen-*Bee*, a term given by late writers to what uſed to be called the *king-bee*, or king of the bees; a large and long-bodied bee, of which kind there is only one found in every ſwarm, and which is always treated with the greateſt reſpect by the reſt.

It is well known that the generation and whole economy of bees principally depend upon this female ſovereign, and that her preſence is abſolutely neceſſary to the proſperity and ſafety of the whole community; inſomuch that the loſs of the queen proves the certain and total deſtruction of the ſwarm or hive, unleſs the owner ſupplies them in time with another ruler. Without her preſence and direction, the other bees will do no manner of work; they will gather neither wax, nor honey, nor any other materials; nor can they breed and propagate their kind without her. A ſtock deprived of its queen, would yield to robbers, or elſe languiſh and pine away, ſo that the whole ſociety would periſh. But as ſoon as a languiſhing ſtock is ſupplied with a queen, pleaſure and activity are apparent through the whole hive; the preſence of the ſovereign reſtores vigour and exertion, and her voice commands univerſal reſpect and obedience: of ſuch importance is the queen to the exiſtence and proſperity of the other members of this community. As the parent and ſovereign of every ſwarm is a female, the whole government is veſted in one; ſo that where there happen to be more, as there ſometimes are, and eſpecially in ſwarms that are united, confuſion and diſcord prevail, until all, except one, are expelled and ſlain.

As in forming artificial ſwarms, and for other purpoſes, it will be neceſſary to diſtinguiſh the queen from the other bees, we ſhall obſerve, that ſhe may be known by her ſize, which is much larger than that of the common working-bees, and longer than that of the drones; by the form and ſhape of her body, eſpecially of the hinder part of it, which is more taper, and terminates in a much ſharper point than the bodies of the other bees, in order the more readily to reach the bottom of the cells, where the eggs are depoſited for the propagation of the ſpecies (ſee *Generation of* Bees): and alſo by her colour; her upper parts being ſcarcely at all different in this reſpect from the honey-bees, but her belly and legs are of a very deep yellow, reſembling the pureſt and the richeſt gold. It is ſaid that ſhe may alſo be diſtinguiſhed by the note of her voice, which is an octave; and by her being one of the laſt which falls with her belly upwards, when the bees of a ſingle ſtock are dropped into an empty hive, in order to be united with thoſe of another ſtock.

Naturaliſts have obſerved, that the queen-bees are produced in a manner peculiar to themſelves, and different from the drones and working-bees. Some have ſuppoſed that the eggs laid by the queen in a hive, and deſtined for the production of queen-bees, are of a peculiar kind; but though this is not the caſe, as M. Schirach has lately diſcovered, yet there are particular cells appropriated for this purpoſe. Theſe cells are generally near the edges, and at the bottom of the combs, and ſometimes on the ſides of a honey-comb; they are of an oblong orbicular form, and very ſtrong; and are more or leſs numerous in different hives, as occaſion ſeems to require. It has been alſo ſuppoſed, that the matter with which they are nouriſhed is of a different kind and quality from that employed for the nouriſhment of the other bees; that which has been collected out of the royal cells being of a gummy glutinous nature, of a deep tranſparent red, and diſſolving in the fire rather than crumbling to powder.

It has been generally ſuppoſed, that the queen-bee is the only female contained in the hive; that the drones are the males by which ſhe is fecundated; and that the working-bees are neutral, or of neither ſex. But M. Schirach has lately eſtabliſhed a different doctrine, which has been alſo confirmed by the later obſervations of Mr. Debraw. According to this writer, all the working or common bees are females in diſguiſe; and the queen-bee lays only two kinds of eggs, *viz.* thoſe which are to produce the drones, and thoſe from which the working-bees are to proceed; and from any one or more of theſe, one or more queens may be produced; ſo that every worm of the latter or common kind, which has been hatched about three days, is capable, under certain circumſtances, of becoming the queen, or mother of a hive. In proof of this doctrine, new and ſingular as it may ſeem, he alleges a number of ſatisfactory and deciſive experiments, which have been ſince verified by thoſe of Mr. Debraw. For the proof of this doctrine by Schirach and Debraw, and the objections of Mr. Hunter, we refer to the article *Generation of* BEES.

From this doctrine we may juſtly infer, that the kingdom of the bees is not, if the expreſſion may be uſed, a *jure divino*, or hereditary monarchy, but an elective kingdom; in which the choice of their future ruler is made by the body of the people, while ſhe is yet in the cradle, or in embryo; and who are determined by motives of preference which will perhaps for ever elude the penetration of the moſt ſagacious naturaliſts.

The concluſions drawn by M. Schirach, from experiments of the preceding kind, very often repeated by himſelf and others with the ſame ſucceſs, are, that all the common or working bees were originally of the female ſex; but that when they have undergone their laſt metamorphoſis, they are condemned to a ſtate of perpetual virginity, and the organs of generation are obliterated; merely becauſe they have not been lodged, fed, and brought up in a particular manner, while they were in the worm ſtate. He ſuppoſes, that the worm deſigned by the community to be a queen, or mother, owes its metamorphoſis into a queen, partly to the extraordinary ſize of its cell, and its peculiar poſition in it; but principally to a certain appropriate nouriſhment found there and carefully adminiſtered to it by the working bees, while it was in the worm ſtate; by which, and poſſibly other means unknown, the developement and extenſion of the germ of the female organs, previouſly exiſting in the embryo, is effected; and thoſe differences in its form and ſize are produced, which afterwards ſo remarkably diſtinguiſh it from the common working bees. Schirach's Hiſtoire Nat. de la Reine des Abeilles, &c. 8vo. 1772. Or, for an abſtract, Monthly Review, vol. xlviii. p. 564, &c. Phil. Tranſ. vol. lxvii. part i. p. 29, &c. See *Generation* and *Sex of* BEES.

This diſcovery is capable of being applied towards forming artificial ſwarms, or new colonies of bees, by which means the number of theſe uſeful inſects might be increaſed, and their produce in honey and wax proportionably augmented. M. Schirach, as well as M. Haſtorff, ſeem, however, to have been miſtaken, when they aſſert, that the artificial queens, formed and reared in a community conſiſting *only* of working bees, proceed almoſt immediately to lay eggs, and to people the hive, without having had any communications with the drones, and at a time when, as they ſuppoſe, there were no drones in being. It is not neceſſary to admit the idea of the prolific quality of a virgin queen-bee; as nature has provided drones of different ſizes, for the purpoſe of impregnating the eggs laid by the female, and continuing the ſpecies, adapted to different occaſions and circumſtances. See DRONE.

QUEEN's *Bench*. See KING's *Bench*, &c.

QUEEN's *Gilliflower*, or *Violet*, in *Botany*. See HESPERIS.

QUEEN *Gold*, *aurum regina*, an ancient royal revenue, belonging to the queen of England, during her marriage to the king; and payable by divers perſons (upon ſeveral grants of the king) by way of oblation out of fines, amounting to ten marks, or upwards; *viz.* one full tenth part above the entire fine, or ten pounds for every hundred pounds fine, on pardons and contracts or agreements.

This becomes a real debt to the queen, by the name of *aurum reginæ*, upon the party's bare agreement with the king for a fine, and recording it without any farther promiſe, or contract, for this tenth part extraordinary.

QUEEN *of the Meadows*, in *Botany*. See SPIRÆA.

QUEEN's *Ware*. See POTTERY.

QUEEN's *Theatre* in the Haymarket, now the Opera-houſe, was built in queen Anne's time by ſir John Vanburgh, and not finiſhed till the ſummer of 1705, at which time there were only two theatres open; Drury Lane, and Lincoln's-Inn-Fields. Betterton, who was at the head of the Lincoln's-Inn-Fields company, removed to the new theatre in the Haymarket, April 9th, 1705; when it was opened with a new prologue, written by ſir Samuel Garth, and ſpoken by Mrs. Bracegirdle. The play was Dryden's "Indian Emperor," with ſinging by the Italian boy. April 23d, "The Merry Wives of Windſor," Falſtaff by Betterton, with dancing by Mad. de la Val. And on the 24th, a new farce called "The Conſultation;" after which was performed an Indian paſtoral, called the "Loves of Ergaſto," ſet to muſic by Giacomo Greber, the German muſician, who had brought over from Italy Margarita de l'Epine; the part of Licoris by the Italian boy. And this was the firſt attempt at dramatic muſic in the Opera-houſe. The company continued acting plays here till the end of June, when there were three repreſentations of "Love for Love," acted all by women. July 20th, according to the Daily Courant, Betterton and his company returned to the theatre in Lincoln's-Inn-Fields, where they continued to act till the Queen's theatre was entirely finiſhed. We are the more minute about the performances in this theatre, as Cibber's account, which has been generally followed by others, is very inaccurate. October 30th, Betterton and his company quitted Lincoln's-Inn-Fields a ſecond time, and returning to the Haymarket, opened that theatre, not with an opera, but with ſir John Vanburgh's comedy of the "Confederacy," which was now acted for the firſt time. This excellent comedy, though the parts were very ſtrongly caſt (Leigh, Dogget, and Booth, being among the men, and Mrs. Barry, Mrs. Porter, and Mrs. Bracegirdle, among the women,) ran but ſix nights ſucceſſively, though the performance of M. des Barques, a dancer juſt arrived from France, was added to the entertainment. It was, indeed, repeated once in November, and twice in December, this year; but it was generally found neceſſary, even in a new theatre, and with ſo ſtrong a company, to fortify the beſt plays with dances or muſic, and often with both. Sometimes there was ſinging in Italian and Engliſh, by ſignora Maria, as lately taught by ſignor N. Haym: and ſometimes muſic compoſed by ſignor Bononcini, and ſongs by ſignora Lovicini, &c. Daily Courant.

QUEENBOROUGH, in *Geography*, a borough and market-town in the liberty of the iſle of Shepey, lathe of Scray, and county of Kent, England, is ſituated about three miles ſouth from Sheerneſs, and forty-five eaſt by ſouth from London. It was anciently called Cyningburgh, from belonging

longing to the Saxon kings, who had a caſtle here, near the weſtern entrance of the Swale, which, after the conqueſt, was denominated the caſtle of Shepey. This fortreſs being totally demoliſhed in the reign of Edward III., that monarch commenced, in 1360, a more extenſive and magnificent one, which was finiſhed in the period of ſix years, under the ſuperintendance of the celebrated William of Wykeham, afterwards biſhop of Wincheſter. When the caſtle was completed, Edward came and reſided in it ſeveral days, during which time he conſtituted the then village a free borough, and ordered it to be called Queenborough, in honour of his conſort Philippa of Hainault. By the charter of incorporation, which bears date in 1366, he conferred ſundry privileges upon the burgeſſes, and empowered them to elect a mayor, two bailiffs, four jurats, a town ſerjeant, and a water bailiff, who were to take their oath of allegiance before the conſtable of the caſtle; and to act as juſtices of the peace within the liberty of the corporation. This charter was confirmed, with additional privileges, by king Charles I.

Queenborough conſiſts chiefly of one ſtreet, which is very wide, and is formed moſtly of modern buildings. According to the parliamentary returns of 1811, the borough, which coincides in extent with the pariſh, contains 163 houſes and 805 inhabitants, who are principally fiſhermen and oyſter dredgers. The market days are Monday and Thurſday weekly, and there is a well-attended fair on the 5th of Auguſt. This town ſends two members to parliament, who are elected by the mayor, jurats, bailiffs, and burgeſſes, about 150 in number, though by the laſt deciſion of the houſe of commons in 1729, the elective franchiſe was declared to reſide only in the mayor, jurats, and common council. The mayor is the returning officer, and the patronage is in the admiralty and board of ordnance.

Of the caſtle built by king Edward, no traces remain except the moat by which it was ſurrounded, and a well, by which it was ſupplied with water, as the town ſtill is. Though a large and maſſive ſtructure, and erected, as the letters patent expreſs it, "for the ſtrength of the realm, and for the refuge of the inhabitants of this iſle," it does not appear to have ever been of any particular uſe, at leaſt it is never mentioned in hiſtory as having been beſieged, or occupied as an important military poſt. It was nevertheleſs ſeveral times repaired; firſt by Richard II., and again in the time of Henry VIII. Queen Elizabeth alſo ſeems to have contributed to its preſervation and embelliſhment, as her arms were diſplayed on the cieling of the great hall, ſurrounded by thoſe of the nobility, and principal gentry of the county, with the date 1593, affixed to ſome panegyrical verſes in honour of that princeſs. The church here was originally built as a chapel to Minſter, a village ſituated about two miles from the town, and deriving its name from the minſtre, or nunnery founded there by Sexburga, widow of Ercombert, king of Kent, about the year 673. That princeſs placed ſeventy-ſeven nuns in her new inſtitution, and took upon herſelf the office of abbeſs; which ſhe afterwards reſigned to her daughter Ermenilda, and retired to Ely, where her ſiſter Etheldred preſided. During the incurſions of the Danes, this nunnery was deſerted and nearly deſtroyed; but when their invaſions ceaſed, it was again tenanted by a few nuns, and continued to exiſt, though in a very mean ſtate, till the year 1130, when the buildings were re-edified by Corbel, archbiſhop of Canterbury, and filled with nuns of the order of St. Benedict. At the diſſolution their number was limited to a prioreſs and ten nuns, whoſe eſtates were eſtimated at 129*l.* 7*s.* 10½*d.* annual rent. Theſe, with the ſcite of the ſuppreſſed monaſtery, were then granted to ſir Thomas Cheyney, lord warden and treaſurer of the houſehold to king Henry VIII. Of the buildings, a gate-houſe, and part of the church, are the only remains. The latter conſiſts of two aiſles, a chancel, and a neat chapel, with the lower diviſion of a ſquare tower at the weſt end. In conformity with the date of its erection, ſome of the arches are ſemicircular in form, but moſt of them are in the early pointed ſtyle. In the ſouth wall of the chancel, under a range of cinquefoil arches, is the effigy of a knight templar, ſaid to repreſent and commemorate ſir Robert de Shurland, lord of Shurland, who was created a knight banneret by Edward I., for his gallant conduct at the ſiege of Carlaverock, in Scotland. Behind the figure, towards the back of the receſs, is the repreſentation of a horſe's head in the act of ſwimming, which has given riſe to much enquiry among antiquaries, and to many fabulous and ſuperſtitious ſtories among the vulgar. On the pavement are ſeveral braſſes of knights and their ladies; and under the arch ſeparating the chancel from the chapel, is a gorgeous altar-tomb in honour of ſir Thomas Cheyney, above-mentioned. Another altar-tomb, near it, bears the recumbent figure of a Spaniſh general, or admiral taken priſoner by ſir Francis Drake, on the defeat of the "Invincible Armada." From an entry in the pariſh regiſter, he appears to have died on board a ſhip at the Nore in 1591. Beauties of England and Wales, vol. vii. by E. W. Brayley.

QUEENSBURY, a townſhip of America, in Waſhington county, New York, bounded eaſterly by Weſtfield and Kingſbury; 35 miles N.E. of Albany.

QUEENSFERRY, SOUTH, a royal burgh and ſea-port town in the county of Linlithgow, Scotland, is ſituated on the ſouthern ſhore of the Frith of Forth, at the diſtance of nine miles W.N.W. from Edinburgh, on the great road to the north. It is firſt mentioned in the charters of king Malcolm IV. by the deſignation of "Paſſagium Reginæ," as is generally ſuppoſed from the frequent uſe of the ferry here by his great grandmother Margaret, queen to Malcolm Canmore, a princeſs highly celebrated in Scottiſh hiſtory for her charitable and beneficent qualities. At that period, however, it was only a village and port, endowed with ſome trifling privileges: indeed, its conſtitution as a royal burgh did not take place till about the year 1556, when its elevation to that rank was ſtrenuouſly oppoſed by the corporation of Linlithgow. It is now governed by a provoſt, one land baillie, two ſea baillies, a dean of guild, and a town council, who, like moſt other counſellors in royal boroughs, are ſelf-elected. Formerly this port enjoyed a conſiderable trade, and even ſo late as the year 1640, it was frequented by above twenty ſhips belonging to reſident owners; but its traffic is at preſent confined to the importation of coal, for the conſumption of the inhabitants, and of the materials uſed in the manufacture of brown ſoap, which, with the fiſhery and the buſineſs of the ferry, conſtitute the chief ſupport of the town. The harbour is in good repair, and is frequently reſorted to as a place of retreat in hard gales, by the ſmaller veſſels navigating the Forth. The paſſage here does not exceed two miles in breadth, and, except in very boiſterous weather, may be croſſed at all times with ſafety and expedition. Much obſcurity prevails relative to the founding of this ferry. The right of it is private property, and ſeems originally to have been attached to the lands of Murie Hall, which lie in the vicinity of the town, and are traditionally ſaid to have been appropriated for "upholding the paſſage." The preſent proprietors are ſeveral gentlemen poſſeſſing land on either ſide of the Forth, who let the paſſage yearly by public auction. As all the northern mails, and moſt carriage travellers, paſs at this ferry, the intercourſe between its ſhores is conſtant and regular. Cattle alſo are tranſ-

ported

ported over in great numbers, as well as carts and waggons; but the difficulty and danger of effecting theſe objects, have induced cattle-drivers and carriers to go round by the bridge at Stirling.

The pariſh of Queensferry is of ſmall extent, being confined entirely to the royalty. In eccleſiaſtical matters it forms part of the preſbytery of Linlithgow, and ſynod of Lothian and Tweedale; and, according to the population returns of 1811, contains 77 houſes and 558 inhabitants.

On the ſummit of the ridge riſing from the ſhore here, ſtands Hopetoun-houſe, the ſeat of the earl of Hopetoun, which is perhaps equal in magnificence of aſpect to any palace or reſidence in Great Britain. The manſion is ſeated on a noble lawn, forming a kind of terrace along the Forth for more than a mile in front, and only terminated by the Frith, which winds round it, and appears like a wide and extenſive lake, interſperſed with iſlands and enlivened with a variety of ſhipping. Behind the houſe the ground is more various, breaking into hills, vallies, and promontories, which ſhoot into the Forth. All the grounds, to a conſiderable diſtance, are planted and adorned; and the houſe is judiciouſly flanked with a thick wood, to protect it againſt the violence of the northern winds. On this ſide the Forth aſſumes, at different points, different appearances, ſometimes putting on the ſemblance of a lake, and ſometimes that of a river. The houſe is a very noble diſplay of architectural magnificence. It was begun by the celebrated architect ſir William Bruce, and finiſhed by Mr. Adam, who is believed to have added the wings. It is much to be regretted, that the interior of this princely manſion does not correſpond with the grand ſcale of the exterior, in the ſize and decorations of the apartments. Beauties of Scotland by Robert Forſyth, vol. iii. Carliſle's Topographical Dictionary of Scotland, 4to. 1813.

QUEENSFERRY, *North*, a ſmall ſea-port town in the diſtrict and pariſh of Dunfermline, Scotland, is ſituated on the northern ſhore of the Frith of Forth, oppoſite to the royal burgh of South Queensferry, deſcribed in the preceding article. The principal export is whin-ſtone for paving, which is found in vaſt abundance in the extenſive "whin-ſtone quarries" adjoining. Of that material a large proportion is conveyed to London, and many towns on the eaſtern coaſt of England. A hamlet, called St. Margaret, between this village and the head-land, which forms the weſtern boundary of Inverkiething bay, is noted as the landing place of prince Edgar Atheling, and his ſiſter Margaret, afterwards queen of Scotland, when they fled from England to avoid the effects of the conqueror's jealouſy of Edgar's claim to the Engliſh crown. By an act of parliament, lately paſſed, the ferry has been placed under excellent regulations; and the harbour on each ſide, but particularly on the north ſide, has been much enlarged and improved. A ſignal houſe here contains apartments for the accommodation of the truſtees, the ſuperintendant, and boatmen. Carliſle's Topographical Dictionary of Scotland, 4to. 1813.

QUEEN'S-HOPE, or EAST-HOPE, a town in the pariſh of Eſtyn, or Hope, cwmwd of Merffordd, cantref of Uwch, Nant, (now called the hundred of Mold,) and county of Flint, North Wales, is ſituated near the river Alun, at the diſtance of ſix miles N.W. from Wrexham. Together with the adjoining caſtle and hamlet of Caer-Gwrle, it conſtitutes a burgh, both by preſcription, and in virtue of a charter granted by Edward the Black Prince in 1351. That deed orders that the conſtable of the caſtle ſhall be mayor, *ex officio*, and ſhall nominate two bailiffs, to govern under him, from among the burgeſſes. This place obtained the appellation of Queen's-Hope, after the year 1282, from the circumſtance of its having been then beſtowed by Edward I. on his beloved and heroic conſort Eleanor; or, as ſome affirm, from her majeſty having lodged here, when on her way to Caernarvon to give the Welſh a ruler born within their own territories. The etymology of its ancient name, "Caergawr-lle," (the camp of the gigantic legion,) ſeems to indicate that it was once occupied by the Romans; and in confirmation of this conjecture we may obſerve, that a Roman hypocauſt has lately been diſcovered here, ſome of the tiles uſed in the conſtruction of which were inſcribed "Legio XX." Pennant ſuppoſes that it was an outpoſt to the grand ſtation Deva, and notices the remains of two roads. The ruins of the caſtle of Caergwrle are ſeated on a lofty rock iſolated from the ſurrounding land, and, on one ſide, extremely precipitous. At what time, or by whom it was originally built, is unknown; but in the reign of Owen Gwynnedd, it formed part of the poſſeſſions of a chieftain named Gryffydd Maelor. Edward I. made a grant of it to prince David, and afterwards, as above-mentioned, to queen Eleanor, at whoſe death both caſtle and manor were given to John de Cromwell, on condition that he repaired the former, which had been ſet fire to, and conſiderably damaged, as was ſuppoſed by deſign, while the king and queen were reſident in it. All that remains of this once magnificent fortreſs, are a circular tower, and a few fragments of walls, together with the deep foſſe, by which it was defended. This foſſe is excavated from the ſolid rock, which is compoſed of breſcia, or an exceſſively coarſe grit.

The conjoint borough of Queen's-Hope and Caergwrle, is contributary with the town of Flint in the election of a repreſentative to the Britiſh parliament. It formerly had the privileges of a market and fairs, but theſe are now diſcontinued. The pariſh is divided into two diſtricts, called Hope and Kinnerton, and contains, according to the parliamentary returns of 1811, 547 houſes and 2617 inhabitants. Of theſe a large proportion reſide in the town, which conſiſts of three broad parallel ſtreets, interſected at right angles by three others of leſs breadth, the whole placed on the ſide of a riſing ground, gently ſloping to the river. The principal building is the church, which contains two mural monuments, one decorated with kneeling figures, but without any inſcription; and the other commemorating ſir John Trevor, knt. ſecretary to the earl of Nottingham, the conqueror of the boaſted invincible armada.

Some objects in the vicinity of the place claim notice. On a hill, oppoſite to that of Caergwrle, is the Britiſh encampment of Caer-Eſtyn, which is formed by a ſingle ditch and rampart. The adjacent ſummits conſiſt chiefly of limeſtone, and diſplay on their ſurface numerous organic examples of the foſſil remains called entrochi and aſtroites. The uncommon ſpecies of the latter, uſually denominated the arboreſcent ſea-ſtar, has been found here. At Rhyddyn are two ſprings ſtrongly impregnated with muriate of ſoda, the waters of which are found highly ſerviceable in ſuch chronic diſorders as elephantiaſis and ſcrophula. At this place is a fine old bridge over the river Alun. On the road to Mould, about two miles from Queen's-Hope, is Plas-Teg, the ſeat of the Trevor family. The houſe is a very noble building, and is generally believed to have been the work of Inigo Jones. Beyond this is Harts-Heath Hall, the property of Guillwn Lloyd Wardle, eſq. It is a large modern manſion, forming a ſquare, with three fronts, and is ſurrounded by fine plantations. Carliſle's Topographical Dictionary of Wales, 4to. 1812. Pennant's Tour in Wales.

QUEEN-

QUEENSTADT, a town of Weſtphalia, in the principality of Halberſtadt; three miles N.E. of Halberſtadt.

QUEENSTOWN, a poſt-town of America, in Queen Anne's county, Maryland, on the E. ſide of Cheſter river; ſix miles S.W. of Centerville, and 65 from Waſhington.

QUEENSTOWN, a town or village of Upper Canada, which lies on the W. ſide of the ſtraits of Niagara, near fort Niagara, and ſeven miles below the Falls. It is at the head of navigation for ſhips; and the portage occaſioned by the Falls of Niagara commences here. From the ſudden change in the face of the country in the neighbourhood of Queenſtown, and the equally ſudden change in the river with reſpect to its breadth, depth, and current, it has been conjectured, that the great falls of the river muſt originally have been ſituated at the ſpot where the waves are ſo abruptly contracted between the hills; and moreover it is a fact well aſcertained, that the falls have receded very conſiderably ſince they were firſt viſited by Europeans, and that they are ſtill receding every year. See Weld's Travels, vol. ii. p. 130.

QUEE-SAN ISLANDS. See CHUSAN.

QUE ESTATE, in *Law*, a plea whereby a man entitling himſelf to land, &c. ſaith, that the ſame eſtate which another had, he now has from him.

Thus, *e. gr.* the plaintiff alleges that ſuch four perſons were ſeiſed of lands whereunto the advowſon in queſtion belonged in fee, and who did preſent it; and that afterwards the church was vacant; *que eſtate*, i. e. *which eſtate* he now has; and, by virtue thereof, he preſents, &c. See PRESCRIPTION.

QUE EST MEME, a term uſed in actions of treſpaſs, &c. for a direct juſtification of the very act complained of by the plaintiff as a wrong.

Thus, in an action upon the caſe, the plaintiff ſaying the lord threatened his tenants at will in ſuch ſort, as he forced them to give up their lands; the lord in his defence pleads, that he ſaid to them if they would not depart, he would ſue them at law. *Que eſt meme, i. e.* this being the ſame threatening that he uſed, the defence is good.

QUEGASCA HARBOUR, in *Geography*, a bay on the S. coaſt of Labrador. N. lat. 50° 7'. W. long. 61° 22'.

QUEI, in *Natural Hiſtory*, a name given by the Chineſe to a peculiar earth found in many parts of the Eaſt.

It is of the nature of an indurated clay, and in ſome degree approaches to the talcs, as our ſteatites and the galactites do. It is very white and abſterſive, uſed by the women of China, to take off ſpots from the ſkin, and render it ſoft and ſmooth, as the Italian ladies uſe talc of Venice. They ſometimes uſe the fine powder of this ſtone dry, rubbing it on the hands and face after waſhing; ſometimes they mix it with pomatum.

QUEICH, in *Geography*, a river of France, which paſſes by Landau, and runs into the Rhine, near Germerſheim.

QUEI-CHUN, a city of China, of the ſecond rank, in the province of Quang-ſi. N. lat. 23° 22'. E. long. 106° 44'.

QUEIGE, a town of France, in the department of Mont Blanc; four miles N.E. of Conflans.

QUEIGNE, a town of Africa, in the kingdom of Bambouk.

QUEI-LING, a city of China, and capital of the province of Quang-ſi, derives its name from a flower called "quei," which grows on a tree reſembling a laurel; it exhales ſo ſweet and agreeable an odour, that the whole country around is perfumed with it. This city is ſituated on the banks of a river, which throws itſelf into the Ta-ho; but it flows with ſuch rapidity, and amidſt narrow vallies, that it is neither navigable nor of any utility to commerce. Quei-ling is a large city, and the whole of it is built almoſt after the model of our ancient fortreſſes; but it is much inferior to moſt of the capitals of the other provinces. Birds are found in great numbers in the territories belonging to it, the colours of which are ſo bright and variegated, that the artiſts of this country, in order to give additional luſtre to their ſilks, interweave with them ſome of their feathers, which have a ſplendour and beauty that cannot be imitated. Quei-ling has under its juriſdiction two cities of the ſecond claſs, and ſeven of the third. N. lat. 25° 12'. E. long. 109° 51'.

QUEIOS, a river of Spain, in Navarre, which runs into the Ebro, near Tudella.

QUEIRA, a town of Africa, in Ludamar; eight miles S. of Benowm.

QUEIS, a river of Sileſia, which riſes in the principality of Jauer, paſſes by Friedberg, Grieffenberg, &c. and joins the Bober, between Sprottau and Sagan.

QUEI-TE, a city of China, of the ſecond rank, in Quang-ſi. N. lat. 23° 18'. E. long. 107° 4'.

QUELAINES, a town of France, in the department of the Mayenne; eight miles S. of Laval.

QUELEA, in *Ornithology*, a ſpecies of *Emberiza;* which ſee.

QUELINES, in *Geography*, mountains of Mexico, between the provinces of Guaxaca and Chiapa.

QUELLINUS, ERASMUS, in *Biography*, called the Old, born at Antwerp in 1607, was a pupil of Rubens, and became a painter of hiſtory of very conſiderable reputation. He lived to the age of 71, and left a ſon John Eraſmus Quellinus, who alſo became a painter, but who left the Flemiſh for the Venetian ſtyle of art, which he practiſed at Antwerp, his native city, till he arrived at the advanced age of 85, having been born in 1630.

QUELPAERT, in *Geography*, an iſland in the ſea of Corea, on which a Dutch veſſel, called the Sparrow-hawk, was wrecked in the year 1635, then ſubject to the king of Corea. No iſland preſents a finer aſpect; the middle of the iſland is occupied by a peak of about 800 toiſes, viſible at the diſtance of about 18 or 20 leagues, and the land gradually ſlopes towards the ſea, ſo that the habitations reſemble an amphitheatre. The ſoil to a great height ſeems to be well cultivated. It belongs, however, to a people who are forbidden to hold any intercourſe with ſtrangers, and who detain in ſlavery unfortunate perſons who are wrecked on the coaſts. Some Dutchmen of the Sparrow-hawk, after a captivity of eighteen years, during which they received many baſtinadoes, found means to take away a bark, and to croſs to Japan, from which they arrived at Batavia. N. lat. of the ſouth point 33° 14'. E. long. 126° 35'.

QUELUSIA, in *Botany*, a name given by Vandelli to the beautiful *Fuchſia coccinea*, now ſo common in gardens. The author ſuppoſed it a new genus, and meant thus to honour a royal villa near Liſbon, called *Quelus*, where he firſt ſaw this plant in bloom.

QUEM *reddítum reddit*, in *Law*, an old writ which lay where a rent-charge, or other rent, which was not rent-ſervice, was granted by fine holding of the grantor. If the tenant would not attorn, then the grantee might have had this writ.

QUEMARY, in *Geography*, a town of Bootan; 20 miles E. of Beyhar.

QUEMENES, a ſmall iſland in the Engliſh channel, near the coaſt of France. N. lat. 48° 22'. W. long. 4° 48'.

QUEMI,

QUEMI, in *Botany*, a name uſed by ſome authors for the nigella, or geth.

QUEMIGNY, in *Geography*, a town of France, in the department of the Côte d'Or; nine miles S.W. of Dijon.

QUENDAL Bay, a bay at the S. extremity of the iſland of Shetland. N. lat. 59° 49'. W. long. 1° 40'.

QUENDON *Water-Barrow*, in *Rural Economy*, a contrivance of the barrow kind, much employed in the neighbourhood of the little village of Quendon, in Eſſex, and from which it takes its name, for the purpoſe of conveying water, waſh, and other liquid matters, to live ſtock of different kinds, as fattening cattle, hogs, horſes, and other animals, as well as for ſome other uſes. It is a ſimple and excellent invention for all ſuch intentions, as very great facility is given to its motion by means of the wheels, and it is, on the whole, very compact in its general formation, which gives it a ſuperiority over many other contrivances of a ſimilar nature, as being capable of being put in motion, when full, without any great difficulty, or the application of any extraordinary power or force.

It is repreſented at *figs.* 6 and 7, in *Plate Agriculture*, ſhewing the methods of clearing quarries, pits, &c. from water. *Fig.* 6. explains the plan, in which *a b*, *a b*, are the wheels, that faſten on to the ſide-beams *c d*, *c d*, which are about four feet in length, and have their ends *c*, *c*, formed in ſuch a manner as to ſerve for handles. E is an oval tub about thirty inches in depth, twenty-four in length, and eighteen in breadth, which is ſupported on the beams by two gudgeons, which play in ſemicircular boxes fixed near the ends of the beams: a croſs piece connects the two beams at *f f*, as does another at *g g*, to which two little curved pieces come, parallel to the form of the tub. The wheels are about four feet in height, and carry the tub ſuſpended between them; for the gudgeons play almoſt over the two ſhort axles, which ſquare into the beams. Two ſlight legs are fixed underneath the barrow at *i i*, to keep it in an upright poſition, but they are not at all eſſential, for the tub would remain in a ſtate of equipoiſe between the wheels even without ſuch aid. It muſt be noticed, that the tub is ſunk rather more than one-half below the gudgeons.

Fig. 7. diſplays the profile of the vehicle; the dotted line ſhews the ſize and place of the tub, which is made oval, for the purpoſe of confining the breadth between the wheels, ſo as to paſs in at narrow door-ways, &c.

It is probable that it might be ſomewhat improved by having the axles hooked within, ſo as to bear upon two loops in one of the iron hoops, and by this means render the uſe of gudgeons and boxes wholly unneceſſary. The tub would lift off and on, as eaſily as at preſent, while it would hang in a more preciſe and perfectly centrical manner. And ſtill further, it would be a great convenience, if the upper part of the tub were furniſhed with a proper ſpout in the front, in order to pour water or other liquid materials through between the pales, &c. for the ſupplying of cattle, &c. This would be more eaſily accompliſhed, if the tub were allowed to ſwing in a free manner, as it might in that caſe be tilted up with great facility, ſo as to favour its being done, as ſhewn by the dotted line in *fig.* 2. About the little town noticed above, it is a great deal employed in carrying water for houſe uſe as well as that of farms. It is deſcribed in the Agricultural Magazine. Many other forms of water-barrows are made uſe of in different places. See Water-*Barrow*.

QUENEG, or Quenena, in *Geography*, a diſtrict of Africa, in the country of Sugulmeſſa, near mount Atlas.

QUENOY, Le, a town of France, in the department of the North; five miles N.N.W. of Lille.

QUENTIN, in *Commerce*, a ſmall weight uſed in Germany; the ounce contains two lochs, or eight quentins.

Quentin, *St.*, in *Geography*. See St. Quintin.

QUEPO, a town of Mexico, in the province of Coſta Rica, on the Eſtrella; 70 miles S S.W. of Carthage.

QUERA, a town of Italy, in the Treviſan; 15 miles W. of Ceneda.

QUERALOS, a town of Spain, in Catalonia; 24 miles E. of Urgel.

QUERCERA, in *Medicine*. See Epialos.

QUERCETO, in *Geography*, a town of Etruria; nine miles S.S.W. of Volterra.

QUERCUS, in *Botany*, the Oak, an ancient Latin name, whoſe etymology has been conſidered as very uncertain, if not quite inexplicable. So it well might ſeem to thoſe who looked no further than the Greek or Latin languages; for though ſome have deduced the word from χοιρος, *a pig*, becauſe pigs feed on acorns, this explanation has not proved ſatisfactory. De Theis, on the authority of Lepelletier, has found a much better etymology for *Quercus*, in the Celtic *quer*, fine, and *cuez*, a tree; and this appellation is ſuppoſed to have been appropriated to the oak, not only for the beauty of the tree, but becauſe it bore the ſacred plant, miſeltoe. This tree was alſo called in the Celtic tongue *derw*, whence came the word *druid*, or prieſt of the oak, and even the Greek δρυς, *an oak*, vulgarly ſuppoſed the original of druid. (See Druids.)—Linn. Gen. 495. Schreb. 646. Willd. Sp. Pl. v. 4. 423. Mart. Mill. Dict. v. 4. Sm. Fl. Brit. 1025. Ait. Hort. Kew. v. 5. 287. Juſſ. 410. Tourn. t. 349. Lamarck Illuſtr. t. 779. Gærtn. t. 37. (Ilex; Tourn. t. 350. Suber; ejuſd.)—Claſs and order, *Monoecia Polyandria*. Nat. Ord. *Amentaceæ*, Linn. Juſſ.

Gen. Ch. Male, in a looſe catkin, *Cal.* Perianth of one leaf, bell-ſhaped, membranous, with about five ſmall, ſharp, often cloven ſegments. *Cor.* none. *Stam.* Filaments from four to ten, capillary, ſhort; anthers large, of two round lobes.

Female, from a bud uſually on the ſame tree, *Cal.* Perianth of one leaf, inferior, coriaceous, hemiſpherical, rough, entire, very ſmall in the flower, permanent. *Cor.* none. *Piſt.* Germen ſuperior, ovate, very ſmall; ſtyle ſimple, divided above into from two to five ſegments, longer than the calyx: ſtigmas ſimple, permanent. *Peric.* none. *Seed* an oval or roundiſh coriaceous nut, of one valve, ſmooth, attached by its ſcarred baſe to the bottom of the ſhortiſh, hardened, permanent, cup-like calyx.

Eſſ. Ch. Male, Calyx bell-ſhaped, membranous, lobed. Corolla none. Stamens from five to ten.

Female, Calyx bell-ſhaped, coriaceous, entire, rough. Corolla none. Style one. Stigmas from two to five. Nut coriaceous, embraced at the baſe by the hardened calyx.

This genus, ſo diſtinct in its botanical characters, andſo valuable for its economical uſes, conſiſts, in the *Species Plantarum* of Linnæus, of no more than thirteen ſpecies. The diſcoveries of Thunberg, but eſpecially thoſe of American travellers, aided by the more accurate enquiries of botaniſts, have ſo greatly enriched the ſubject, that Willdenow, who has ſtudied it well, enumerates ſeventy-ſix kinds of *Quercus*, and even theſe are not all that we have to deſcribe. The importance of many ſpecies requires that they ſhould all be particularized. Two or three of the Eaſt Indian ones, now for the firſt time deſcribed, offer ſome exceptions to the generic character of the calyx.

Section 1.—*Adult leaves undivided and entire.*

1. Q. *Phellos*. Deciduous Willow-leaved Oak. Linn. Sp. Pl. 1412. Willd. n. 1. Ait. n. 1. Purſh n. 1. Sm.

in Abbot's Infects of Georgia, v. 2. 181. t. 91. Michaux Querc. n. 7. t. 12. (Q. virginiana, falicis longiore folio, fructu minimo; Pluk. Amalth. 180. t. 441. f. 7.)—Leaves membranaceous, linear-lanceolate, tapering at each end, entire, fmooth, with a fmall point. Nut roundifh.—Native of North America; in low fwampy forefts, near the fea-coaft, from New Jerfey to Florida, flowering in May. *Purfh.* It is faid by Mr. Aiton, on the authority of Knowlton's MSS., to have been cultivated in England by Mr. Fairchild, before the year 1723; and indeed, by the collection at Bulftrode, this tree appears to have been planted there much earlier, among thofe introduced by the firft earl of Portland. It rifes in its native country, as well as in England, to the height of fifty or fixty feet. The *bark* is fmooth; the *wood* is good, and much in ufe, but of flow growth. *Leaves* fcattered, on fhort ftalks, four or five inches long, and not an inch wide, fmooth, thin and pliant, of a fine green, with a willow-like afpect, deciduous, their edges flightly wavy. *Acorns* in pairs, roundifh, fcarcely above half an inch long, with a thin, tuberculated, or teffellated cup. The *leaves* of the young plant are fomewhat angular, or toothed at each fide. There is faid to be a dwarf ftraggling variety, with fhorter *leaves*, which Catefby has figured in his vol. 1. t. 22. Michaux has two fuppofed varieties, which other botanifts eftcem diftinct fpecies; fee the two following. The fpecific name, chofen by Linnæus, is not a good one, φελλος being the cork-tree.

2. Q. *maritima*. Ever-green Willow-leaved Oak. Willd. n. 2. Purfh n. 2. (Q. Phellos maritima; Michaux Querc. n. 7. var. 2. t. 13. f. 3.)—Leaves coriaceous, elliptic-lanceolate, entire, fmooth, with a fmall point. Nut roundifh. —Found on the fea-coaft of Virginia and Carolina, flowering in May and June. This differs from the foregoing in its low fhrubby habit, and firm evergreen *leaves*, which are more elliptical in fhape, and not above two inches long. The whole plant is from three to eight feet only in height. It appears by the accounts of authors to be diftinct from the above-mentioned variety of *Phellos*.

3. Q. *fericea*. Silky Willow-leaved Oak. Willd. n. 3. Purfh n. 3. (Q. Phellos; Sm. in Abb. Inf. v. 2. 101. t. 51. Q. Phellos pumila; Michaux Querc. n. 7. var. 3. t. 13. f. 1, 2.)—Leaves lanceolate-oblong, fomewhat wavy; obtufe at the bafe; rather dilated upwards; filky beneath. Nut almoft globular.—Native of the fea-coaft, from Carolina to Florida, flowering in May. It is perhaps the moft humble of the whole genus, fcarcely ever exceeding two feet in height, and throwing out creeping fcyons, whence it has obtained the name of the Running Oak. The filkinefs of the *leaves* beneath gives them a glaucous appearance.

4. Q. *myrtifolia*. Myrtle-leaved Oak. Willd. n. 4. Purfh n. 4.—"Leaves coriaceous, oblong, entire, fmooth, acute at each end."—Native of Carolina, according to Willdenow, who alone has noticed this fpecies, and from whom Purfh has admitted it into his work. The *branches* are round, brown. *Leaves* an inch, or rather more, in length, coriaceous, evergreen, oblong, fomewhat acute at the bafe; entire and flightly revolute at the margin; fhining above; opaque, but fmooth, beneath; on fhort *footftalks*. The form of the *leaves* is much like the common broad-leaved myrtle. The *flowers* and *fruit* are unknown. *Willd.*

5. Q. *virens*. Live Oak. Ait. Hort. Kew. ed. 1. v. 3. 356. ed. 2. n. 2. Willd. n. 5. Purfh n. 5. Michaux Querc. n. 6. t. 10, 11. (Q. Phellos β; Linn. Sp. 1412. Q. fempervirens; Walt. Card. 234.)—Leaves coriaceous, elliptic-oblong, revolute, entire, pointlefs; obtufe at the bafe; clothed with ftarry down beneath. Fruit ftalked. Nut oblong.—Found near the fea-coaft of North America, in a foil of fand upon clay, from Virginia to Florida and Miffiffippi, flowering in May. Miller cultivated it at Chelfea in 1739, but we know not that this fpecies is ftill preferved, or, at leaft, diftinguifhed from *Q. Ilex*, in our gardens or plantations. It is one of the moft valuable American trees, growing to the height of forty or fifty feet, and extending its *branches*, in open fituations, to a great extent; whence it ferves, by its denfe evergreen *leaves*, to fhelter cattle from the fummer's heat and winter's cold. The *wood* is the fineft and moft durable fhip timber. It is felled towards the end of autumn, and kept three months before it is ufed. Michaux recommends this tree to the notice of the French and Spaniards, as likely to thrive well on the fandy coafts of the Mediterranean, and of the weftern ocean. By his account it fucceeds beft where there is a bafis of clay under the fand, to fix the larger roots. The afpect of the *leaves* is not unlike our European *Q. Ilex*, but they are, except when very young, more uniformly entire, and more fhining; their under fide lefs denfely pubefcent; and their fhort *footftalks*, as well as the mid-rib, reddifh. The foliage of feedling plants, and of vigorous young fhoots, is, indeed, ftrongly toothed. The adult *leaves* are fcarcely more than two inches long, fomewhat oval, or obovate and bluntifh, without any terminal briftle; filky in the fpring; fubfequently of a dark but fhining green, and downy, with ftarry pubefcence, beneath. The *ftamens* are but four or five. *Stalks* of the fruit an inch long. *Acorn* cylindrical, an inch long, with a teffellated, but not rugged or tuberculated, cup. The acorns are faid to be greedily devoured by hogs, and feveral wild animals; and to afford an oil, which the favages of Florida mix with their food.

6. Q. *cinerea*. Afh-coloured Silky-leaved Oak. Willd. n. 6. Ait. n. 3. Purfh n. 6. Michaux Querc. n. 8. t. 14. (Q. humilis; Walt. Carol. 234. Q. Phellos β, fericea; Ait. Hort. Kew. ed. 1. v. 3. 354. Q. Phellos γ; Linn. Sp. Pl. 1412.)—Leaves coriaceous, elliptic-lanceolate, revolute, entire, bluntifh with a fmall point; clothed with ftarry down beneath. Fruit feffile. Nut nearly globofe.—Native of dry barren fituations, and pine forefts, from Virginia to Georgia, flowering in May. Michaux fays it fprings up chiefly on land that, after having been cultivated, becomes abandoned on account of the bad quality of the foil. The form of the *tree* is unfightly, and its fize very variable, from four to twenty feet in height. The *wood* is of no ufe but for firing. *Leaves* longer than in the preceding; the young ones dilated at the top, with three points. *Fruit* nearly or quite feffile, almoft globular, and not much above half an inch long.

7. Q. *microphylla*. Small-leaved Dwarf Oak. Willd. n. 7. Nee in Annal. Scient. Nat. v. 3. 264. Fifch. Mifc. Hifp. v. 1. 99. *Willd.*—"Leaves lanceolate, pointed, entire, villous; downy beneath. Calyx of the fruit villous. Nut roundifh."—Found by Louis Nee, on the hills of Arambaro, in New Spain. A *fhrub*, from three to five feet high, with a rough afh-coloured bark. *Leaves* on fhort ftalks, fcattered, numerous, from four to fix lines long, fcarcely two lines broad, veiny, revolute, wavy, pointed, reddifh-grey; villous above; denfely downy beneath; thofe about the extremities of the branches oppofite. *Stipulas* awl-fhaped, falling off at the clofe of fummer. *Acorns* in axillary pairs, about the ends of the branches, ovate, the fize of a large pea, half covered by the villous cup, which is inveſted with unequal fcales. *Nee.*

8. Q. *falicifolia*. Mexican Willow Oak. Willd. n. 8. Nee in Annal. Scient. Nat. v. 3. 265. Fifch. Mifc. Hifp. v. 1. 101. *Willd.*—"Leaves oblong-lanceolate, entire, fmooth; the forks of the veins villous and brown beneath. Nut oblong."

long."—Found by Lewis Nee, in the kingdom of Mexico, near Acapulco. A *tree* twenty-eight feet high, with alternate *branches;* the young ones ſomewhat furrowed, and clothed with browniſh-red hairs. *Leaves* from five to ſeven inches long, an inch wide, ſcattered, on ſhort ſtalks, rather coriaceous, ſmooth, veiny, entire, wavy, pointed; reticulated and green above; yellowiſh beneath, with tufts of hairs, as big as a pin's head, in the forks of the veins. *Acorns* nearly ſeſſile, in axillary pairs, the ſize of a hazel-nut, downy, half covered by the hemiſpherical, greyiſh, villous cup, beſet with very thin ſcales. *Nee.*

9. Q. *glabra.* Smooth-leaved Japan Oak. Thunb. Jap. 175. Willd. n. 9.—"Leaves lanceolate-oblong, pointed, ſmooth, with parallel veins."—Gathered by Thunberg in Japan. A *tree*, whoſe *branches* grow two or three together, ſlightly ſpreading, rugged and knotty. *Leaves* alternate, ſtalked, lanceolate-oblong, entire, pointed, with parallel ribs (veins); tapering at the baſe; ſmooth on both ſides; ſhining above, yellowiſh beneath. *Spikes* of flowers either ſolitary, or two or three together, downy. *Thunberg.*

10. Q. *concentrica.* Concentric-furrowed Oak. Loureir. Cochinch. 572. Willd. n. 10. "Leaves lanceolate-ovate, pointed, incurved, entire. Calyx lax, very ſhort, furrowed concentrically."—Native of the lofty foreſts of Cochinchina. A large *tree*, whoſe wood is ſerviceable for various uſes. *Branches* aſcending. *Leaves* ſcattered, ſtalked, ſmooth on both ſides. *Acorns* ſtalked, oblong-ovate, ſmooth, red, pointed, their cups ſhort and lax, externally marked with five parallel circular furrows; ſee n. 27.

11. Q. *molucca.* Molucca Oak. Linn. Sp. Pl. 1412. Willd. n. 11. Rumph. Amboin. v. 3. 85. t. 56.—Leaves elliptic-lanceolate, entire, acute at each end, ſmooth. Nut roundiſh, furrowed.—Native of the Molucca iſles. A large and lofty *tree*, whoſe wood is hard and heavy, laſting long under water. *Leaves* ſix or eight inches long and three broad, on ſhort ſtalks, with eight or ten irregular lateral veins. *Acorns* ſhort and roundiſh, furrowed in their upper part; the cup ſhort, warty. By Rumphius's account, there ſeem to be more ſpecies than one comprehended under the chapter above cited, but he does not give us ſufficient marks to define them ſpecifically.

12. Q. *ſpicata.* Cluſter-fruited Oak.—Leaves elliptic-lanceolate, taper-pointed, entire, ſmooth. Spikes axillary, ſolitary, dioecious. Fruit ſpiked, aggregate, ovate.—Gathered by Dr. Francis Buchanan, in woods at Suembu, in Upper Nepaul, flowering in May, 1802. This is a *tree* of vaſt dimenſions, whoſe wood is uſeful, though inferior in quality to that of *Q. annulata*, n. 22. The younger *branches* are angular, clothed with very minute green pubeſcence. *Leaves* alternate, ſtalked, of a broad lanceolate, or elliptical figure, with a taper point, entire throughout, ſix or ſeven inches long, and two and a half wide; bright green, ſmooth and ſhining above; paler, opaque, but ſcarcely pubeſcent, beneath; furniſhed with numerous, parallel, tranſverſe veins. *Footſtalks* not an inch long, depreſſed. *Stipulas* deciduous. *Flowers* in long, linear, downy, pale, ſtraight, ſolitary, axillary *ſpikes;* the males with about eight *ſtamens*, much longer than the calyx, and a roundiſh rudiment of a germen in the centre; females on a ſeparate tree, crowded three together in ſeſſile groups in each ſpike. *Acorns* eatable, but not very good, the ſize and ſhape of a large filberd, even, pointed, dark brown; their cups ſhort, ſcaly. The original natives of Nepaul, or Nawars, know this tree by the name of *Guey Saſki*, or *Pacuſhingali:* their Hindu conquerors, the Parbutties, call it *Arcaula.*

13. Q. *tribuloides.* Caltrop-fruited Oak.—Leaves ovato-lanceolate, taper-pointed, entire, ſmooth. Spikes aggregate. Calyx of the fruit ſpinous, covering the nut.—Diſcovered by the ſame able botaniſt as the preceding, in the foreſts of Upper Nepaul, flowering and fruiting at various ſeaſons. A *tree* with ſmooth *branches*. *Leaves* on ſhort ſtalks, lanceolate, more or leſs ovate, ſomewhat unequal at the baſe, about four inches long, and one and a half broad, rigid and rather coriaceous, with irregular, diſtant, ſlightly curved veins; the upper ſurface poliſhed; the under paler and opaque. *Flowers* monoecious, in ſlender, downy, cluſtered, axillary or terminal, pendulous ſpikes, the male ſpikes moſt numerous. *Stamens* about eight, with a dotted central diſk. *Acorns* ſpiked, ſcattered, ovate, ſmooth, obliquely pointed, about half an inch long, entirely concealed in the greatly enlarged *calyx*, which is downy, globoſe, and armed with very numerous, rigid, prominent, ſharp thorns, a quarter of an inch, or more, in length, ſpreading in every direction. This ſpecies is called *Cattum*, or *Cattunge*, in the Parbutty language; *Shingali*, or *Catu Shingali*, by the Nawars. Its great peculiarity conſiſts in the acorns, which are eatable, being entirely encloſed in a ſtrongly muricated *calyx*, or globoſe cup, which approaches the nature of the cheſnut, *Fagus Caſtanea*, and in ſome of our ſpecimens ſeems even to ſplit into two or three valves. The flowers, however, agree with *Quercus*, to which genus Dr. Buchanan referred this remarkable plant. On one tree he obſerved the *flowers* to be all female.

14. Q. *laurifolia.* Laurel-leaved Oak. Willd. n. 12. Ait. n. 4. Purſh n. 8. Michaux Querc. n. 10. t. 17, 18.—Leaves obovate, entire, ſmooth, nearly ſeſſile; tapering at the baſe. Nut roundiſh, even.—Native of ſhady foreſts, and the ſea-coaſt, in Georgia and South Carolina, flowering in May. This is ſometimes called the Swamp Willow, and was firſt brought alive to England, by the late Mr. Fraſer, in 1786. It riſes to the height of fifty or ſixty feet. Michaux ſpeaks of the wood as of a good quality, but inferior on the whole to that of our fifth ſpecies, *Q. virens.* The *leaves* are crowded about the ends of the branches, deciduous, about four inches long, uſually acute, but ſometimes, as in Michaux's t. 18, remarkably obtuſe. *Acorns* ſolitary, nearly ſeſſile, almoſt globoſe, with a ſcaly cup.

15. Q. *imbricaria.* Shingle Oak. Willd. n. 13. Ait. n. 5. Purſh n. 7. Michaux Querc. n. 9. t. 15, 16.—Leaves elliptic-oblong, acute at each end, entire, almoſt ſeſſile; downy beneath. Nut nearly globoſe.—Native of the banks of rivers among the Allegany mountains, and in the countries to the weſt, rarely to the eaſt of thoſe mountains, flowering in May and June. Brought to England in 1786, by Mr. Fraſer. The *leaves* are twice the ſize of the laſt, acute, but not contracted, at their baſe, and downy on the under ſide. *Acorns* much like the laſt-deſcribed. This *tree* is forty or fifty feet high. Its wood is chiefly uſed, by the French ſettlers in the Illinois country, for making boards to cover houſes, whence the appellation of *Q. imbricaria* in Michaux, and of Shingle Oak among the Engliſh Americans. For although the ſcales of the cup are rather larger than thoſe of *Q. laurifolia*, the ſpecific name does not allude to that circumſtance.

16. Q. *elliptica.* Oval-leaved Mexican Oak. Willd. n. 14. Nee in Annal. Scient. Nat. v. 3. 278. Fiſch. Miſc. Hiſp. v. 1. 117.—"Leaves elliptical, entire, coriaceous, nearly ſeſſile; rounded at each end; roughiſh beneath. Gathered by Louis Nee, but without flowers or fruit, in the kingdom of Mexico, by the road from Ixmiquilpan to Cimapan, as well as between Tixtala and the river Azul. The *trunk* is thick, twelve feet high, with a grey bark. *Branches* horizontal; the ſmaller ſhoots erect;

all

all very leafy. *Leaves* three inches long, and one and a half broad, ſlightly revolute; ſmooth above; roughiſh and veiny beneath, the veins forked. *Footſtalks* thick and very ſhort. *Nee.*

17. Q. *acuta*. Pointed-leaved Japan Oak. Thunb. Jap. 175. Willd. n. 15.—"Leaves oblong, pointed, entire, with parallel veins; rounded at the baſe; downy when young."—Obſerved by Thunberg in Japan. The *branches* are knotty, aſh-coloured, dotted with white, ſmooth downy at the ſummit. *Leaves* alternate, ſtalked, ſmooth, when full-grown; covered at the back, when young, with ruſty down. *Spikes* axillary, clothed with ſimilar pubeſcence. *Thunberg.*

18. Q. *magnoliæfolia*. Magnolia-leaved Oak. Willd. n. 16. Nee in Annal. Scient. Nat. v. 3. 268. Fiſch. Miſc. Hiſp. v. 1. 103.—"Leaves ovate-oblong, coriaceous, entire, ſhining; downy beneath; ſomewhat emarginate at the baſe. Fruit racemoſe."—Found by Louis Nee, in the kingdom of Mexico, between Chilpancingo and Tixtala, and about the river Azul. This is an elegant *tree*, twenty feet, or more, in height. *Trunk* thick, with a dark-coloured bark full of fiſſures. *Branches* horizontal; younger ones furrowed, and dotted with white. *Leaves* ſix or eight inches long, and three broad, ovate, rigid; ſometimes emarginate at the baſe; green and ſhining above; downy beneath, with the larger veins prominent, and the ſmaller reticulated. *Footſtalks* thick, a line in length. *Stipulas* criſped, downy, deciduous. Female *cluſters* ſolitary, axillary, two inches long; the lower ones alternate, upper oppoſite. *Acorns* ovate, half covered by their hemiſpherical cup, which is the ſize of the ſeed of *Cicer arietinum*, its ſcales ſcarcely at all imbricated. *Nee.*

19. Q. *lutea*. Yellow-leaved Mexican Oak. Willd. n. 17. Nee in Annal. Scient. Nat. v. 3. 269. Fiſch. Miſc. Hiſp. v. 1. 105.—"Leaves obovate, entire, ſhining; ſomewhat heart-ſhaped at the baſe; downy and yellow beneath."—Found in Mexico by the ſame celebrated traveller and botaniſt. This agrees with the preceding in its mode of growth, and fructification, inſomuch that it may be thought a variety; yet the *leaves* are very different. They are of a larger ſize, broader towards the end, and contracted towards the *footſtalk*, as well as more deeply emarginate at the baſe; and their under ſide is clothed with ochrey yellow pubeſcence.

20. Q. *ſemecarpifolia*. Marking-nut-leaved Oak.—Leaves obovate, obtuſe, coriaceous, entire; heart-ſhaped at the baſe; downy beneath; the young ones with ſpinous teeth.—Gathered by Dr. F. Buchanan, on the banks of torrents in Upper Nepaul, where its Parbuttie appellation is *Caſſur*, and its Nawar name *Ghirſi*. This is a middle-ſized *tree*, with angular *branches*, clothed when young with ſcaly down. *Leaves* evergreen, alternate, on ſhort thick *ſtalks*, obovate-oblong, four or five inches in length, and two in breadth; more or leſs heart-ſhaped at the baſe; their upper ſurface ſmooth and ſhining; the under opaque, clothed with ruſty down, and furniſhed with numerous, irregular, rather diſtant, tranſverſe, prominent veins; their margin entire, ſlightly wavy. The extremity is uſually rounded and obtuſe, ſometimes abrupt, ſometimes tipped with a little ſpine. On young branches the *leaves* are ſerrated with ſtrong ſpines, or even ſinuated, and clothed on both ſides with ruſty down. *Stipulas* in pairs, awl-ſhaped, erect, permanent, as long as the footſtalks. Dr. Buchanan did not obſerve the *flowers* or *fruit*. The aſpect of the adult *leaves* is much like thoſe of *Semecarpus Anacardium*, or ſome of the entire-leaved ſpecies of *Ficus*.

Section 2.—*Leaves more or leſs toothed or ſerrated.*

21. Q. *glauca*. Glaucous-leaved Oak. Thunb. Jap. 175. Banks Ic. Kæmpf. t. 17. Willd. n. 11. (Kas no ki; Kæmpf. Amoen. 816.)—Leaves obovate, pointed; ſerrated towards the extremity; glaucous beneath. Nut roundiſh.—Gathered near Nagaſaki, in Japan, by profeſſor Thunberg, to whom we are obliged for a ſpecimen. He deſcribes it as a very large *tree*, whoſe *branches* are ſomewhat umbellate, erect, round, purple, ſmooth, except ſome prominent white points. The *leaves* are alternate, about three inches long, and near two broad, with a blunt projecting point; their upper ſurface ſmooth and poliſhed; the under covered with a fine glaucous mealineſs, and marked with prominent, ſtraight, parallel, but rather diſtant, obliquely tranſverſe veins; the margin diſtantly ſerrated upwards. *Footſtalks* about half an inch long, purple. *Flowers* axillary. *Acorns*, by Kæmpfer's figure, axillary, often in pairs, of a roundiſh tumid ſhape, pointed, not an inch long, their cups ſhort, ſeemingly marked with concentric lines; their *ſtalks* ſimple, ſhort and thick.

22. Q. *annulata*. Ring-cupped Oak.—Leaves obovate, pointed; ſerrated in their upper half; ſomewhat glaucous and downy beneath. Fruit ſpiked. Nut oblong. Calyx furrowed concentrically.—Gathered by Dr. Buchanan, at various places in Upper Nepaul, bearing fruit, in December 1802. A very large *tree*, whoſe wood is excellent; the *branches* two or three together, ſmooth. *Leaves* evergreen, rigid, exactly like thoſe of the laſt ſpecies, but ſomewhat ſilky beneath, and leſs glaucous; the young ones very ſilky. *Stipulas* linear, hairy, longer than the footſtalks, deciduous. *Male flowers* in pendulous, hairy, yellowiſh, ſhortiſh ſpikes, ſpringing from buds below the leaves, whoſe ſcales are imbricated in five rows: *female* from three to ſix, in ſolitary, axillary, upright, ſtalked, ſmooth ſpikes, about the length of the footſtalks. *Calyx* of the female flowers globoſe, ſmaller than hempſeed, compoſed of ſeveral concentric imbricated layers, of which the outermoſt is ſmooth and notched, the reſt downy and entire. *Germen* globoſe. *Style* very ſhort and thick. *Stigmas* three, obtuſe. *Acorns* quite ſeſſile on the common flower-ſtalk. *Cup* rather ſmaller than that of our Britiſh oaks, entire and even at the edge, compoſed of ſeven or eight concentric, annular, imbricated, crenate ſcales, externally ſilky. *Nut* ovate, acute, ſmooth and even, twice as long as the cup. The Parbutties call this tree *Phullaat*; the Nawars *Guſhi*, or *Paca ſtringali*.

We find great reaſon to think that it may be, as Dr. Buchanan ſuſpected, the ſame ſpecies with Thunberg's *glauca* laſt deſcribed. The *leaves* of his ſpecimen ſhew a ſlight degree of pubeſcence about the veins, but have not the minute ſilkineſs of our's. The greateſt and moſt eſſential difference, if Kæmpfer be as correct as uſual, conſiſts in the female inflorescence. He delineates the acorns of *glauca* on ſhort, ſimple, axillary *ſtalks*, either ſolitary or in pairs; and Thunberg deſcribes the *flowers* as axillary. In our plant the female *flowers* are indeed axillary, but they compoſe a ſtalked *ſpike*, and neither they nor the *acorns* have any partial ſtalks. Such differences are found between other ſpecies of Oaks, and prove eſſential and invariable. We therefore cannot but, for the preſent at leaſt, rely on Kæmpfer's known fidelity, and propoſe our Q. *annulata* as a diſtinct ſpecies.

23. Q. *lamelloſa*. Many-cupped Oak.—Leaves elliptic-oblong, pointed, ſerrated, many-veined; glaucous and ſomewhat downy beneath. Calyx of many concentric entire layers, as long as the nut.—Diſcovered by Dr. Buchanan, in the more remote woods of Nepaul, bearing fruit in December 1802. In the Nawar language it is called *Tuppaſuſhi*. The *tree* is lofty, with ſmooth bluntly-angular *branches*. *Leaves* alternate, ſix inches in length and two in breadth,

elliptic-oblong, rigid, taper-pointed, ſharply ſerrated; ſmooth and green above; glaucous and often finely downy beneath, with innumerable, prominent, crowded, ſtraight, parallel, moſtly oppoſite, obliquely tranſverſe veins: the aſpect and ſize of the *leaves* much reſembling *Dillenia indica*. *Footſtalks* an inch and half long, tumid at the baſe. *Stipulas* deciduous. Female *flowers* in ſhort axillary ſpikes. *Acorns* ovate, pointed, the ſize of chefnuts, each completely enveloped and concealed by the large, globular, downy *cup*, which is as big as a ſmall apple, and conſiſts of eight or nine diſtinct, concentric, entire, imbricated layers, much more deeply ſeparated than the rings of *Q. annulata*. An approach towards the genus *Fagus*, or *Caſtanea* of ſome authors, may be obſerved, as Dr. Buchanan ſuggeſts, in this ſpecies, which is nevertheleſs a genuine *Quercus*, and far leſs doubtful than our *tribuloides*, n. 13. It proves however that the mere elongation of the acorn, beyond the cup, is not an indiſpenſable character of the preſent genus. See alſo *tomentoſa*, n. 42.

24. Q. *cuſpidata*. Pointed Japan Oak. Thunb. Jap. 176. Willd. n. 19. (Sui, vulgò Sſi no ki; Kæmpf. Amoen. 816.) "Leaves ovate, pointed, ſerrated, ſmooth. Calyx prickly."—Native of Japan, about Nagaſaki. A *tree*, with ſtriated, ſmooth, ſpreading *branches*. *Leaves* alternate, ſtalked, an inch long, ovate, rounded at the baſe, pointed, ſmooth on both ſides, with parallel veins; their upper half ſerrated. *Female flowers* ſcattered over the young branches, ſolitary, nearly ſeſſile. Cup of the *acorn* prickly, the ſize of a hazelnut. *Thunb.* This ſpecies, like n. 13, appears, by its prickly cup, allied to *Fagus;* eſpecially as Kæmpfer, who calls it *Fagus folio fraxini*, deſcribes the dry cup as ſplitting into three, four, or five parts. The *nut* is eaten by the Japaneſe, either raw or cooked.

25. Q. *ſerrata*. Saw-leaved Japan Oak. Thunb. Jap. 176. Willd. n. 20.—"Leaves oblong, ſerrated, villous and downy, with parallel veins."—Native of Japan, flowering in May and June. A *tree*, with alternate, ſmooth, aſh-coloured, knotty, ſpreading *branches*, beſprinkled with white tubercles. *Leaves* alternate, pointed, all acutely and equally ſerrated, furniſhed with ſtraight parallel veins; green above and very ſilky when young; paler beneath, ſilky and downy at firſt, but ſubſequently more ſlightly villous; their length from one to three inches. Male *flowers* in hairy, drooping, long-ſtalked *ſpikes*, each an inch long. Our ſpecimen is in an early ſtate of foliage, nor have we any account of the *fruit*, or female *flowers*.

26. Q. *dentata*. Tooth-leaved Japan Oak. Thunb. Jap. 177. Willd. n. 69. (Koku; Kæmpf. Amoen. 816.)—"Leaves obovate-oblong, obtuſe, deeply toothed; downy beneath."—Native of hills in Japan, flowering in April and May. A *tree*, with thick, erect, rugged, furrowed *branches*, beſprinkled with dots and tubercles; downy at the ſummits. *Leaves* crowded about the extremities, on very ſhort ſtalks, obovate-oblong, obtuſe, with deep teeth deſtitute of ſpines; villous above; downy beneath; pliant, two inches long; their veins parallel. *Thunb.* Kæmpfer ſays the wood is white.

27. Q. *lanata*. Woolly-leaved Nepaul Oak.—Leaves elliptic-oblong, ſharply ſerrated, coriaceous; denſely woolly beneath. Fruit in axillary ſolitary ſpikes. Calyx ſcaly, without prickles.—Native of the mountains of Upper Nepaul, flowering in April. *Buchanan.* The Parbutties call it *Banza*, or *Banja;* the Nawars *Soſhi Shingali*. This is a *tree* of vaſt dimenſions, with a ſcaly bark, and rigid, brown, warty *branches*, clothed, when young, with denſe white down. *Leaves* alternate, ſomewhat two-ranked, ſtalked, elliptic-oblong, ſometimes rather obovate, pointed, from three to five inches in length, and two or more in breadth ſtrongly and ſharply ſerrated, except at the very baſe, which is more or leſs rounded, and occaſionally unequal; the upper ſurface green, ſhining, and naked, (except when young), but not quite ſmooth to the touch; the under clothed with fine, denſe, uniform, white, woolly pubeſcence, and marked with prominent, parallel, but not very crowded, obliquely-tranſverſe veins. *Footſtalks* ſtout, downy, ſcarcely an inch long. *Stipulas* ovate, membranous, deciduous. Male *flowers* in ſhort, denſe, hairy *ſpikes*, at the baſe of the young ſhoots, as they protrude from the bud. *Calyx* with five or ſix teeth. *Anthers* about ſix, ſeſſile. Female *flowers*, as far as Dr. Buchanan could obſerve, on a ſeparate tree, in very ſhort, ſolitary, axillary *ſpikes*. *Acorns* either ſolitary, or ſeveral crowded together, ſmall, ovate, hairy, half covered by their ſcaly unarmed cups.

28. Q. *diverſifolia*. Various-leaved Mexican Oak. Willd. n. 21. Nee in Annal. Scient. Nat. v. 3. 270. Fiſch. Miſc. Hiſp. v. 1. 107. *Willd.*—Leaves ovate, undivided or deeply toothed; yellow and downy beneath. Fruit ſpiked, globoſe.—Found by Louis Nee, between the villages of Chalma and Santa Roſa in New Spain. A *ſhrub*, from ten to fourteen feet high; its *trunk* ſeldom ſtraight; the *bark* cracked, dark-coloured; the *branches* alternate. *Leaves* either an inch and half long, and undivided, or two inches and a half, and deeply toothed; ſmooth and ſhining above; downy, and dull yellow, beneath. *Footſtalks* hardly a line in length. *Stipulas* oblong, reddiſh, membranous, contracted at the baſe, deciduous. *Acorns* four or five, ſeſſile, on a thread ſhaped axillary ſtalk, two inches long. *Cup* the ſize and ſhape of a pea, covered with ſcales. *Nuts* ſcarcely projecting above a line beyond the cup. *Nee.* The *fruit*, being ſeſſile, is evidently ſpiked, not, as the authors quoted term it, racemoſe.

29. Q. *agrifolia*. Holly-leaved American Oak. Willd. n. 22. Nee in Annal. Scient. Nat. v. 3. 271. Fiſch. Miſc. Hiſp. v. 1. 108. *Willd.* Purſh n. 9.—Leaves roundiſh-ovate, ſomewhat heart ſhaped, ſmooth on both ſides, with ſpinous teeth. Fruit axillary, ſeſſile. Scales of the calyx lax. Nut ovate.—Native of the weſt (not eaſt) coaſt of North America, near Monterey, and Nootka ſound. *Nee.* *Branches* ſmooth, aſh-coloured. *Leaves* about two inches long, and almoſt as wide, ſmooth, veiny, nearly heart-ſhaped, bordered with diſtant ſpinous teeth. Spikes of *male flowers* an inch long. *Calyx* ſhorter than the ſtamens. *Anthers* five, two-celled. *Female flowers* axillary, ſeſſile, moſtly two together. *Calyx* hemiſpherical, beſet with lax yellow ſcales. *Nut* thrice as long as the calyx, meaſuring eight lines, ovate, acute. *Nee.*

Plukenet's t. 196. f. 3, cited with doubt by Willdenow and Purſh, appears to belong, as Linnæus thought, to his own *Hippomane ſpinoſa*. The ſhape of the leaves certainly does not agree with the above deſcription, though perfectly anſwerable to Plumier's figure of this *Hippomane*, which is *Sapium ilicifolium* of Willdenow, Sp. Pl. v. 4. 573, who there copies the ſame ſynonym from Linnæus, without any mark of uncertainty.

30. Q. *gramuntia*. Holly-leaved Montpellier Oak. Linn. Sp. Pl. 1413. Willd. n. 23. Ait. n. 6. (Ilex foliis rotundioribus et ſpinoſis, e luco gramuntio; Magn. Monſp. 140.)—Leaves roundiſh-elliptical, nearly ſeſſile, undulated, with deep ſpinous divaricated teeth; denſely downy beneath; ſomewhat heart-ſhaped at the baſe.—Native of the wood of Gramont, near Montpellier, and of Spain. Cultivated in England in 1730. It bloſſoms in June. This is rather a ſmall ſtraggling *tree*, with numerous round grey *branches*, downy when young. *Leaves* evergreen, ſcarcely an inch

long, rigid, broadly elliptical, often nearly orbicular, very much undulated at the margin, their deep broad ſpinous teeth pointing every way; the upper ſurface dark green, rather glaucous, beſprinkled with minute ſtarry hairs; the under denſely clothed with white entangled down. We have ſeen neither *flowers* nor *fruit*. Willdenow appears miſtaken in diſcarding the ſynonym of Magnol, which anſwers extremely well to the Linnæan ſpecimens, though indeed the author ſpeaks of his plant as a variety of *Q. Ilex*. It is, nevertheleſs, true that Linnæus confounded herewith a plant from Magnol's herbarium, which is not diſtinct from *Q. Ilex*.

31. Q. *Ballota*. Sweet-acorn Oak. Desfont. Atlant. v. 2. 350. Willd. n. 24. (Ilex major; Cluſ. Hiſt. v. 1. 23?)—Leaves elliptical, coriaceous; entire or ſerrated; very downy beneath. Bark even. Nut cylindrical, elongated.—Native of ſeveral places in the neighbourhood of mount Athos, according to profeſſor Desfontaines, from whom we have a wild ſpecimen. It flowers in May. This is a large and handſome evergreen *tree*, whoſe *trunk* is from twenty to thirty feet high; the *wood* hard, compact, and very uſeful; the *bark* even, not corky, though full of fiſſures; *branches* downy. *Footſtalks* a quarter of an inch long, downy. *Leaves* various in ſhape, but more or leſs elliptical, an inch or inch and half long; either quite entire, or ſerrated with ſmall ſpinous teeth; their upper ſurface, at leaſt when young, beſprinkled with minute ſtarry hairs; the under always very white and denſely downy. *Male flowers* in copious, long, lax, pendulous *ſpikes*, with uſually ſeven *ſtamens; female* on the ſame tree, axillary, ſolitary or aggregate. *Acorns* cylindrical, an inch and half or two inches long, half an inch in diameter, eatable and very palatable, either raw or roaſted. *Cup* hemiſpherical, covered with numerous, obtuſe, downy, cloſely imbricated ſcales.

32. Q. *Ilex*. Common Evergreen Oak, or Holm Oak. Linn. Sp. Pl. 1412. Willd. n. 25. Ait. n. 7.—Leaves ovate-oblong, acute, coriaceous; entire or ſerrated; hoary beneath. Bark even. Nut ovate. The varieties are; α, with lanceolate entire leaves; Smilax Dalech; Bauh. Hiſt. v. 1. part 2. 101. Suber ſecundus; Matth. Valgr. v. 1. 188, as to the figure: β, with lanceolate ſerrated leaves; Ilex; Matth. Valgr. v. 1. 186. Duham. Arb. v. 1. t. 123: γ, with rounder, leſs rigid, and more or leſs ſerrated leaves; Phellodrys; Matth. Valgr. v 1. 189, as to the figure. Ilex n. 3; Duham. Arb. v. 1. t. 124. This ſpecies occurs in various parts of the ſouth of Europe, and north of Africa, and is hardy, as well as evergreen, with us, thriving particularly near the ſea, though of ſlow growth, flowering in May and June. It uſually forms a large buſhy tree, but occaſionally riſes with a ſtraight naked trunk, and round head, to a great height. The *wood* is hard and heavy, valuable for many purpoſes. The French uſe it for pullies in the navy. The *bark* is hard and even, not corky. *Leaves* various in ſhape and ſize; dark green, convex, and quite ſmooth, above; hoary or downy beneath; their edges either revolute and entire, or irregularly notched and ſerrated. *Footſtalks* half an inch long, downy. *Acorns* uſually two, on an axillary downy ſtalk which is longer than the footſtalk, ovate, hardly an inch long, with a ſcaly downy cup. They are eaten by hogs, but are very different in ſhape and quality from thoſe of the laſt-deſcribed ſpecies. So many varieties, or ſpecies, nearly correſponding with theſe two, are mentioned by authors, that it is difficult to underſtand them. The ſubject requires, and well deſerves, a practical inveſtigation. Lamarck, under the article Chêne, in his dictionary, mentions ſeveral kinds, which he knew but imperfectly, and which we have no means of elucidating further, ſo that we dare not adopt, or attempt to reduce them to order.

33. Q. *Suber*. Cork Tree. Linn. Sp. Pl. 1413. Willd. n. 26. Ait. n. 8. Hunter's Evel. Sylv. 362, with a plate. (Suber; Camer. Epit. 115. S. primus; Matth. Valgr. v. 1. 187. S. latifolium, perpetuò virens; Duham. Arb. v. 2. 291. t. 80. S. latifolium; Ger. Em. 1347, the middle figure only.)—Leaves ovate-oblong, bluntiſh, coriaceous; entire or ſharply ſerrated; downy beneath. Bark cracked, fungous.—Native of the ſouth of Europe, and north of Africa. Duhamel ſays it can hardly bear the climate of the north of France. It lives however in our Engliſh gardens, where it has been kept more than a century. The *bark* is remarkable for a thick ſpongy coat, yielding the well-known ſubſtance called cork. The *leaves* much reſemble the broad variety of *Q. Ilex*, nor do the *acorns* greatly differ from thoſe of that tree. We have not been able to aſcertain what authors mean by th ir *Suber anguſtifolium non ſerratum*, the figure of which, Matth. Valgr. v. 1. 188. Duham. Arb. v. 2. t. 81, we have cited as our firſt variety of *Ilex*. We ſhould ſuſpect the *Suber* itſelf to be altogether a variety of *Ilex*, differing only in the bark; and that there might be a broad and a narrow-leaved variety of each; were not the dwarf tufted ſtumpy habit of the Cork Tree, on the ſandy plains of Italy, Spain, &c. ſo peculiar. Yet this poſſibly may, as well as the nature of the bark, be owing to the ſoil, for in ſtrong ground the cork, according to Duhamel, degenerates. Willdenow ſays "the *leaves* of *Q. Suber* are a little elongated at the baſe, running down into the *footſtalk*, which is not the caſe with *Ilex*;" but this character ſeems ſcarcely permanent.

34. Q. *coccifera*. Kermes Oak. Linn. Sp. Pl. 1413. Willd. n. 27. Ait. n. 9. (Ilex coccifera; Camer. Epit. 774. I. aculeata cocciglandifera; Garid. Aix. 245. t. 53. Niſſole in Mem. de l'Acad. des Sciences for 1714. 435. t. 17, 18. I. coccigera; Ger. Em. 1342.)—Leaves elliptic-oblong, rigid, ſmooth on both ſides, with ſpreading, briſtly, ſpinous teeth. Nut ovate. Calyx with ſpreading pointed ſcales.—Native of the ſouth of Europe, and the Levant, flowering in the ſpring. This is a buſhy evergreen *ſhrub*, celebrated for producing the *kermes*, a valuable article of dyeing, before the introduction of cochineal, and which afforded the *color kermeſinus*, or crimſon. The *kermes* is an inſect, of the genus *Coccus*, which ſticks to the branches, in the form of a red ball, the ſize of a pea. It is now out of uſe among dyers, and is only uſed by French apothecaries. The *leaves* of this ſhrub are, at moſt, but half the ſize of the laſt, though they vary much in magnitude as well as figure. They are diſtinguiſhed by their rigidity, ſmoothneſs on both ſides, and their prominent needle-like marginal prickles. The ſcales of the mature *calyx* are alſo much more elongated and prominent than in *Ilex* or *Suber*, and of an angular awl-ſhaped figure.

35. Q. *Pſeudo-coccifera*. Baſtard Kermes Oak. Desfont. Atlant. v. 2. 349. Willd. n. 28.—Leaves elliptic-oblong, rigid, ſmooth on both ſides, with ſpinous ſerratures. Nut ovate. Calyx with flat, ſlightly ſpreading, ſcales.—Obſerved by Desfontaines at Algiers and about mount Athos. At Tunis it is called the "meal-bearing oak," probably from the uſe of the acorns as food. This is a *tree*, from fifteen to twenty feet high, with round *branches*, clothed with ruſty down when young. The *leaves* are twice or thrice as large as thoſe of *Q. coccifera*, thicker and leſs wavy, with much ſmaller and ſhorter ſpinous ſerratures, rather than teeth. *Calyx* clothed with numerous, flat, ſhort, ſlightly ſpreading ſcales. *Nut* ovate, pointed. Willdenow, not having ſeen a ſpecimen, has miſunderſtood the

the nature of the *calyx*, and has in other reſpects altered Desfontaines' ſpecific character for the worſe.

36. Q. *rigida*. Rigid-leaved Oak. Willd. n. 29.—(Ilex aculeata cocciglandifera, glande maximâ, nunc cylindraceâ, nunc ſubrotundâ, cupulâ echinatâ; Tourn. Cor. 40?—"Leaves oblong, undivided, with ſpinous ſerratures, ſmooth; glaucous beneath; heart-ſhaped at the baſe. Footſtalks bearded at the ſummit. Scales of the calyx of the fruit rigid, ſpreading."—Native of the coaſt of Caramania. *Willdenow*. A pretty ſpecies, ſufficiently diſtinct from its allies. *Branches* pale brown, dotted. *Leaves* oblong, an inch or rather more in length, rigid, with ſpinous ſerratures; deep green and ſhining above; glaucous beneath; cordate at the baſe. *Footſtalks* very ſhort, ſmooth, except at the top, where a line of browniſh hairs, on each ſide, runs up the midrib. *Calyx* of the fruit ſeſſile, beſet with rigid, woody, lanceolate, ſpreading ſcales. *Willd.*

A ſpecimen before us, gathered by the late Dr. Brouſſonet at Algiers, anſwers preciſely to this deſcription, eſpecially in the curious character of the hairy lines, running a little way up the midrib of the leaf; but the foliage is equally green and ſhining on both ſides. The *calyx* reſembles that of *coccifera*, but its inner ſcales are longer, and more ſpreading.

37. Q. *rotundifolia*. Round-leaved Spaniſh Oak. Lamarck Dict. v. 1. 723. Willd. n. 30.—"Leaves obovate-oblong, abrupt, with ſpinous teeth; heart-ſhaped at the baſe; ſmoothiſh above; downy beneath."—Native of Spain. Seen by Lamarck, in a young ſtate, in the garden of Monſ. Cels, and by Willdenow dry without fructification. The *branches* are round and downy. *Leaves* ſtalked, an inch or more in length; glaucous-grey, and not quite ſmooth, above; white and cottony beneath. The *acorns* are ſaid to be large and long, eatable like cheſnuts. This deſcription is not inapplicable, on the whole, to our n. 31, *Q. Ballota*.

38. Q. *humilis*. Dwarf Portugueſe Oak. Lamarck Dict. v. 1. 719. Willd. n. 31. Ger. Em. 1340. (Q. pedem vix ſuperans; Bauh. Pin. 420. Robur 7; Cluſ. Hiſt. v. 1. 19.)—Leaves obovate, with ſpinous ſerratures; heart-ſhaped at the baſe; downy beneath. Calyx of the fruit flattened. Nut oblong.—Found by Cluſius in barren ſandy ground near Liſbon, very abundantly. The whole plant is rarely more than a foot high when wild; though Lamarck ſays it becomes twice or thrice as tall by culture. The young *branches* are downy. *Leaves* an inch, or inch and half long, on ſhort *footſtalks*; ſmooth and ſhining above; downy and hoary beneath; their larger veins ſtraight and parallel. The *acorns* are deſcribed as more bitter than our common oak, their form oblong, their cups remarkably ſhort and flattened.

39. Q. *luſitanica*. Portugueſe Gall Oak. Lamarck Dict. v. 1. 719. Willd. n. 32. (Q. valentina; Cavan. Ic. v. 2. 25. t. 129? Robur 4; Cluſ. Hiſt. v. 1. 18, and R. 5; ibid. 19. Galla five Robur majus; Ger. Em. 1348, and G. minor; ibid. 1349.)—"Leaves elliptical, with deep pointed ſerratures; downy beneath. Fruit racemoſe. Calyx hemiſpherical. Nut oblong."—Native of Portugal, and perhaps Spain. Lamarck ſays this ſpecies conſiſts of ſeveral varieties, all very low *ſhrubs*, ſubject to bear galls; their *branches* copious and ſlender; their *leaves* ſmall, intermediate in form between the evergreen and the ordinary oaks of Europe. Willdenow deſcribes the *leaves* an inch in length, oblong, obtuſe, rigid; their ſerratures ſomewhat pointed; the upper ſurface poliſhed and ſmooth; the under hoary with ſlender, ſtarry, crowded hairs. *Footſtalks* ſhort. *Fruit* racemoſe, or rather, as we ſhould imagine, ſpiked. He adds that the figure of Cavanilles ſcarcely anſwers to the plant in queſtion; and indeed that author deſcribes his as a lofty *tree*, taller than *Q. Ilex*, with deciduous *leaves*, and large, ſolitary *acorns*. We have ſeen no ſpecimen.

40. Q. *infectoria*. Oriental Gall Oak. Olivier's Travels, Engliſh edition, v. 2. 42. t. 14, 15. Willd. n. 33.—Leaves ovate-oblong, very ſmooth on both ſides, deeply toothed, ſomewhat ſinuated, deciduous. Fruit ſeſſile. Calyx teſſellated. Nut elongated, nearly cylindrical.—This oak, according to Olivier, is ſcattered throughout all Aſia minor, from the Boſphorus as far as Syria, and from the coaſts of the Archipelago, as far as the frontiers of Perſia. It ſeldom attains the height of ſix feet, and the *ſtem* is crooked, with the habit of a *ſhrub* rather than a *tree*. The *leaves* are an inch or inch and half long, deciduous, bright green, ſmooth on both ſides, but paler beneath; their ſerratures deep and broad, not acutely pointed. *Fruit* ſolitary, nearly ſeſſile. *Cup* ſlightly downy, its ſcales not very diſtinct. *Acorn* two or three times longer than the cup, ſmooth, nearly cylindrical. The galls produced on the young branches of this oak, from the puncture of a ſpecies of *Diplolepis*, are preferred to all others for dyeing, and are a great article of the Levant trade. (See GALLS.) Olivier obſerves that the plant bears a number of different galls, beſides the above, which are neglected, as uſeleſs.

41. Q. *mucronata*. Pointed-toothed Mexican Oak. Willd. n. 34. (Q. caſtanea; Nee in Annal. Scient. Nat. v. 3. 276. Fiſch. Miſc. Hiſp. v. 1. 114. *Willd.*)—"Leaves oblong-lanceolate, with pointed awned ſerratures; poliſhed above; downy beneath; heart-ſhaped at the baſe."—Found by Louis Nee, without flowers or fruit, in New Spain, between Ixmiquilpan and Cimapan. The *tree* is twelve feet high, with a ſtraight *trunk*, covered with a brittle dark-coloured *bark*. *Branches* erect, alternate, ſmooth, much ſub-divided. *Leaves* three inches long, and one broad, acute; abrupt and heart-ſhaped at the baſe, their ſerratures awned; the upper ſurface green and ſmooth; the under clothed with fine yellow down. *Footſtalks* two lines long. *Stipulas* none. *Nee.*

42. Q. *tomentoſa*. Downy Mexican Oak. Willd. n. 35. (Q. peduncularis; Nee in Annal. Scient. Nat. v. 3. 270. Fiſch. Miſc. Hiſp. v. 1. 106. *Willd.*)—"Leaves oblong-ovate, with tooth-like notches; denſely downy beneath. Fruit racemoſe. Nut globoſe, nearly covered by the calyx."—Native of New Spain, in the road from Mexico to Acapulco, beyond the river Meſcala. A *tree*, twenty feet high, with an upright *trunk*, and grey brittle *bark*. *Branches* numerous, alternate, clothed with denſe reddiſh wool. *Leaves* five inches long, hardly two wide, crowded; obtuſe at the baſe; pointed at the end; bordered with tooth-like notches; green and ſmoothiſh above; downy, with prominent veins, beneath. *Footſtalks* downy, very ſhort. *Female flowers* on an axillary ſolitary ſtalk, three or four inches long. *Acorns* but little bigger than pepper-corns, each almoſt entirely concealed in its ſcaly, downy, reddiſh cup. *Nee.* This ſpecies agrees with our thirteenth, *tribuloides*, in having its acorn concealed by the cup. The *fruit* is deſcribed, by the authors we are obliged to copy, as *racemoſe*. We have ſeen no ſpecimens, but analogy would induce us to ſuppoſe it rather *ſpiked*.

43. Q. *circinata*. Round-toothed Mexican Oak. Willd. n. 36. Nee in Annal. Scient. Nat. v. 3. 272. Fiſch. Miſc. Hiſp. v. 1. 109. *Willd.*—"Leaves ovate, crenate, undulated; acute at each end; downy beneath. Nut ſcarcely longer than the calyx."—Native of New Spain, between Tixtala and Chilpancingo. A *tree* twenty or twenty-five feet high. *Trunk* erect. *Bark* brittle, aſh-coloured. *Branches* horizontal; the young ones erect, furrowed,

rowed, villous. *Leaves* alternate, from five to ſeven inches long, and three broad; green and ſhining above; more or leſs downy, and fleſh-coloured, or reddiſh-brown, beneath; the margin undulated and crenate, the notches rounded, their edges turned towards the point of the leaf. *Fruit* ſupported by a very ſhort common ſtalk. *Calyx* hemiſpherical, the ſize of Chick peas, *Cicer arietinum;* its ſcales acute at the point. *Nut* but little larger than the calyx. Plukenet's t. 54. f. 3, in ſome meaſure reſembles the ſpecies before us, but is ſaid to have a large fruit, and is cited by authors as *Q. Prinus*. *Nee.*

44. Q. *ſplendens*. Silky-leaved Mexican Oak. Willd. n. 37. Nee in Annal. Scient. Nat. v. 3. 275. Fiſch. Miſc. Hiſp. v. 1. 113. *Willd.*) "Leaves oblong-ovate, bluntly toothed; ſlightly downy above; denſely ſilky beneath."—Native of New Spain, near Taxala. *Trunk* erect, much branched, fifteen feet high. *Branches* partly horizontal, partly erect, clothed with red ſhining down. *Leaves* ſcattered, crowded, three inches long, and an inch and half broad; green, with a thin downy coat, above; thickly clothed beneath with ſhining pubeſcence, the midrib only being prominent; their edges bluntly and unequally toothed. *Footſtalks* very ſhort, with an awl-ſhaped villous *ſtipula* at each ſide. *Flowers* and *fruit* not obſerved. *Nee.*

45. Q. *rugoſa*. Rugged Mexican Oak. Willd. n. 38. Nee in Annal. Scient. Nat. v. 3. 275. Fiſch. Miſc. Hiſp. v. 1. 112. *Willd.*—"Leaves ovate-oblong, coriaceous, rugoſe; toothed towards the end; heart-ſhaped at the baſe; downy and ruſty beneath."—Native of the woods of Huiſquiluca and Ocuila, in the way from Mexico to Santo Chriſto de Chalma. A middle-ſized *tree*, having numerous, alternate, round, grey *branches*, rough with minute prominent points. *Leaves* three inches in length, hardly two in breadth, thick and coriaceous; rugged, green and ſhining on the upper ſide; brown and downy at the back; heart-ſhaped at the baſe; the margin toothed from the middle to the extremity. *Footſtalks* two lines long, thickened at their baſe. *Female flowers* in ſcaly axillary cluſters. *Nee.*

46. Q. *macrophylla*. Large-leaved Mexican Oak. Willd. n. 39. Nee in Annal. Scient. Nat. v. 3. 274. Fiſch. Miſc. Hiſp. v. 1. 111. *Willd.*—"Leaves obovate, crenate; tapering and heart-ſhaped at the baſe; downy beneath. Fruit ſpiked."—Found by Louis Nee, the diſcoverer likewiſe of the five preceding ſpecies, in the diſtricts of Chilpancingo and La Curva, and on the mountains of Quirapu, in New Spain. This is a *tree*, thirty feet high, with a ſtout upright *trunk*, and denſe *head*. The principal *branches* are horizontal; the reſt upright, furrowed when young. *Leaves* a foot long, and ſeven or eight inches broad; rounded at the end; gradually tapering down to the emarginate, or heart-ſhaped, baſe, where they meaſure only four lines acroſs; their upper ſurface green and ſhining; the under yellowiſh, clothed with very minute down; the margin crenate and wavy. *Footſtalks* very ſhort and thick. *Female flowers* ſeſſile on a common ſtalk, and encompaſſed with downy *bracteas*. *Nee.*

47. Q. *Prinus*. Cheſnut-leaved White Oak. Linn. Sp. Pl. 1413. Willd. n. 40. Ait. n. 10. Purſh n. 30. (Q. Prinus, var. 1, paluſtris; Michaux Querc. n. 5. t. 6. Q. caſtaneæ foliis, procera arbor virginiana; Pluk. Almag. 309. Phyt. t. 54. f. 3 Cateſb. Carol. v. 1. t. 18.)—Leaves on longiſh ſtalks, obovate, acute; ſomewhat downy beneath; with nearly equal, dilated, callous-tipped, tooth-like ſerratures. Calyx of the fruit contracted at the baſe. Nut ovate. Found in low ſhady moiſt woods, and on the banks of rivers, from Pennſylvania to Florida, flowering in May. It appears to have been known in England in 1730. This is one of the talleſt trees produced in the ſouthern parts of the United States, and remarkable for the beauty of its form, as well as the large ſize of its *acorns*, which are plentiful and ſweet, a delicious and beneficial food for hogs and other wild animals. The *wood* is excellent, much uſed for making wheel-carriages, and yet ſo readily ſplit as to ſerve for baſket-work and brooms. The *leaves* are ſix inches, or more, in length, and three broad; ſilky in the ſpring; ſmooth and glaucous in ſummer; ſometimes very downy on old trees. *Footſtalks* an inch long. *Stamens* five to ten. *Acorns* an inch and half long, ovate; their cups ſhallow, covered with numerous cloſely-imbricated ſcales. Michaux ſays the *bark* is whitiſh, peeling off in long ſtrips.

48. Q. *Chinquapin*. Chinquapin, or Dwarf Cheſnut Oak. Purſh n. 34. (Q. prinoides; Willd. n. 41. Q. Prinus, var. 4, pumila; Michaux Querc. n. 5. t. 9. f. 1. Q. Prinus Chinquapin; Michaux Arb. v. 2. 65. t. 10, good. *Purſh.*)—Leaves on ſhort ſtalks, obovate, ſmooth; glaucous beneath; tapering at the baſe; with nearly equal, dilated, acute, callous-tipped, tooth-like ſerratures. Calyx of the fruit hemiſpherical. Nut ovate.—Found on dry mountainous lands, from Pennſylvania to Carolina, flowering in May, when, according to Mr. Purſh, it is highly ornamental. This is a humble *ſhrub*, not above three or four feet high. The young *leaves* are whitiſh and downy beneath; the adult ones ſmooth and glaucous, ſcarcely above one-third the ſize of the preceding. *Female flowers*, according to Michaux, ſmall, two or three together, on a ſhort, ſolitary, axillary *ſtalk*. *Acorns* of a middling ſize, with a thin, nearly hemiſpherical, cup.

49. Q. *montana*. Rock Cheſnut Oak. Willd. n. 42. Purſh n. 32. (Q. Prinus; Sm. in Abbot's Inſ. v. 2. 163. t. 82. Q. Prinus, var. 2, monticola; Michaux Querc. n. 5. t. 7.)—Leaves on ſhortiſh ſtalks, obovate, acute; downy and white beneath: with nearly equal, dilated, ſhort, blunt, callous-tipped tooth-like ſerratures. Fruit in pairs, on ſhort ſtalks. Calyx hemiſpherical, with rugged ſcales. Nut oblong-ovate.—Found abundantly, in rocky ſituations, on the mountains of North America, from New England to Carolina, flowering in May. Michaux ſuggeſts that this ſpecies would be well worth cultivating in Europe. The *tree* riſes to the height of ſixty feet; the *wood* is tough and very uſeful, the *bark* excellent for tanning. It differs from *Q. Prinus*, n. 47, with which it has been confounded, in the conſtant white downineſs of the under ſide of the *leaves*, which are much ſmaller and leſs dilated upward. The *acorns* moreover are but half the ſize of that ſpecies, and more oblong, two together on a very ſhort ſtalk.

50. Q. *bicolor*. Swamp White Oak. Willd. n. 43. Purſh n. 31. (Q. Prinus, var. 5, tomentoſa; Michaux Querc. n. 5. t. 9. f. 2. Q. Prinus diſcolor; Michaux Arb. v. 2. 46. t. 6. *Purſh.*)—Leaves nearly ſeſſile, obovate; downy and white beneath; with very broad, unequal, obtuſe, callous-tipped, lobe-like teeth. Fruit in pairs, on long briſtle-pointed ſtalks. Calyx hemiſpherical. Nut oblong-ovate.—Native of low wet woods, from Pennſylvania to Carolina, flowering in May. *Purſh.* It grows to a very large *tree*. The *leaves* have extremely broad ſhallow teeth, or, as they might be called, lobes, approaching to the figure of our common Engliſh Oak leaves; their under ſide white and very downy. The *acorns* are ſweet and eatable, like moſt of the *Prinus* tribe. Willdenow ſays the teeth are occaſionally variable in ſize, one or two of them being ſometimes remarkably elongated; and that the baſe of the *leaf* is more entire than in the foregoing.

51. Q. *Caſtanea*. Yellow Oak. Willd. n. 44. Purſh n. 33. (Q. Prinus, v. 3, acuminata; Michaux Querc. n. 5. t. 8.)

t. 8.)—Leaves on long footſtalks, oblong-lanceolate, pointed; ſomewhat downy beneath; with numerous, nearly equal, dilated, acute, callous-tipped, tooth-like ſerratures. Calyx hemiſpherical. Nut roundiſh-ovate.—Found in the Allegany mountains, and on the banks of the Delaware, flowering in May. *Purſh.* Michaux ſays it occurs in all the fertile countries to the weſt of thoſe mountains; and as the temperature of that climate agrees with the north of Europe, the tree in queſtion would be well worth trying here. The *wood* is excellent; *bark* very ſerviceable in tanning; and the *acorns* ſweet. The *tree* is large and handſome, ſeventy or eighty feet high. *Leaves* much like thoſe of our Sweet Cheſnut in form, but glaucous and often downy beneath. *Acorns* much rounder than in any of the four preceding, and ſhorter in proportion to the cup. Theſe Cheſnut Oaks, *Prinus* and its allies, ſeem not to have as yet attracted the notice of European cultivators, perhaps from their having been improperly confounded by botaniſts. The above accounts of their diſtinctions, and their valuable qualities, it is hoped, may cauſe them to be ſought out, and introduced into this country. Their different acorns might ſurely be eaſily imported.

Section 3.—*Leaves lobed at the extremity.*

52. Q. *aquatica.* Water Oak. Soland. in Ait. Hort. Kew. ed. 1. v. 3. 357. ed. 2. n. 11. Willd. n. 45. Purſh n. 11. Michaux Querc. n. 11. t. 19. t. 20. f. 1, 3, 4, 5, and t. 21. (Q. foliis cuneiformibus, obſoletè trilobis, intermedio productiore; Gron. Virg. 149. Q. folio non ſerrato, in ſummitate quaſi triangulato; Cateſb. Carol. v. 1. t. 20. Herb. Linn.)—Leaves wedge-ſhaped, ſmooth; tapering at the baſe; dilated and obſcurely three-lobed at the end, the middle lobe largeſt. Calyx nearly hemiſpherical. Nut roundiſh.—Native of ſwamps in North America, from Maryland to Florida, bloſſoming in May. Miller is ſaid to have cultivated this ſpecies in 1748, but it is little known in England. The *tree* is forty feet high; its wood, according to Purſh and Michaux, is little eſteemed; but the latter is of opinion that it might prove more valuable if felled in winter; he mentions alſo that the tree is not peculiar to ſwamps, or inundated meadows, but occurs ſometimes in dry ſandy ground, as on plains near the ſea-coaſt of Florida. Few trees vary ſo much in the ſhape of their *leaves*, according to age or ſituation, as this. The proper form of its *foliage* is wedge-ſhaped, much elongated and tapering at the baſe; dilated, rhomboid, or very ſlightly and bluntly three-lobed at the extremity; the edges entire; both ſides uſually ſmooth. *Footſtalks* variable in length, but rather ſhort; clothed, when young, with ſtarry hairs, which are ſometimes ſcattered over the back of the young leaf. Some of its *leaves* however, even on the ſame tree, are deeply three-lobed; and thoſe of young plants are, the firſt year, oblong and quite entire; the next two or three ſeaſons, variouſly toothed and ſinuated; inſomuch that botaniſts know not well how to diſtinguiſh its varieties from ſome of the following ſpecies. The *acorns* are ſhort and roundiſh, with a ſhallow cup, and ſtand generally in pairs, on ſhort ſtalks.

53. Q. *nigra.* Barren Oak, or Black Jack. Linn. Sp. Pl. 1413. Willd. n. 46. Ait. n. 12. Purſh n. 15. Sm. in Abbot's Inſ. v. 2. 115. t. 58. Michaux Querc. n. 12. t. 22, 23. (Q. marylandica, folio tritido, ad ſaſſafras accedente; Cateſb. Carol. v. 1. t. 19.)—Leaves wedge-ſhaped; ſomewhat heart-ſhaped at the baſe; dilated, abrupt, and very ſlightly three-lobed at the end; the middle lobe ſhorteſt; ſmooth above; ruſty beneath. Calyx hemiſpherical, with membranous ſcales. Nut roundiſh-ovate.—In barren ſandy or gravelly woods, from New Jerſey to Florida, flowering in May. This tree is of low growth, eſpecially in the more northern ſtates. It bears abundance of acorns, very good food for hogs. The wood is ſmall, but excellent for fuel. *Purſh.* The *leaves* are twice or thrice the ſize of the laſt, ſingularly dilated, and abrupt, at the end; their lobes, when young, more evident, and each tipped with a briſtle, which ſoon falls off. *Acorns* moſtly in pairs, nearly ſeſſile, with very ſcaly cups.

54. Q. *triloba.* Downy Black Oak. Willd. n. 47. Ait. n. 13. Purſh n. 14. Michaux Querc. n. 14. t. 26. (Q. rubra; Abbot's Inſ. v. 1. 99. t. 50.)—Leaves wedge-ſhaped, with three terminal, briſtly-pointed lobes, the middle one longeſt; downy beneath. Calyx of the fruit flattiſh. Nut nearly round.—Native of barren tracts, near the ſea-coaſt, from New Jerſey to Georgia, flowering in May. It was brought to England in 1800, by Meſſrs. Fraſer. The *tree* is fifty or ſixty feet high, of rapid growth, even in a poor ſoil. Michaux deſcribes it as very fit for making live fences; though the wood is moſt generally uſed in America for paling. The *leaves* are much ſmaller than thoſe of *Q. nigra*, rounded, not heart-ſhaped, at the baſe, and with longer *footſtalks*. Their lobes are direct, not laterally dilated, each tipped with one or more ſmall briſtles, and the under ſide is covered with denſe white down. The *foliage* of young ſhoots, that ſpring up where foreſts of this tree have been burnt, are often near a foot long, deeply pinnatifid, and ſharply lobed; as repreſented in Michaux, t. 26. f. 2.

55. Q. *nana.* Dwarf Jagged Oak. Willd. n. 48. Purſh n. 13. (Q. aquatica; Sm. in Abbot's Inſ. v. 2. 117. t. 59. Q. aquatica elongata; Ait. n. 11, γ.)—Leaves oblong-wedge-ſhaped, ſmooth, ſomewhat ſinuated; three-lobed at the extremity: lobes divaricated, pointed, the middle one largeſt; forks of the vein downy beneath.—In barren lands, called pine-barrens, of South Carolina, flowering in May. Purſh deſcribes it as "a low-growing ſpecies, always keeping diſtinct from *Q. aquatica.*" The *leaves* are almoſt ſeſſile, two or three inches long, much more diſtinctly lobed than in *aquatica* or *nigra*, and more ſinuated or angular beſides, than in any of the three laſt deſcribed. The *acorns* are almoſt globular, with a very ſhallow cup.

Section 4.—*Leaves ſinuated, with pointed lobes.*

56. Q. *hemiſphærica.* Hemiſpherical Oak. "Bartram's Travels 320." Willd. n. 49. Purſh n. 12. (Q. aquatica maritima; Michaux Querc. n. 11. t. 20. f. 2.)—"Leaves evergreen, oblong-lanceolate; undivided, three-lobed, or ſinuated; ſmooth on both ſides; lobes pointed." *Willd.*—Native of Georgia and Florida. Some of the *leaves* are very deeply three-lobed, or pinnatifid; others linear-oblong and undivided. Willdenow ſays they are evergreen, and that the *foliage* of the young plant is ſo like *Q. Phellos*, our firſt ſpecies, as to be hardly diſtinguiſhable. Michaux, however, aſſerts this ſuppoſed ſpecies to be but a maritime variety of *aquatica*, and Purſh thinks it a young plant of that kind.

57. Q. *elongata.* Downy-leaved Oak. Willd. n. 50. Ait. n. 14. (Q. falcata; Michaux Querc. n. 16. t. 28. Purſh n. 22. Q. diſcolor; Ait. ed. 1. v. 3. 358.)—Leaves downy beneath, ſinuated, with three or more ſomewhat falcate, briſtle-pointed lobes; the terminal one elongated, jagged. Calyx hemiſpherical.—In ſandy ſoil, near the ſea-coaſt; from New Jerſey to Georgia, flowering in May. A very large *tree*, commonly called Spaniſh Oak; in the ſouthern ſtates, Red Oak. *Purſh.* The height of the *tree* is fifty or ſixty feet. *Leaves* on long ſtalks; obtuſe or rounded at the baſe; deeply lobed, or in ſome meaſure palmate; the lobes often recurved, or ſickle-ſhaped; taper-pointed, and more or leſs notched at the end, each ſegment tipped with a long briſtle. *Acorns* ſmall, roundiſh; its cup hemiſpherical, with lax

lax ſcales. The *leaves* of young trees are ſaid to be very like thoſe of *triloba*, n. 54.

58. Q. *tinctoria*. Dyers' Oak, Black Oak, or Quercitron. Willd. n. 51. Ait. n. 15. Purſh n. 16. (Q. tinctoria anguloſa; Michaux Querc. n. 13. t. 24. Q. diſcolor; Willd. Arb. 274.)—Leaves downy beneath, obovate-oblong, dilated, widely ſinuated; lobes ſhort, obtuſe, ſlightly toothed, briſtle-pointed. Calyx of the fruit flat underneath. Nut globoſe.—In all large woods, particularly in the mountainous parts, from New England to Georgia, flowering in May. It is one of the largeſt trees of the American foreſt, highly valuable for its timber, as well as bark, which laſt is ſo very ſuperior in tanning to any other ſpecies of Oak. *Purſh*. Michaux ſays, this Oak is found only in a good ſoil, always at a diſtance from the ſea; attaining its greateſt ſize, which is eighty feet in height, and eight in diameter, in the vallies between the high mountains of North Carolina. The bark is uſed by tanners, throughout the north and weſt parts of the United States. It gives a yellowiſh colour, whence the name of Quercitron, and which enhances the value of the leather. The bark, bruiſed and powdered, was in great requeſt among dyers in France, before the war interrupted this branch of commerce. The *leaves* are conſpicuous for their broad, angular, abrupt figure, a ſpan long, and nearly as wide, with ſhallow ſinuſes, and briſtle-tipped angles. *Acorns* almoſt ſeſſile, globular, with a ſcaly, ſhallow, flattiſh cup.

59. Q. *diſcolor*. Sinuous Dyers' Oak. Willd. n. 52. Purſh n. 17. Sm. in Abbot's Inſ. v. 2. 111. t. 56. (Q. tinctoria ſinuoſa; Michaux Querc. n. 13. t. 25. Q. virginiana, venis rubris muricata; Pluk. Phyt. t. 54. f. 5.)—Leaves downy beneath, oblong, pinnatifid; leaves oblong, toothed, briſtle-pointed. Calyx turbinate. Nut ovate.—In large foreſts, from Pennſylvania to Carolina, flowering in May. This reſembles the preceding and *Q. coccinea*, n. 61. The young expanding *leaves* are covered with white down on both ſides, which is not the caſe with either *rubra* or *coccinea*. *Purſh*. This differs from the laſt in having much more ſinuated, or pinnatifid *leaves*, and larger, more ovate, *acorns*, whoſe cups are turbinate, or tapering at the baſe. The qualities of the wood and bark probably agree with the *tinctoria*, or Michaux, who conſiders the preſent plant as but a variety, would have mentioned the contrary.

60. Q. *rubra*. Mountain Red Oak. Linn. Sp. Pl. 1413. Willd. n. 53. Ait. n. 16. Purſh n. 20. Michaux Querc. n. 20. t. 35, 36. Abbot's Inſ. v. 2. 205. t. 103. (Q. eſculi diviſura, foliis amplioribus aculeatis; Pluk. Phyt. t. 54. f. 4.)—Leaves ſmooth, oblong, ſinuated, on long ſtalks; lobes acute, ſharply toothed, briſtle-pointed. Calyx of the fruit flat underneath. Nut ovate.—Native of foreſts on a fertile ſoil, from Canada to Pennſylvania, and in all the country weſt of the Allegany mountains, bloſſoming in May. It was cultivated by Miller before 1739, and is to be found in ſeveral plantations. A large and handſome timber *tree*, of rapid growth; its *wood* highly uſeful for building and for carriages; and the *bark* is ſaid by Michaux to be the very beſt known for tanning, the European tanners, ſettled in America, having found it, by experiment, more efficacious than any of the oak barks of Europe. The *tree* is ninety or one hundred feet high. *Leaves* four or five inches long, on *footſtalks* about half that length; unequally ſinuated or pinnatifid, with rather ſpreading, but not remote, lobes, whoſe ends are very acute, as well as, here and there, ſharply toothed, each tooth and point tipped with a long briſtle. *Acorns* rather large, ovate, with a ſhortiſh flat-bottomed cup. The *leaves* turn of a deep red in autumn, which hue is common to moſt American trees and ſhrubs, in a greater or leſs degree. Purſh ſays, this is excluſively known by the name of Red Oak, though various others are ſo denominated in ſeveral parts of America.

Q. *ambigua*, Michaux Arb. v. 2. 120. t. 24. Purſh n. 19, is ſuppoſed by the latter to be a hybrid between this and the following.

61. Q. *coccinea*. Scarlet Oak. Willd. n. 54. Ait. n. 17. Purſh n. 18. Michaux Querc. n. 18. t. 31, 32. (Q. rubra β; Ait. ed. 1. v. 3. 357.)—Leaves ſmooth, oblong, deeply and widely ſinuated, on long ſtalks; lobes divaricated, acute, ſharply toothed, briſtle-pointed. Calyx of the fruit turbinate, half as long as the nut.—Native of woods, on a fertile ſoil, from New England to Georgia, bloſſoming in May. This was one of the firſt American trees brought to Europe, having been cultivated before the end of the 17th century, by biſhop Compton, as well as by the firſt earl of Portland. The bright red of the foliage in autumn gives the tree a beautiful and ſtriking appearance, both in its native foreſts and our European plantations. It nearly equals the preceding in ſize; the *wood*, according to Michaux, is better, but the *bark* leſs valuable. The *leaves* are larger, with deeper, more rounded, ſinuſes, and more diſtant lobes. *Acorns* half covered by the deeper, more turbinate, cup.

62. Q. *Cateſbæi*. Barren Scrub Oak. Willd. n. 55. Purſh n. 21. Michaux Querc. n. 17. t. 29, 30. (Q. rubra β; Sm. in Abbot's Inſ. v. 1. 27. t. 14. Q. eſculi diviſura, foliis amplioribus aculeatis; Cateſb. Carol. v. 1. t. 23.)—Leaves ſmooth, oblong; wedge-ſhaped at the baſe; deeply and widely ſinuated, on ſhort ſtalks; lobes three or five, divaricated, acute, two or three-cleft, briſtle-pointed. Calyx of the fruit turbinate, half as long as the nut.—Native of dry barren ground in Maryland, Virginia, Carolina, and Georgia, abundantly, flowering in May. This ſpecies is ſhrubby, not above fifteen feet high; its *wood* of a bad quality, uſed only for firing. The ſhortneſs of the *footſtalks*, and the fewneſs of the lobes of the *leaves*, added to their acute baſe, are ſufficient botanical diſtinctions between the preſent and the two laſt, eſpecially as the ſize and quality of the tree are ſo unlike thoſe ſpecies.

63. Q. *paluſtris*. Marſh, or Pin, Oak. Willd. n. 56. Ait. n. 18. Purſh n. 23. Michaux Querc. n. 19. t. 33, 34.—Leaves ſmooth, oblong, deeply and widely ſinuated, on long ſtalks; lobes diſtant, parallel, acute, ſharply toothed, briſtle-pointed; forks of the veins denſely woolly beneath. Calyx of the fruit flattened. Nut nearly globoſe.—Native of low ſwampy woods, from New England to Pennſylvania, and in the Illinois country, flowering in May. Meſſrs. Fraſer are recorded as having brought this ſpecies to England in 1800, but it was previouſly cultivated in Holland and France. This is a large *tree*, whoſe wood is tough, uſed for making ſpokes of wheels. The *leaves* are ſmaller than thoſe of *rubra* or *coccinea*, and with more numerous lobes than *Cateſbæi*; their ſinuſes rounded and very wide, and the forks at the origin of their veins marked by a tuft of glandular hairs. The *acorns* are ſmall, globular, with ſhallow cups, and generally very abundant.

64. Q. *acutifolia*. Pointed-leaved Mexican Oak. Willd. n. 57. Nee in Annal. Scient. Nat. v. 3. 267. Fiſch. Miſc. Hiſp. v. 1. 102. *Willd.*—"Leaves ovato-lanceolate, ſinuated, taper-pointed; unequal at the baſe; lobes toothed, briſtle-pointed; forks of the veins villous beneath. Fruit racemoſe."—Native of New Spain, in the road from Acapulco to Mexico. This is the largeſt of all the Oaks in New Spain. *Trunk* thick, twenty-five feet high, ornamented with a denſe head of innumerable *branches*. *Leaves* from five to ſeven inches long, an inch and a half or two

inches broad, their *footſtalks* an inch in length; ovate and unequal at the baſe, gradually contracting upwards to a ſharp point, ſinuated, beſet with awl-ſhaped teeth; green and ſhining above; reddiſh and veiny beneath, the forks of the veins villous. *Female flowers* in axillary four-flowered cluſters, (or rather, we preſume, *ſpikes*.) *Germens* ovate. *Acorns* ſmall, ſcarcely ſo big as a pea, nearly covered by the cup, which is clothed with blackiſh ſcales. *Nee.*

65. Q. *candicans*. Hoary Mexican Oak. Willd. n. 58. Nee in Annal. Scient. Nat. v. 3. 277. Fiſch. Miſc. Hiſp. v. 1. 115. *Willd.*—"Leaves ovate, ſinuated; white and downy beneath; lobes toothed, briſtle-pointed."—Native of New Spain, in ſandy ground near Tixtala. A *tree* of a middling ſize, with a denſe head of upright *branches*. *Leaves* nine inches long, four wide, tapering at each end, ſinuated, with briſtle-pointed teeth; green and ſmooth above; white and downy underneath. *Footſtalks* four lines in length. *Flowers* and *fruit* not obſerved. *Nee.*

66. Q. *ilicifolia*. Holly-leaved, or Bear Oak. "Wangenh. Amer. 79. t. 6. f. 17." Willd. n. 59. Ait. n. 19. (Q. Baniſteri; Michaux Querc. n. 15. t. 27. Purſh n. 24. Q. aquatica? Sm. in Abbot's Inſ. v. 2. 157. t. 79?)—Leaves obovate-wedge-ſhaped, with three or five deep briſtle-pointed lobes, entire; downy beneath. Fruit ſtalked, in pairs.—Found in dry barren fields, and on mountains, from New Jerſey to Virginia, flowering in May; covering, wherever it occurs, large tracts of ground, thence termed Oak-barrens. It is known by the name of Bear Oak, Black Scrub Oak, and Dwarf Red Oak. *Purſh.* A *ſhrub* four to ſix feet, occaſionally more, in height, with downy *branches*. *Footſtalks* downy, near an inch long. *Leaves* two inches, or two inches and a half long, and near two wide, tolerably uniform, acute at the baſe, cut into five, rarely but three, deep divaricated, broad, acute lobes, entire at the margin, and ſcarcely toothed at the ſummit, though tipped with one or two briſtles; the upper ſide green, veiny, and ſmooth; the under pale, and finely downy. *Female flowers* in pairs, on thick, ſolitary, axillary, downy *ſtalks*, much ſhorter than the footſtalks. *Acorns* about half an inch long, nearly globular, half covered by their ſcaly hemiſpherical cups. Michaux thinks this ſpecies would ſerve well for making quick hedges. A ſpecimen from Kalm, unnamed, is in the Linnæan herbarium.

67. Q. *Pſeudo-ſuber*. Baſtard Cork Oak. "Santi Viagg. 156. t. 4." Spreng. Antiq. Bot. 16. t. 1. Willd. n. 60. Desfont. Atlant. v. 2. 348.—Leaves ovate-oblong, ſinuated, hoary beneath; lobes numerous, pointed, entire. Bark fungous, cracked. Nut ovate. Calyx muricated, with lax, recurved, linear ſcales.—Native of the mountains of Tuſcany, Spain, and Barbary. Desfontaines gathered it on mount Atlas, and the abbé Durand near Tangier. A *tree* fifty or ſixty feet high, whoſe *bark* is corky, though leſs ſo than in *Q. Suber*, n. 33. Young *branches* downy or hoary, ſometimes ſmooth, ſtriated. *Leaves* deciduous, an inch and a half to three inches long, an inch or an inch and a half wide, acute; entire and ſlightly heart-ſhaped at the baſe; ſomewhat dilated upwards, and bordered with numerous, uniform, ſmall, broad, acute, lobes or ſerratures, ſeparated by roundiſh ſinuſes; upper ſurface green and ſmooth; under glaucous, hoary, or ſomewhat downy. *Acorns* on ſhort ſtalks, ovate, above an inch long, half covered by the cup, which is downy, and clothed with lax bluntiſh ſcales, recurved at their tips. Desfontaines ſays the *leaves* of young trees are deeply ſinuated and ſerrated; thoſe of old ones more ſlightly ſo. In our ſpecimens from Durand and Brouſſonet, the under ſide is ſcarcely downy, except a denſe fringe to the mid-rib. The tranſverſe veins are more numerous, ſtraight, and parallel, than in Sprengel's plate. *Footſtalks* rather above half an inch long, ſmooth or downy. *Acorns* nearly ſeſſile, crowded about the ends of the branches. Yet we think it muſt be, at leaſt, the plant of Desfontaines.

68. Q. *Aegilops*. Great-prickly-cupped Oak, or Velanida. Linn. Sp. Pl. 1414. Willd. n. 61. Ait. n. 20. Mill. Ic. t. 215. Olivier's Travels, Engliſh edition, v. 2. 44. t. 13. (Q. orientalis, caſtaneæ folio, glande reconditâ in cupulâ craſſâ et ſquamoſâ; Tourn. Cor. 40. Velani; Tourn Voy. v. 1. 128. Glans Cerri; Dalech. Hiſt. v. 1. 7.)—Leaves ovate-oblong, with briſtle-pointed tooth-like lobes; hoary beneath. Calyx of the fruit very large, hemiſpherical, with lanceolate, elongated, ſpreading ſcales.—Native of the Levant. Miller cultivated this Oak in 1731. The *tree* is not ſo lofty as ſome other ſpecies, nor is the *wood* much eſteemed, or uſed, but in cabinet work. *Leaves* ſtalked, about three inches long, bright green; a little downy at the back; their edges, as in the laſt, very coarſely and acutely ſerrated, rather than lobed, each tooth tipped with a briſtly point. *Acorn* large, ſhort, a little hollow at the top. *Cup* ſeſſile, woody, two or three inches in diameter, from the projection of its numerous, oblong, thick ſcales. Theſe cups are uſed, as well as the gall-nut, (ſee n. 40.) by the Orientals, Italians, and Engliſh, in dyeing, and are a conſiderable article of commerce. Tournefort ſays the modern Greeks call theſe acorns *Velani*, a corruption of *βάλανι*, and the tree *Velanida*. The young acorns and cups, gathered from the tree, are much more eſteemed than ſuch as fall of themſelves, when fully grown, and ſell for twice the price of the latter. Dalechamp, Lobel, and Bauhin, miſtake the unripe cup and acorn of this ſpecies, as belonging to *Q. Cerris*, n. 83.

Sect. 5.—*Leaves ſinuated, with blunt or pointleſs lobes.*

69. Q. *alba*. White Oak. Linn. Sp. Pl. 1414. Willd. n. 62. Ait. n. 21. Purſh n. 29. Michaux Querc. n. 4. t. 5. (Q. alba virginiana; Cateſb. Carol. v. 1. t. 21. f. 2.)—Leaves oblong, deeply pinnatifid; glaucous beneath; lobes linear-oblong, obtuſe, entire, dilated upwards. Fruit ſtalked. Calyx depreſſed, warty.—Native of woods, on a fertile ſoil, from New England to Carolina, flowering in May; cultivated here in 1724, by Mr. Furber. Purſh ſays it is one of the moſt abundant and uſeful of its genus, in America, and grows in the middle States to an immenſe ſize. The adult *leaves* are nearly a ſpan long, deeply and elegantly pinnatifid; tapering and acute at the baſe; gradually dilated upward; ſomewhat abrupt, though three-lobed, at the end; their lobes all entire, blunt, pointleſs, veiny; the upper ſurface green and ſhining; the under opaque and glaucous; not downy, as Linnæus and Willdenow define them, except perhaps when young. *Footſtalks* ſtout, angular, half an inch, or more, in length. *Fruit-ſtalks* twice as long, each bearing one or two, laterally ſeſſile, ovate *acorns*, full an inch in length, with a ſhort tuberculated cup. Michaux obſerves, that this Oak is preferred to all others in America, for building houſes and ſhips; as well as for caſks. The wood is ſo tough and pliable, as to ſerve for making baſkets and brooms. The acorns are ſweet, and Parkinſon records that, in his time, the Indians were ſaid to obtain from them, by boiling, an oil which they uſed in cookery. A ſuppoſed variety, called *repanda*, is figured by Michaux, in which the *leaves* are merely waved, not lobed; and green on both ſides, though downy beneath. With this we are unacquainted, as alſo with Willdenow's intermediate variety, called *pubeſcens*.

70. Q. *Eſculus*. Italian, or Small-prickly-cupped Oak.

Linn.

Linn. Sp. Pl. 1414. Willd. n. 63. Ait. n. 22. (Phagus eſculus, mas et foemina; Dalech. Hiſt. 5.)—Leaves ovate-oblong, ſinuated, ſmooth; paler beneath; ſegments bluntiſh; ſomewhat angular at the baſe. Fruit nearly ſeſſile. Calyx ſcaly, hemiſpherical.—Native of the ſouth of Europe. Cultivated by Miller in 1739; hardy in our gardens, flowering in May. *Aiton.* So little attention has been paid to this ſpecies by botanical writers, that we can find no certain deſcription nor figure of it, except in Dalechamp. We even doubt whether the plant intended in the firſt edition of the Hortus Kewenſis be the true one; yet this ſeems what Willdenow meant in his *Arbores*, or Baumzucht, though he does not cite either that work or Hort. Kew. in his Sp. Pl. What Linnæus briefly deſcribed in his Mantiſſa, 496, under the name of *Eſculus*, ſeems to be *Cerris*, with which latter the deſcription, copied by Willdenow, and the ſpecific character extracted therefrom, well agree; but not at all with the original and authentic ſpecimen of *Eſculus* in the Linnæan herbarium. By this laſt alone can any one determine what Linnæus had in contemplation, when he wrote both editions of Species Plantarum, and we ſhall here deſcribe the ſpecimen. The *branch* is angular, furrowed, and ſmooth. *Leaves* ſcattered, aggregate at the top, from two to three inches long, and one and a half, at moſt, in breadth; ſmooth and ſhining above; paler, rather glaucous, and almoſt equally ſmooth, beneath, with finely reticulated veins; tapering at the very baſe, but juſt above it dilated, angular, and in ſome meaſure cordate, as Dalechamp's figures more diſtinctly ſhew. The ſummit is obtuſe, and the margin cut unequally, on each ſide, into about five broad, blunt, entire, tooth-like ſerratures, or ſmall lobes. *Footſtalks* near an inch long, deſtitute of the long, linear, tufted, ſtipulaceous ſcales, or *ramenta*, found in *Aegilops*, *Cerris*, and *auſtriaca* hereafter mentioned. Young *acorns* axillary, nearly ſeſſile, ſolitary or in pairs; the cups ſcaly, the ſize of ſmall peas. Dalechamp repreſents the full-grown acorns about an inch long, embraced by an hemiſpherical ſcaly cup, about one-third that length. He ſays they are ſweet and eatable, brought to table roaſted by the Spaniards, as well as the ruſtic Italians, but ſometimes found to affect the head, like darnel. The name *Eſculus* is derived by etymologiſts from *eſca*, food, and is commonly taken for the Beech-tree, ordinary readers of Virgil's Georgics not diſtinguiſhing one from the other; juſt as the *Cicada* of that poet has been vulgarly ſuppoſed the graſshopper. The Delphin edition of the Georgics has the above word *Aeſculus*, as Linnæus has adopted it, unwarrantably, for the generic appellation of the Horſe Cheſnut; and the editors rightly obſerve, that ſome perſons confound it with *Fagus*, the Beech. Our *Q. Eſculus* is moſt probably the Φηγος of Dioſcorides, which he expreſsly ſays is a kind of Oak. See FAGUS.

71. Q. *Robur*. Common Britiſh Oak. Linn. Sp. Pl. 1414. Sm. Fl. Brit. n. 1. Engl. Bot. t. 1342. Woodv. Med. Bot. t. 126. Mart. Ruſt. t. 10, var. pedunculata. (Q. pedunculata; Willd. n. 65. Ehrh. Arb. 77. Pl. Off. 168. Ait. n. 24. Q. foemina; Roth. Germ. v. 1. 408. v. 2. p. 2. 488. Fl. Dan. t. 1180. Q. racemoſa; Lamarck Dict. v. 1. 715. Q. cum longo pediculo; Bauh. Pin. 420. Q. hemeris; Dalech. Hiſt. 4. Quercus; Fuchſ. Hiſt. 229. Matth. Valgr. v. 1. 184. Duham. Arb. v. 2. t. 47. Tabern. Kreuterb. 1374. Oak-Tree; Hunt. Evel. Sylv. 69, with a plate.)—Leaves deciduous, oblong, ſmooth, dilated upwards; ſinuſes rather acute; lobes obtuſe. Stalks of the fruit elongated. Nut oblong.—Common in woods and hedges, throughout the more temperate parts of Europe, flowering in April. Nothing is more general in the woods and hedges of Britain, nor more important as an object of national culture. The *tree* is the moſt ornamental to our plantations and landſcapes; the *wood* more uſeful than any other, for its hardneſs, toughneſs, and durability; the *bark* peculiarly valuable for tanning. The *leaves* are alternate, with ſhort, or ſcarcely any, footſtalks, obovate-oblong, ſmooth, irregularly ſinuated, with obtuſe, rounded, pointleſs, entire lobes; their upper ſide of a rich ſhining green; the under paler, ſlightly glaucous; the baſe ſomewhat heart-ſhaped, or auricled. *Cluſters*, or rather *ſpikes*, axillary; the male ones lax, pendulous, many-flowered, yellow; female on ſtalks an inch and a half or two inches long, compoſed of about three, laterally ſeſſile, green *flowers*, ſurmounted by a naked elongation of the common ſtalk. *Calyx* of the male membranous, bell-ſhaped, moſtly five-cleft, with about ten *ſtamens*; of the female coriaceous, ſcaly, downy, globoſe, at length hemiſpherical, woody, entire. *Germen* ovate. *Style* ſhort, cylindrical. *Stigmas* three. *Acorn* elliptic-oblong, thrice the length of the cup. This being what Linnæus, as well as Britiſh botaniſts, always conſidered as *Quercus Robur*, the ſuperior quality of its wood, no where better underſtood than here, entitling it, above all others, to that appellation, we cannot, on any account, ſubmit to the errors of Willdenow, or any other writer, who has been pleaſed to change the name; and we feel equal ſurpriſe and regret that the excellent editors of the new Hort. Kew. ſhould, in this caſe at leaſt, have carried their implicit conformity ſo far. We truſt they will hereafter correct themſelves in this point, as well as in the barbarous name *Araucaria*, retained by Willdenow, contrary to all propriety, for DOMBEYA. See that article.

72. Q. *ſeſſiliflora*. Seſſile-fruited Oak. Saliſb. Prodr. 392. Sm. Fl. Brit. n. 2, α. Engl. Bot. t. 1845. (Q. Robur; Willd. n. 64. Ait. n. 23. Lamarck Dict. v. 1. 717. Mart. Ruſt. t. 11, var. ſeſſilis. Q. ſeſſilis; Ehrh. Arb. 87. Q. platyphyllos mas et foemina; Dalech Hiſt. 2, 3. Q. latifolia mas, quæ brevi pediculo eſt; Bauh. Pin. 419. Raii Syn. 440.)—Leaves on longiſh footſtalks, deciduous, oblong, ſmooth; ſinuſes oppoſite, rather acute; lobes obtuſe. Fruit ſeſſile. Nut oblong.—Native of woods and hedges, in the temperate parts of Europe; rather leſs common in England than the preceding, flowering in April or May. Profeſſor Martyn has rightly corrected Miller, who mentions the preſent as the common Oak of this country, and the former as rare. Why the German botaniſts, like Lamarck, take this for *Robur*, is difficult to underſtand, unleſs the meaſure originated in inattention to the qualities, as well as hiſtory, of the trees. The *wood* of our *ſeſſiliflora*, in which name we gladly follow Mr. Saliſbury, is of far leſs value than the true Britiſh Oak, and the importance of diſtinguiſhing the two ſpecies becomes, therefore, the more obvious. The *leaves* grow on longer *footſtalks*, and are generally more equally and regularly pinnatifid. The *female flowers*, and the *acorns*, are almoſt perfectly ſeſſile. In Engliſh Botany four *ſtigmas* are delineated; but we know not how far that character, which would be an excellent one, is conſtant.

73. Q. *pubeſcens*. Downy-waved-leaved Oak. Willd. n. 66, excluding the reference to Fl. Brit. (Q. Robur lanuginoſa; Lamarck Dict. v. 1. 717. Robur prima; Cluſ. Hiſt. v. 1. 18.)—Leaves oblong-obovate, ſtalked, ſinuated; downy beneath; lobes obtuſe, angular, wavy; ſomewhat heart-ſhaped and unequal at the baſe. Fruit nearly ſeſſile.—Native of France, Auſtria, Hungary, Tartary, and of the Val d'Aoſt, Piedmont, in which laſt place it was gathered by Mr. Davall. We have ſeen a tree of

this ſpecies, growing on the north lawn at Holkham, Norfolk, the ſeat of Mr. Coke, where it was planted by his anceſtor, the earl of Leiceſter; but no Britiſh writer ſeems acquainted with the ſpecies in queſtion, though unqueſtionably diſtinct. Willdenow juſtly ſays it is like his *Robur*, our *ſeſſiliflora*, but abundantly different, being of more humble ſtature, with ſmaller *leaves*, downy beneath, very hoary and white in the ſpring, ſomewhat heart-ſhaped at the baſe, and with ſmaller *fruit*. To this we would add, the *leaves* are remarkably undulated, eſpecially in drying, and their upper ſurface is more or leſs beſprinkled with very minute, ſcattered, ſtarry hairs. The *fruit* in Mr. Davall's ſpecimens is quite ſeſſile, either ſolitary, or in one inſtance accompanied by two abortive ones; in thoſe from Holkham the female *flowers* are more or leſs elevated, three together, on a thick downy *ſtalk*. Hence perhaps Willdenow terms the *fruit* ſubſeſſile. The ſcales of the *cup* in both are downy, thin, flat, and cloſely imbricated.

A variety of this, with deeper ſegments, and of more humble growth, is Robur tertia, Cluſ. Hiſt. v. 1. 18. f. 1. Of this a ſpecimen, erroneouſly named *Cerris*, and pinned to *Eſculus*, n. 70, above deſcribed, is preſerved in the Linnæan herbarium.

74. Q. *atro-virens*. Durmaſt Oak. Mart. Ruſt. t. 12. (Q. ſeſſiliflora β; Sm. Fl. Brit. 1027. Q. pubeſcens; Ait. n. 25, but not of Willdenow. Q. Robur nigra; Lamarck Dict. v. 1. 717. Chêne noir; Secondat du chêne. 3. t. 5?)—Leaves elliptic-oblong, ſtalked, ſinuated; downy and hoary beneath; lobes numerous, obtuſe, even, and entire; baſe equal. Fruit ſeſſile.—Native of France and the ſouth of England, flowering in April and May. Profeſſor Martyn had his ſpecimens from the New Foreſt, Hampſhire, where it is known by the name of the Durmaſt Oak. The whole *tree* is well deſcribed by him as having much the air of a cheſnut, and being of freer growth than the true *Robur*; the *bark* lighter coloured and ſmoother; the *wood* not ſo ſtrong, nor of ſo firm a texture. The *leaves* are leſs deeply, but more copiouſly, ſinuated, with five, ſix, or ſeven ſhort lobes at each ſide; the under ſurface downy, and of a hoary grey, with purpliſh ribs. The *foliage* appears later than in either of our common Oaks, and laſts longer, ſometimes the whole winter. *Acorns* ſeſſile, rather large. Lamarck's deſcription, indicated above, accords exactly with our Engliſh plant, to which alſo, we preſume, the ſynonym of Secondat muſt belong, though we have not been able to conſult his book. A more accurate ſtudy of this genus has led us to agree with our departed friend Willdenow, in diſtinguiſhing the Durmaſt Oak from our *ſeſſiliflora*, but he errs in referring it to his *pubeſcens*, and has led Mr. Aiton into the ſame miſtake. Its *leaves* are more oblong, leſs deeply ſinuated, flat, not undulated; the under ſide whiter, with coloured veins. The *fruit* larger, and more decidedly ſeſſile.

75. Q. *pyrenaica*. Pyrenean Oak. Willd. n. 67.—"Leaves oblong, pinnatifid, ſtalked; downy beneath; ſomewhat heart-ſhaped and unequal at the baſe; lobes obtuſe, ſlightly toothed. Fruit ſtalked."—Native of the Pyrenees. The *leaves* are larger than in *ſeſſiliflora*, ſtalked, deeply ſinuated; denſely downy underneath. *Footſtalks* downy. *Acorns* four, ſeſſile on one common elongated ſtalk. It differs abundantly from *pubeſcens*, in having much larger *leaves*, ſinuated in a pinnatifid manner, very downy beneath; and ſtalked *fruit*. Such is Willdenow's account. We have ſeen no ſpecimen. Can this be our above-mentioned variety of *pubeſcens*?

76. Q. *faginea*. Beech Oak. Lamarck Dict. v. 1. 725. Willd. n. 68. (Phellodrys alba anguſtifolia, folio ferrato; Dalech. Hiſt. 25.)—Leaves on ſhort downy ſtalks, obovate, with numerous, uniform, ſhallow lobes; downy beneath; ſomewhat heart-ſhaped and unequal at the baſe. Fruit ſeſſile. Native of Spain and the ſouth of France. *Leaves* ſmall, an inch and half long, deciduous, obovate, very ſlightly ſinuated, or, more properly ſpeaking, coarſely toothed, the lobes being very ſhort, equal, and obtuſe; the upper ſide poliſhed and ſmooth; the under white and downy. *Footſtalks* downy. *Fruit* ſeſſile. *Willdenow*. In the Linnæan herbarium are ſpecimens, gathered by Baron Alſtroemer in Spain, which anſwer extremely well to the above deſcription, and not amiſs to the figure of Dalechamp, which Lamarck cites with heſitation. In theſe however, the lobes, or teeth, are acute, and the upper ſurface covered with minute ſtarry hairs. There are alſo long, linear, recurved, ramentaceous *ſtipulas*, that are ſoon deciduous. We do not ſcruple to conſider this as Lamarck's plant at leaſt, and probably Willdenow's.

77. Q. *lobata*. Round-lobed Mexican Oak. Willd. n. 70. Nee in Annal. Scient. Nat. v. 3. 277. Fiſch. Miſc. Hiſp. v. 1. 116. *Willd.*—"Leaves obovate-wedge-ſhaped, ſinuated, ſmooth; lobes toothed."—Native of New Spain. *Branches* furrowed, alternate. *Leaves* four inches long, two inches and a half wide, ſmooth, alternate, orbicular towards the extremity; wedge-ſhaped at the lower part; ſinuated; the lobes rounded, obtuſe, toothed. *Footſtalks* ſlender, three or four lines in length. *Nee.*

78. Q. *obtuſiloba*. Blunt-lobed Iron Oak. Michaux Querc. n. 1. t. 1. Purſh n. 25. (Q. ſtellata; Willd. n. 71. Ait. n. 26. Wangenh. Amer. 78. t. 6. f. 15.)—Leaves oblong, ſinuated, roughiſh on both ſides; lobes obtuſe; the upper ones dilated, abrupt, ſlightly divided. Calyx of the fruit hemiſpherical.—Found in moſt of the upland foreſts, from Canada to Florida, bloſſoming in May. The *tree* is fifty or ſixty feet high, ſpreading, its timber of great value for ſhip-building. The whiteneſs of the *bark*, as in *Q. alba*, cauſes both theſe ſpecies to be called White Oak by the Americans, who nevertheleſs know how to diſtinguiſh their timber. The *leaves* of the preſent are roughiſh beneath, with minute ruſty hairs, not hoary; and their upper ſurface appears to partake occaſionally, if not always, of the ſame ſort of pubeſcence. Their length is from three to five inches; the baſe wedge-ſhaped, ſpreading upwards into two ſmaller, oppoſite, rounded lobes, beyond which the *leaf* dilates, ſuddenly and widely, into a pair of broad, ſlightly cloven, or emarginate, lobes, and, after another ſudden contraction, ends in a terminal three-cleft one. The margin is entire throughout. *Footſtalks* ſhort, downy. *Acorns* three or four on a ſhort ſtalk, of a middling ſize, ſcarcely exceeding our Britiſh Oaks, elliptical, about half encloſed in the ſcaly cup.

79. Q. *lyrata*. Over-cup Lyrate Oak, Swamp-poſt, or Water White Oak. Walt. Carol. 235. Willd. n. 72. Ait. n. 27. Purſh n. 28. Michaux Querc. n. 3. t. 4.—Leaves oblong, deeply ſinuated, ſmooth; much contracted in the middle; lobes acute; the upper ones dilated, angular, and abrupt. Calyx of the fruit globoſe, muricated, nearly covering the nut.—Native of ſwamps, from Carolina to Florida, and on the Miſſiſippi; flowering in May. *Purſh.* Michaux ſays, that though he always found this ſpecies in watery places, its growth, in a dry nurſery-ground, exceeded that of moſt other ſpecies planted with it. He gives fifty or ſixty feet as the height of the *tree*; Purſh from eight to fifteen only. The ſmooth fine-green *leaves* have more acutely-angular lobes than the foregoing, and are remarkably contracted about the middle. *Acorn* globoſe, nearly covered by the globular prickly cup.

80. Q. *macrocarpa*. Large-fruited Oak, or Over-cup White Oak. Willd. n. 73. Purſh n. 26. Michaux Querc. n. 2. t. 2, 3.—Leaves oblong, lyrate; downy beneath; terminal lobe very large, three-cleft, ſinuated. Calyx of the fruit hemiſpherical, ſcaly, fringed with briſtles.—Found on dry ſlate or limeſtone hills, in all the countries to the weſt of the Allegany mountains, flowering in May. A large *tree*, whoſe *wood*, according to Purſh and Michaux, is very excellent. The *bark* of the young branches is corky. In wet ſituations the whole plant languiſhes, and becomes covered with lichens. The *leaves* are a foot long, more truly and preciſely lyrate than thoſe of the laſt; but the ſpecific name of the preſent is excellent, the *acorns* being larger than thoſe of any other known American ſpecies. Their form is oval, their length two inches, and they are half covered by the cup, ſeveral rows of whoſe broad ſcales end in long briſtles, making a rigid fringe.

81. Q. *oliveæformis*. Olive-ſhaped Moſſy-cup Oak. "Michaux Arb. v. 2. 32. t. 2." Purſh n. 27.—"Leaves oblong, ſmooth; glaucous beneath; deeply and unequally pinnatifid. Fruit elliptic-ovate. Calyx cup-ſhaped, fringed."—Obſerved by Michaux on the banks of Hudſon's river, and in the weſtern parts of New York; by Purſh in Pennſylvania and Virginia, on iron-ore hills; flowering in May. This is deſcribed as a large *tree*; the *foliage* handſome, ſomewhat reſembling that of the laſt. We have not examined either a ſpecimen or figure. Willdenow does not mention this ſpecies.

82. Q. *crinita*. Hairy-cupped Oak. Lamarck Dict. v. 1. 718, 8. Olivier's Travels, Engliſh edition, v. 2. 5. t. 12. (Q. Tournefortii; Willd. n. 74. Q. orientalis latifolia, foliis ad coſtam pulchre inciſis, glande maximâ, cupulâ crinitâ; Tourn. Cor. 40. Voy. v. 2. 172.)—Leaves on long ſtalks, oblong, deeply pinnatifid; downy beneath; lobes lanceolate, bluntiſh, nearly entire. Calyx of the fruit hemiſpherical, downy, briſtly.—Gathered by Tournefort in vallies and plains near Tocat, in Armenia. Olivier ſays it is met with throughout great part of Aſia Minor and Syria. The timber is brought to the arſenal of Conſtantinople, from the ſouthern ſhores of the Black Sea, and is alſo moſt commonly employed for the frame-work of houſes. The *tree* grows to a conſiderable height, and furniſhes excellent wood. This author, who takes the tree in queſtion for *Q. Cerris* of Linnæus, may, poſſibly, confound the real *Cerris* along with it, as Lamarck, though not without ſcruple, has combined them. Olivier's plate, however, very clearly repreſents the above plant of Tournefort; and Lamarck's excellent definition of the ſame, as variety ε of his *crinita*, is abundantly ſufficient to ſtamp it a ſpecies. "Leaves very ſoftly villous, deeply pinnatifid; their ſegments oblong, nearly ſimple, obtuſe, ſomewhat pectinate," (or parallel.) He ſays it is reported to grow wild in the province of Angoumois, and is a tree of handſome aſpect, remarkable for its ſoft, downy, broad *leaves*, cut very deeply into large ſegments, blunt at their extremity, often ſimple, ſometimes furniſhed with a few angles, or ſhort lobes, at their poſterior margin. *Acorns* ſeſſile, their cup briſtly, as in the Burgundy Oak (*Cerris*). Tournefort's ſpecimens agree with the Angoumois Oak, as it is called, ſeen by Lamarck in a cultivated ſtate at Godonvillier. We have ſeen no ſpecimen, but the above accounts are ſufficiently clear to admit of no doubt. Olivier's plate repreſents the *leaves* three or four inches in length, their ſegments about an inch long, almoſt all ſimple and undivided, bluntiſh, entire, more or leſs diſtant, each making an angle with the narrow linear border of the main rib. *Footſtalks* ſlender, an inch, more or leſs, in length, apparently ſmooth. *Acorns* lateral, about an inch long, elliptical, obtuſe, ſolitary, on ſhort ſimple ſtalks; the *cups* beſet with numerous ſoft taper briſtles, divaricated upwards and downwards, near half an inch long. Nothing is exhibited, or deſcribed, concerning the *ſtipulas*, which are very remarkable in the two following ſpecies.

83. Q. *Cerris*. Turkey Oak. Linn. Sp. Pl. 1415. Willd. n. 75. Ait. n. 28, γ. (Q. crinita α et β; Lamarck Dict. v. 1. 718. Q. haliphlæos; Juſſ. in Hort. Paris. Q. burgundiaca, calyce hiſpido; Bauh. Pin. 420. Cerris Plinii, majore glande; Lob. Ic. v. 2. 156. Dod. Pempt. 831. Ger. Em. 1345. Cerrus; Dalech. Hiſt. v. 1. 6, good.)—Leaves on very ſhort ſtalks, oblong, deeply and unequally pinnatifid; hairy beneath; lobes lanceolate, acute, ſomewhat angular. Stipulas longer than the footſtalks. Calyx of the fruit hemiſpherical, briſtly.—Native of France, Italy, and the Levant. Sometimes cultivated in England, but not commonly. This is a tall handſome *tree*, whoſe ſynonyms are much confounded by old writers with *Q. Aegilops*, n. 68, and by more recent botaniſts with the following. Its *leaves* are deeply pinnatifid in the manner of the foregoing; more or leſs unequally; but the lobes are more acute, pointed, and moſt generally angular, ſometimes remarkably lobed or compound. The under ſide differs eſſentially, in being neither downy nor hoary, but rough with minute, ſcattered, tawny, briſtly hairs; the upper, which is of a darker green, and rather ſhining, is alſo occaſionally roughiſh to the touch. *Footſtalks* rough, thick, hardly a quarter of an inch, ſometimes not a line, in length. *Stipulas* linear, acute, downy, from half an inch to an inch long, permanent, accompanied by an axillary tuft of ſimilar, but ſmaller, ſcales. The *acorns* we have not ſeen. They are repreſented ſeſſile, two or three together, large, oblong, with an hemiſpherical cup, which is ſhaggy with long briſtles, projecting in every direction. They are ſaid to be peculiarly bitter and auſtere.

Lamarck aſſerts, from his own obſervation, that the Q. orientalis latifolia, glande maximâ, cupulâ crinitâ, Tourn. Cor. 40, ſcarcely differs in any reſpect from this. If ſo, the term *latifolia* is not happily applied, unleſs Tournefort had alſo noticed, as in our laſt, the deep diviſions of the *leaves*, which are full as remarkable in the preſent ſpecies.

84. Q. *auſtriaca*. Auſtrian Oak. Willd. n. 76. (Q. Cerris; Hoſt. Syn. 520, α and β. Ait. n. 28. Q. crinita γ, cerris Linn.; Lamarck. Dict. v. 1. 718. Q. calyce hiſpido, glande minore; Bauh. Pin. 420. Cerrus; Cluſ. Hiſt. v. 1. 20, excellent. Cerri minoris ramulus cum flore; Ger. Em. 1346, with Cluſius's figure. Cerris Plinii minore glande; Lob. Ic. v. 2. 156. Ger. Em. 1345. Aegilops minore glande; Dod. Pempt. 831. Haliphloeos, Cerrus foemina; Dalech. Hiſt. v. 1. 7.)—Leaves on longiſh ſtalks, ovate-oblong, ſlightly but copiouſly ſinuated; downy and hoary beneath; lobes ſhort, ovate, acute, entire. Stipulas ſhorter than the footſtalks. Calyx of the fruit hemiſpherical, briſtly.—Native of Auſtria, Hungary, Carniola, Italy, and other parts of the ſouth of Europe, in ſtony mountainous places. It occurs not unfrequently in plantations of exotic trees, both in France and England, being generally miſtaken for *Q. Cerris*, from which nothing can be more certainly diſtinct. This *tree* is taller than the Common Oak, *Q. Robur*, and in favourable ſituations riſes perpendicularly to a conſiderable height, as Cluſius deſcribed it, though Lamarck ſays it is ſmaller, leſs handſome, more twiſted and knotty, than the laſt, as well as often hollow. The *wood* is whiter, ſofter, and leſs valuable, than *Q. Robur*; the *bark* grey, tolerably even. *Branches* forming a round

a round and compact head. *Leaves* two or three inches long, acute, generally rounded and a little unequal at the base; their upper surface of a fine shining green, and nearly smooth; the under whitish, clothed with fine dense down; the margin cut, at each side, into four, five, or six, tolerably regular, rounded or ovate, acute, pointed, entire lobes, more or less deep, separated by round sinuses; the disk of the leaf being left entire, of a considerable width. *Footstalks* near an inch long, downy. *Stipulas* as in the foregoing, but smaller and shorter, usually about half the length of the footstalks. *Acorns* like those of the last, but smaller. The figures of Lobel, Dodonæus, and Ger. Em. 1345, do not well represent the *leaves* of this species, or indeed of the former: that of Clusius, adopted by the editor of Gerarde, in p. 1346, is perfectly correct. The cuts of Dalechamp, both of one and the other, are sufficiently expressive, and very correct as to the footstalks. The lobes of neither of these species are quite pointless, but rather more pointed, as well as acute, than those of *Esculus*, n. 70.

We have thus added eight species of *Quercus* to Willdenow's list. Those botanists who may take the trouble of following us with attention, will perceive that this valuable genus still requires elucidation, particularly with respect to the European, and, above all, the oriental kinds; some of which last, barely indicated by authors, we have been obliged to leave unexplained. Of the most common and important species, *Q. Robur*, we have seen in Mr. Coke's woods at Holkham, some striking varieties, at least, whose distinctions and qualities are well worthy of examination. Two of these have shorter *flower-stalks* than the common *Robur*, and one of them is three weeks earlier in coming into leaf than the other. The *footstalks* of both are longer than is usual in *Robur*. How far a difference of quality in the wood may accompany these botanical distinctions, we must refer to the inquiries of those who are interested in, and have the means of investigating, so important a subject, which is indeed of the first economical, and even national, consequence. It is much to be wished that the species of the Norway Oak, so valuable for floors, on account of its straightness, and freedom from knots, could be determined. Perhaps these circumstances are owing to its being drawn up straight, with few branches, in its close native forests, and therefore it may not be specifically different from one or other of our own species. Michaux, and other writers on the American Oaks, have taught us, that the pubescence of the *leaves* in this genus is of more specific importance than had previously been supposed, and we therefore have paid the more regard to it in discriminating some of the European kinds. The *flowers*, male and female, appear still to demand more precise investigation and comparison, than they have any where received. S.

Quercus, in *Gardening*, furnishes plants of the forest, deciduous, evergreen, ornamental tree-kinds, of which the species cultivated are, the common oak-tree (Q. robur); the willow-leaved oak-tree (Q. phellos); the chesnut-leaved oak-tree (Q. prinus); the black oak-tree (Q. nigra); the red oak-tree (Q. rubra); the white oak-tree (Q. alba); the Italian or small prickly-cupped oak-tree (Q. esculus); the great prickly-cupped oak-tree (Q. ægilops); the Turkey oak-tree (Q. cerris); the evergreen or holm oak-tree (Q. ilex); the holly-leaved evergreen oak-tree (Q. gramuntia); the cork-barked oak, or cork tree (Q. suber); and the kermes oak-tree (Q. coccifera).

Of the first there are several varieties; as with the acorns on long peduncles. This is found in the wilds of Kent and Sussex, where there are many large trees. The leaves are not so deeply sinuated, nor are they so irregular as in the common sort, but the indentures are opposite; they have scarcely any footstalks, but sit close to the branches; but the acorns stand upon very long footstalks. The timber of this sort is accounted better than that of the common oak, and the trees have a better appearance.

The broad-leaved evergreen oak, which grows upon the Apennines, and also in Suabia and Portugal. The leaves are broader, and not so deeply sinuated as those of the common oak; they are of a lighter green on their upper side, and pale on their under; have very short footstalks, and their points are obtuse; the acorns have very long footstalks, which frequently sustain three or four in a cluster.

The dwarf oak, which grows in the south of France and Italy, and is a low bushy oak, rises but six or seven feet high, sending out many slender branches the whole length. The leaves are oblong, and obtusely indented, about three inches long, and an inch and a half broad, standing upon slender footstalks; the acorns small, growing in clusters.

There are also many other varieties of common oak, which dealers in timber and woodmen distinguish by their use, qualities, and accidents, and to which they give different names; but these being merely local, and not founded on permanent characters, it is difficult to ascertain them.

In the second species they distinguish two sorts; one of which is called the Highland willow oak, and grows upon poor dry land; the leaves are of a pale green, and entire, shaped like those of the willow tree; the acorns are very small, but have pretty large cups. The other grows in low moist land, and rises to a much greater height; the leaves are larger and narrower, but the acorns are of the same size and shape. It is suggested, as probable, that their difference may be owing to the soil in which they grow. Martyn observes, that the latter becomes a large timber tree, and that there are said to be several varieties of it.

The third species has seemingly two varieties, one of which grows to a much larger tree than the other; but this may be occasioned by the soil, for the largest trees grow in rich low lands, where they become bigger than any of the North American oaks. The wood is not of a very fine grain, but is very serviceable; the bark is grey and scaly; the leaves are five or six inches long, and two inches and a half broad in the middle, indented on the edges with many transverse veins running from the midrib to the borders; they are of a bright green, and so nearly resemble those of the chesnut tree as scarcely to be distinguished from it. The acorns are very large, and their cups are short. The leaves of the other variety are not so large, nor so strongly veined; and the acorns are smaller, and a little longer. The different varieties are distinguished by the form of their leaves, which in the one is ovate, and in the other oblong.

The fifth sort has several varieties.

And in the ninth sort there are several varieties.

The tenth species has likewise several varieties, differing greatly in the size and shape of their leaves; but these will all arise from acorns of the same tree: even the lower and upper branches have very frequently leaves very different in size and shape; those on the lower branches being much broader, rounder, and their edges indented and set with prickles; but those on the upper long, narrow, and entire. The leaves are from three to four inches long, and an inch broad near the base, gradually lessening to a point; they are of a lucid green on their upper side, but whitish and downy on their under, and do not fall till they are thrust

off

off by young leaves in the ſpring. The acorns are ſmaller than thoſe of the common oak, but of the ſame ſhape.

The twelfth ſpecies has alſo two or three varieties; one with a broad leaf, a ſecond with a narrow leaf, both evergreen; and one or two which caſt their leaves in autumn: but the broad-leaved evergreen is the moſt common. The leaves of this are entire, about two inches long, and an inch and quarter broad, with a little down on their under ſides, on very ſhort footſtalks: theſe leaves continue green through the winter till the middle of May, when they generally fall off juſt before the new leaves come out, ſo that the trees are often almoſt bare for a ſhort time. The acorns are very like thoſe of the common oak.

The exterior bark forms the cork, which is taken from the tree every eight or ten years; but there is an interior bark which nouriſhes them, ſo that ſtripping off the outer bark is ſo far from injuring the trees, that it is neceſſary to continue them: for, when the bark is not taken off, they ſeldom laſt longer than 50 or 60 years in health; whereas trees which are barked every eight or ten years will live 150 years, or more. The bark of a young tree is porous, and good for little: however, it is neceſſary to take it off, when the trees are twelve or fifteen years old, for without this the bark will never be good. After eight or ten years, the bark will be fit to take off again; but this ſecond peeling is of little uſe. At the third peeling, the bark will be in perfection, and will continue ſo for 150 years; as the beſt cork is taken from old trees. The time for ſtripping the bark is in July, when the ſecond ſap flows plentifully: the operation is performed with an inſtrument like that which is uſed for diſbarking the oak.

It is from the laſt ſpecies they collect the kermes, or ſcarlet grain, a little red gall, occaſioned by the puncture of an inſect called *coccus ilicis*. With this the ancients uſed to dye cloth of a beautiful colour.

Method of Culture.—Theſe trees are all capable of being raiſed from the ſeed or acorns, which, in the common oak, ſhould be gathered in autumn when quite ripe, juſt as they drop from the trees; but thoſe of moſt of the foreign oaks are generally procured from abroad, and ſold by the ſeedſmen.

All the ſorts ſhould be ſown as ſoon after they are obtained as poſſible, as they are apt to ſprout if they remain long out of the ground; and for their reception, a ſpot of light ground in the nurſery ſhould be prepared by digging or ploughing, dividing it into four feet wide beds, in which the acorns ſhould be ſown, either in drills, two inches deep, in five or ſix rows lengthwiſe of the bed; or rake the mould off the bed, the depth of two inches, into the alleys; then ſowing the acorns all over the ſurface, about two or three inches apart, preſs them down with the ſpade, and ſpread the earth evenly over them two inches thick. When they come up in the ſpring, they ſhould have occaſional waterings and weeding; and when the plants are one or two years old, it is proper to plant them out in nurſery-rows: this may be done in autumn, winter, or early in the ſpring, taking them carefully up out of the ſeed-bed, ſhortening their perpendicular tap-roots, and trimming off any lateral ſhoots from the ſtem, leaving their top perfectly entire; then planting them in lines two feet and a half aſunder, and fifteen or eighteen inches in the rows, where they ſhould ſtand, with the uſual nurſery care, till of a proper ſize for final planting out either as foreſt trees, or for ornament, training them up as full ſtandards, with clean ſtraight ſtems, and with their tops ſtill entire.

But in raiſing the ſtriped-leaved varieties of the common oak, and any particular variety of the other ſpecies, it ſhould be by grafting, (as they will not continue the ſame from ſeed,) which ſhould be performed upon any kind of oakling ſtocks raiſed from the acorns, and trained for ſtandards, as in other kinds.

With reſpect to the final planting out, it may be performed in all ſorts of deciduous oaks any time in open ſettled weather, from November till February or March; and in the evergreen kinds in October, November, or the ſpring; and in a mild open ſeaſon in any of the winter months.

When the trees of all the ſorts are from about three or four to ſix feet ſtature, they are proper for being planted out for good; though, as foreſt or timber trees, it is better to plant them out finally while they are quite young, as from two to three or four feet in height; or when planted immediately from the ſeed-bed, where they are to remain, it may be advantageous, as the very young oaks root more freely than older trees, and take a freer growth. Thoſe deſigned as foreſt or timber trees ſhould be planted in large open tracts of ground, to form woods, placing them in rows only from four or five to ten feet aſunder, and from two or three to five or ſix feet in the rows, to allow for a gradual thinning. But perhaps the beſt method of all for raiſing them, as timber trees, is from the ſeed, by ſowing or ſetting the acorns. See PLANTATION and PLANTING.

Sometimes, indeed, large plantations of theſe trees, for woods, are raiſed by ſowing the acorns at once in the places where they are to remain; it being generally found that the trees raiſed at once from the acorn, from their not being checked, much outſtrip the tranſplanted trees in their growth. The method of performing it is this: the ground being prepared by good ploughing and harrowing in the autumn, having procured a proper quantity of acorns, draw drills acroſs the ground four feet aſunder, and two inches deep, dropping the acorns into them ſix or eight inches aſunder, allowing for failing and thinning, covering them in evenly with the earth the depth of the drills; or, inſtead of drilling them in, they may be planted with a dibble the ſame depth and diſtance.

The general management of theſe trees in woods, or timber plantations, is the ſame as directed for foreſt trees in general. See PLANTATION.

All the above ſorts of trees may be employed to diverſify large ornamental plantations in out-grounds, and in forming clumps in ſpacious lawns, parks, and other extenſive open ſpaces: the evergreen kinds, in particular, have great merit for all ornamental purpoſes in pleaſure-grounds and plantations. And all the larger growing kinds, both deciduous and evergreens, are highly valuable as foreſt trees for timber; but the firſt ſort claims precedence as a timber tree, for its prodigious height and bulk, and ſuperior worth of the wood.

In planting any of the ſpecies for ornament or variety in large pleaſure-grounds, ſome may be diſpoſed in aſſemblage in any continued plantation, ſome in clumps, and others ſingly.

All the different ſorts of the oak will ſucceed in any ſoil of a middling quality, where the expoſure is not unfavourable; but to the moſt advantage, where the land is of a loamy nature: they, however, thrive tolerably in thoſe ſoils which are of a gravelly, ſandy, or clayey deſcription.

Beſides the great value of theſe ſorts of trees for the utility and durability of their wood, as timber, for the purpoſes of ſhip-building, houſe-building in ſome parts, park-paling, poſts, railings, and a variety of other ſtrong uſes; they, in many of the kinds, afford conſiderable additional advantage

advantage by their produce in bark, for the uſe of the tanners and cork-cutters, in tanning leather, and being made into corks; after the former of which, it is alſo much employed in gardening, for the forming of bark hot-beds, in raiſing tender hot-houſe exotic plants: as well as in their annual crops of acorns, as an excellent food for the keeping and fattening of ſwine, deer, and ſome other animals.

QUERCUS, in *Planting*, a claſſical term ſometimes applied to the oak-tree in nurſery collections, intended for this ſort of application. See OAK-*Tree*.

QUERCUS *Marina*, the *Sea-Oak*, in *Botany*, the name of one of the broad-leaved dichotomous ſea-fucuſes.

It is not agreed, among the late botaniſts, what was the ſea-oak of Theophraſtus; and the moſt ancient botaniſts, Cluſius and Cæſalpinus, ſuppoſe it to have been a ſpecies of the ſhrubby coralline; but that ſeems by no means to have been the caſe, ſince Theophraſtus ſays his ſea-oak had a long, thick, and fleſhy leaf, whence we may much more naturally conclude it to have been of the fucus claſs.

QUERCY, in *Geography*, a province of France before the revolution, in the government of Guienne; bordered on the E. by Rouergue and Auvergne, on the S. by Upper Languedoc, on the W. by Perigord and Agenois, and on the N. by Limoſin: it contained two biſhoprics, *viz.* Cahors and Montauban. The air is good, and the land is fertile: its capital was Cahors. It now conſtitutes the department of the Lot.

QUEREIVA, in *Ornithology*, the purple-throated chatterer of Latham, a ſpecies of Ampelis.

QUERELA, QUARREL, in *Law*, denotes an action, or declaration, preferred in any court of juſtice. See QUARREL.

In an action where the plaintiff is called *querens*, *i. e.* complainant, his brief, complaint, or declaration, is called *querela*.

QUERELA *Audita*. See AUDITA.

QUERELA *coram rege et concilio*, a writ by which one is called to juſtify a complaint of a treſpaſs made to the king himſelf, before the king and his council.

QUERELA *Duplex*. See DOUBLE *Quarrel*.

QUERELA, *Ex gravi*. See EX GRAVI, &c.

QUERENGHI, ANTONIO, in *Biography*, a man of letters, was born at Padua in 1546. He diſplayed, at an early period of his life, a decided attachment to literature; he wrote verſes before he was twelve years of age, and ſoon became diſtinguiſhed by his deep knowledge of the languages, civil laws, and the philoſophy that was taught at that period. For ſome time he applied himſelf to theology, and made conſiderable proficiency in it. He next went to Rome, where he entered into the ſervice of ſeveral cardinals, and at length became ſecretary of the ſacred college, in which capacity he was preſent at the election of five popes. Clement VIII. conferred upon him the canonry of Padua, which occaſioned him to reſide in that city, but he returned to Rome in the pontificate of Paul V., by whom he was promoted to ſome offices of truſt. He died at Rome in 1633, at the age of 87. He was a man of various and extenſive literature, and was much regarded by the learned of the time in which he flouriſhed. His writings were numerous, and comprehended the ſciences and polite literature. He is chiefly known to poſterity by his poems, which are correct and elegant, but by no means animated. Moreri.

QUERETANO, in *Geography*, a town of Mexico; 80 miles N.N.W. of Mexico. N. lat. 20° 25′. W. long. 101° 30′.

QUERFAA, in the *Materia Medica of the Arabians*, a name given by Avicenna and others to cinnamon, when gathered with the wood of the young branches.

It was a common practice in the early times not to ſtrip the ſmall bark from medicinal trees, but to cut off the little boughs, and uſe the bark and wood together. This the Greeks called *xylo cinnamomum*, or woody cinnamon; and the Arabians, *querfaa*, *querfe*, or *kerfe*.

QUERFURT, in *Geography*, a town of Saxony, ſituated on the little river Weite, inconſiderable in itſelf, but having large ſuburbs; the number of houſes is eſtimated at upwards of 500. The old caſtle belonging to it ſtands on a hill, and it has likewiſe a ſuperintendency; 16 miles S.W. of Halle. N. lat. 51° 23′. E. long. 11° 45′.

QUERIA, in *Botany*, received that name from Loefling and Linnæus, in compliment to Don Joſeph Quer y Martinez, a Spaniſh ſurgeon, who though he wrote againſt the Linnæan ſyſtem, and even the ſexes of plants, contending that palm-trees ripen fruit without impregnation, was an aſſiduous practical botaniſt. He publiſhed a Spaniſh Flora, in his native tongue, conſiſting of four volumes quarto, of which the firſt three appeared in 1762, and the fourth in 1764. A fifth and ſixth were added by Ortega in 1784. Quer was profeſſor of botany in the royal garden at Madrid, and died in 1764, aged 69. He wrote alſo on the *Uvi Urſi*, (which he removes from the genus *Arbutus*,) as a ſpecific in calculous complaints; and on the medical uſe of *Cicuta*.—See Haller's Bibl. Bot. v. 2. 516. and Dryandr. Bibl. Banks.— Linn. Gen. 43. Schreb. 58. Willd. Sp. Pl. v. 1. 493. Mart. Mill. Dict. v. 4. Ait. Hort. Kew. v. 1. 185. Juſſ. 300. Lamarck Illuſtr. t. 52. Gærtn. t. 128?—Claſs and order, *Triandria Trigynia*. Nat. Ord. *Caryophylleæ*, Linn. Juſſ.

Gen. Ch. *Cal.* Perianth inferior, of five erect, oblong, acute, permanent leaves; the outermoſt recurved. *Cor.* none. *Stam.* Filaments three, capillary, ſhort; anthers roundiſh. *Piſt.* Germen ſuperior, ovate; ſtyles three, the length of the ſtamens; ſtigmas ſimple. *Peric.* Capſule roundiſh, of one cell, with three valves. *Seed* ſolitary, roundiſh, compreſſed.

Eſſ. Ch. Calyx of five leaves. Corolla none. Capſule of one cell, with one ſeed.

Obſ. Linnæus remarks, that this genus differs evidently from MINUARTIA, ſee that article, in having a ſolitary ſeed. *Q. canadenſis*, figured by Gærtner, is removed hence by Michaux to his genus *Anychia*, which belongs to a different natural order, the *Holeraceæ* of Linnæus, and has a capſule deſtitute of valves. Gærtner indicates its cloſe affinity, except in number of ſtamens, to his PARONYCHIA, ſee that article. Michaux and Purſh aſſert that its ſtamens vary from two to five.

1. Q. *hiſpanica*. Spaniſh Queria. Linn. Sp. Pl. 132. Willd. n. 1. Ait. n. 1. Loefl. It. 48. 83. Quer. Fl. Eſpan. v. 6. 667. t. 15. f. 2.—Flowers crowded into a tuft. —Native of ſandy grounds in Spain. Seeds were ſent to Kew, in 1800, by the late marchioneſs of Bute. The plant is a diminutive hardy annual, flowering moſt part of the ſummer. *Root* fibrous. Whole *herb* whitiſh, brittle, one or two inches high, with ſeveral leafy, round, rather downy, ſlightly reddiſh *ſtems*. *Leaves* oppoſite, ſeſſile, awl-ſhaped, three-ribbed, curved to one ſide, rather longer than the joints of the ſtem. Head of *flowers* obſcurely quadrangular, denſely dichotomous, eaſily breaking off from the ſtem. *Bracteas* oppoſite, awl-ſhaped, recurved, and hooked, eaſily catching hold of the coats of animals. *Flowers* very minute.

2. Q. *canadenſis*. Canadian Queria. Linn. Sp. Pl. 132. Willd. n. 2. Ait. n. 2. Gærtn. v. 2. 217. t. 128. f. 10. Gron. Virg. ed. 2. 16. (Mollugo foliis oppoſitis, ſtipulis quaternis,

quaternis, caule dichotomo; Gron. Virg. ed. 1. 14. Anychia dichotoma; Michaux Boreal-Amer. v. 1. 113. Purſh v. 1. 176.)—Flowers ſolitary, ſtem forked.—Native of dry lime-ſtone hills, from New York to Kentucky, flowering from June to Auguſt. Introduced at Kew, in 1806, by his royal highneſs the duke of Kent, according to Mr. Aiton, who marks it as a hardy biennial. Linnæus and others make it perennial; which the appearance of the plant contradicts. The *root* is ſmall, tapering, with a few pale fibres. *Stem* ſolitary, near a ſpan high, round, jointed, ſmooth, reddiſh, erect, leafy; ſimple below; repeatedly ſubdivided, forked and ſpreading, above; the branches divaricated, capillary, leafy, many-flowered. *Leaves* oppoſite, on ſhort ſtalks, obovate, entire, ſmooth, from one-fourth to three-fourths of an inch long, covered on both ſides with reddiſh dots, which become prominent as the leaves dry. Theſe dots, Linnæus ſays, diſappear by culture. *Stipulas* two at each ſide, membranous, acute. *Flowers* very ſmall, axillary or lateral, green, on ſhort ſtalks. *Calyx-leaves* concave, or vaulted, below the point. *Stamens*, according to Michaux, always five in the wild plant; in the cultivated one often but two. Linnæus juſtly points out the reſemblance of this herb, at firſt ſight, to *Linum catharticum;* but its ſtrict affinity to *Illecebrum*, *Polygonum*, &c. is far more ſtriking, as well as its total unlikeneſs to the original *Queria;* ſo that there can be no doubt of the neceſſity of removing it from the preſent genus, whether the *Anychia* of Michaux be permanently eſtabliſhed or not.

3. Q. *trichotoma*. Three-forked Queria. Thunb. in Tranſ. of the Linn. Soc. v. 2. 329. Willd. n. 3. (Rubia ſpicis ternis; Thunb. Jap. 357.)—Flowers racemoſe. Stem triply forked.—Native of Japan.—*Herb* with widely ſpreading, thread-ſhaped, ſmooth *branches*. *Leaves* oppoſite, on very ſhort ſtalks, ovate, acute, nearly entire, ſmooth, widely ſpreading, as long as the finger nail. *Cluſters* axillary, three; two oppoſite, one terminal, compoſed of three or four pair of oppoſite, minute, deciduous *flowers*. To this deſcription Thunberg adds—"*Corolla* cylindrical. *Fruit* inferior, oblong, ſmooth."—This muſt be altogether a miſtake, if the plant has any pretenſions to be reckoned a *Queria*. Having ſeen no ſpecimen, we leave the matter as we find it. The genus before us muſt probably depend on the firſt ſpecies only; and whether the character of the ſolitary ſeed, by which alone it ſtands diſtinguiſhed from *Minuartia*, be ſufficient, there being the ſtricteſt conformity in habit and every other particular, we feel much inclined to doubt.

QUERIGUT, in *Geography*, a town of France, in the department of the Arriége, and chief place of a canton, in the diſtrict of Foix; 27 miles S.E. of Taraſcon. The place contains 809, and the canton 2483 inhabitants, on a territory of 132½ kiliometres, in ſeven communes.

QUERIMBA, a cluſter of iſlands, deriving its name from the principal, in the Indian ſea, near the coaſt of Africa; fertile in dates, oranges, grapes, and other fruits and legumes. The paſtures feed great numbers of large and ſmall cattle, and the coaſts abound with fiſh. Theſe iſlands, when firſt diſcovered by the Portugueſe, were inhabited by Arabians; but at preſent they are chiefly occupied by the deſcendants of Portugueſe. S. lat. 12° 20′. — Alſo, a country of Africa, bordering on the coaſt. S. lat. 9° to 13°.—Alſo, a river of Africa, which runs into the Indian ſea, S. lat. 12° 20′.

QUERKEINESS, or Kerkeines, two iſlands in the Mediterranean, near the coaſt of Tripoli; one of them about ten miles long and five wide, anciently called "Cercina;" the other, which is ſmaller, is united to the larger by a bridge; 15 miles S.S.E. of cape Oudia. N. lat. 34° 59′. E. long. 11° 12′.

QUERO, a town of South America, in the juriſdiction of Riobamba.

QUERPO. See Cuerpo.

QUERQUEDULA, in *Ornithology*, a ſpecies of *Anas*. See Duck and Teal.

QUERRE′, in *Geography*, a town of France, in the department of the Mayne and Loire; 12 miles N. of Angers.

QUERRIEN, a town of France, in the department of the Finiſterre; ſix miles N. of Quimperle.

QUERRIES, or Equerries. See Equerry.

QUERRIEUX, in *Geography*, a town of France, in the department of the Somme; ſix miles N.E. of Amiens.

QUERRY, *Gentleman of the*, is an officer appointed to hold the king's ſtirrup, when he mounts on horſeback.

QUERS, in *Geography*, a town of France, in the department of the Upper Saone; three miles S.E. of Luxeuil.

QUESADA, a town of Spain, in the province of Jaen; 12 miles S.E. of Ubeda.

QUESENDORF, a town of Pruſſia, in the palatinate of Culm; four miles S.E. of Bretchen.

QUESNAY, Francis, in *Biography*, a celebrated French phyſician, was born at Mercy, a little town not very diſtant from Paris, in 1694. His family were employed in ruſtic occupations, and gave him no other education than was deemed neceſſary for their mode of life; ſo that at the age of ſixteen he was ſcarcely able to read. About this time, however, a thirſt for information ſeized him, and partly by the aſſiſtance of a country ſurgeon, and the few books that he poſſeſſed, but principally by his own labour, he acquired a knowledge of Latin and Greek, and entered with ardour into the ſtudy of the ancient and modern writings on philoſophy. In oppoſition to the grovelling notions of his relations, he reſolved to turn his purſuits to medicine, having perceived its connection with the various branches of phyſical ſcience; and his maſter, the ſurgeon of Ecquevilly, was ſoon convinced of the ſuperior acquirements of his pupil, ſome of whoſe eſſays he preſented as his own, on applying for admiſſion into the college of St. Côme, and they were received with great applauſe. This ſtill farther roufed the zeal of Queſnay, and he repaired to Paris, where he entered with great aſſiduity into the ſtudies connected with the profeſſion. After ſome time he ſettled at Mantes, a conſiderable town in his native province. Here he was diſcovered by Garengeot, an eminent ſurgeon, who was engaged with Peyronie in an attempt to eſtabliſh an academy of ſurgery, for the collection of ſurgical knowledge. Having written a refutation of the doctrines of Silva, reſpecting blood-letting, which led him to a public controverſy, in which he was deemed victorious by Peyronie, he diſplayed ſuch profound views, indefatigable zeal, and great general knowledge, as determined Peyronie to appoint him the ſecretary of his new academy. This diſtinguiſhed poſt raiſed him ſtill higher in the public eſtimation; but the labours connected with it at length injured his health, which had been for ſome time delicate, and he determined to turn his attention to medicine more particularly, and took the degree of doctor of phyſic. He had been employed during the campaigns of the king, and on the death of M. Terray was appointed conſulting phyſician to his majeſty; and was much eſteemed and favoured by madame de Pompadour; he ſeems, indeed, to have been much employed, and to have been held in high conſideration by the dauphin,

the father of Louis XVI., and by the whole court. After the dauphin had undergone the ſmall-pox, the king preſented him with letters of nobility, unſolicited, as a mark of his eſteem. He was appointed alſo firſt phyſician in ordinary to his majeſty. He was a member of the Academy of Sciences, of the Royal Society of London, &c. Notwithſtanding his long life, and his courtly favour, as well as extenſive employment, he died poſſeſſed of little fortune, his liberality to his friends having prevented him from accumulating money. His death took place at Verſailles, in December, 1774, at the age of eighty.

This able and indefatigable man left ſeveral works, which bear the ſtamp of conſiderable reſearch, clear and methodical views, and acute obſervation, mixed, however, with ſome diſpoſition to hypotheſis. His firſt eſſay on blood-letting, already mentioned, was publiſhed in 1730, under the title of "Obſervations ſur les Effets de la Saignée, avec des Remarques critiques ſur la Traité de Silva;" and a ſecond edition, conſiderably enlarged, was printed in 1750. But in the mean time he publiſhed another work, entitled "L'Art de Guerir par la Saignée," Paris, 1736, in which he recommends blood-letting in many diſeaſes. In the ſame year appeared his "Eſſai Phyſique ſur l'Economie Animale," in two volumes, 12mo., which was reprinted in 1747, in three volumes. This work, however, was deemed very imperfect by Haller, and is in fact characteriſed by a love of hypotheſis, rather than by the details of experience and obſervation. In 1743, his "Preface des Memoires de l'Academie de Chirurgie," gained him conſiderable applauſe, as a work of literary reſearch. In 1744 he publiſhed his "Recherches critiques et hiſtoriques ſur l'Origine, ſur les divers Etats, et ſur les Progrés, de la Chirurgie en France," which called forth ſome replies on the alleged inaccuracy of ſome of the hiſtorical ſtatements. His other publications were entitled, "Teſtament de M. de la Peyronie du 18 Avril, 1747;" "Examen impartial des Conteſtations des Medecins et des Chirurgiens de Paris," 1748, 12mo.; "Memoire préſenté au Roi par ſon premier Chirurgien, où l'on examine la Sageſſe de l'Ancienne Légiſlation ſur l'Etat de la Chirurgie en France," 4to.; "Traité de la Suppuration," 12mo.; and "Traité de la Gangrene," 12mo.; all in the year 1749. And laſtly, his "Traité des Fièvres continues," 1753, in two volumes, 12mo. Eloy Dict. Hiſt. de la Médécine.

QUESNE, Abraham du, an able French naval commander, was deſcended from a noble family in Normandy. He was born in 1610, and was brought up to the ſea-ſervice under his father, who gave him the command of a veſſel when he was only ſeventeen years of age. In 1637 he was preſent at the attack of the iſles of Sainte Marguerite, and in the following year contributed greatly to the defeat of the Spaniards before Gattori. He was afterwards in various actions on the coaſt of Spain. In 1644 he went to ſerve in Sweden, and was promoted to the rank of vice-admiral of the Swediſh fleet. In this ſtation he had a command in the famous battle in which the Danes were entirely defeated, and his veſſel was one that boarded and took the enemy's admiral ſhip. On his return to France he commanded a ſquadron ſent to the expedition againſt Naples. The French navy being in a low ſtate on account of the minority of the king, he fitted out ſeveral ſhips at his own expence in 1650, with which he aſſiſted in the reduction of Bordeaux, which had revolted, and was aided by a Spaniſh fleet. In 1676 he had the glory of being oppoſed to the great De Ruyter. The Spaniſh and Dutch fleets had united to prevent the French from ſuccouring the inhabitants of Meſſina, but Du Queſne, after a deſperate fight, ſucceeded in entering the port. He was alſo engaged with De Ruyter when the latter was mortally wounded. Du Queſne obtained a more glorious and decided ſucceſs in another engagement with the Spaniſh and Dutch fleets at Palermo, when, by means of his fire-ſhips, he deſtroyed twelve large ſhips of the enemy, and thus procured for his king the ſovereignty of the Mediterranean. In 1682 he was ſent with a fleet to awe the piratical ſtates of Barbary, which had committed depredations on the French coaſts, and in the following year he ſailed to Algiers, and bombarded the town with ſuch fury as nearly to lay it in ruins. In the following ſpring the admiral anchored before the city, and did not leave it till he had deſtroyed almoſt all the buildings, with the whole of the ſhipping and fortifications, the conſequence of which was they were obliged humbly to ſue for peace. He ſtruck equal terror into the ſtates of Tripoli and Tunis, which were likewiſe compelled to purchaſe peace with France by ſubmiſſion. He performed other great and important ſervices for his ſovereign, but the recompence due to him on account of all he did was impeded by his firm attachment to the reformed religion in which he was bred, and which the bigotry of the king regarded as criminal. He received, however, the royal gift of a fine eſtate, which was erected into a marquiſate, and gave him a title; and on the repeal of the edict of Nantes, he was the only perſon exempted from its penalties. This great hero, one of the chief boaſts of the French navy, preſerved an extraordinary degree of health and vigour, notwithſtanding the many wounds which he had received, till his death in 1688, when he had attained to the 78th year of his age. He left a ſon, of whom we ſhall ſay a few words.

Quesne, Henry du, was born in 1652, and at the age of fourteen he entered the French navy, and ſerved with great diſtinction under his father. He was preſent at the bombardment of Algiers in 1683, and negotiated the peace of Tunis. At the period when the higheſt proſpects in his profeſſion lay before him, his attachment to the Proteſtant religion cauſed him, at the repeal of the edict of Nantes, to quit his country and the ſervice, but he refuſed with indignation the offers that were made him to take a command in the armies of its enemies, and retired to Switzerland. His high reputation raiſed him to great credit with the Proteſtant powers, which he employed in engaging them to undertake the protection of his perſecuted brethren; and through his means a great number of victims of the moſt cruel intolerance procured their liberation from the gallies. In 1701 he ſold his eſtate in Switzerland, and retired to Geneva, of which he was admitted to the citizenſhip. Here he died in 1723, reſpected alike for his learning and piety. As an author he had taken a conſiderable ſhare in the verſion of the New Teſtament publiſhed by the paſtors of Geneva, and he was author of a work entitled "Reflexions Anciennes et Modernes ſur l'Euchariſtie."

Quesne, *Fort du*, in *Geography*. See Pittsburg.

QUESNEL, Pasquier, in *Biography*, a French prieſt of much celebrity, was born at Paris in the year 1634. Having completed his education, and being admitted a member of the congregation of the oratory, he took prieſt's orders in 1659. From this time he devoted himſelf, with great diligence, to the ſtudy of the ſcriptures, and of the fathers, and to the compoſition of books in practical piety. At the age of 28 he was appointed firſt director of the inſtitution belonging to his order at Paris. The firſt of his publications was entitled "Moral Reflections upon the Goſpels." After this he was employed in preparing for the preſs a new edition of "The Works of St. Leo," in two volumes, 4to. in which he has given a vaſt number of notes

that

that reflect great honour on the learning of the editor. Its value was enhanced, in the judgment of his countrymen, by his introducing into it an able defence of the ſentiments of the Gallican church, in oppoſition to the pretenſions of the church of Rome. This circumſtance gave great offence to the papal government, and the edition was condemned in the following year at Rome. On account of his attachment to father de Sainte-Marthe, general of the oratory in France, he was obliged to quit his dioceſe, and from other unpleaſant circumſtances he thought it right to withdraw privately from France into foreign countries. He took refuge at Bruſſels, where he continued his "Moral Reflections" on the acts of the apoſtles, and the epiſtles. This, with his former work, he publiſhed in 1687. He afterwards reviſed and made additions to the former work on the Evangeliſts, and printed an uniform edition of the whole in 1693 or 1694, in four vols. 8vo. In the year 1703 the Jeſuits, always inimical to the rights and liberties of mankind, and who, to the utter diſgrace of the preſent period, have been juſt re-eſtabliſhed in their powers, availed themſelves of their influence with an ignorant and bigotted king of Spain, to obtain an order for the arreſt of father Queſnel, who was now thruſt into a dungeon belonging to the archiepiſcopal palace at Bruſſels. From this ſituation he was unexpectedly delivered in leſs than four months by the ingenuity of a Spaniard, who contrived to open a paſſage through the walls of the priſon ſufficiently large for his eſcape. Having thus obtained his liberty, he made the beſt of his way to Holland, where he publiſhed ſeveral pieces in vindication of himſelf and writings from charges preferred againſt both before the eccleſiaſtical court of Mechlin, and the ſentence of condemnation pronounced by the archbiſhop. In the year 1705 the enemies of Queſnel applied to the pope Clement XI. for the condemnation of the "Moral Reflections," to which he acceded, although he had ſome years before expreſſed his decided approbation of them, and even wiſhed to engage the author to come to reſide at Rome. Such, however, was the pontiff's inconſiſtency, that he iſſued a decree which condemned the "Moral Reflections" in general, but without ſpecifying any particular doctrines which merited ſuch a ſentence. At length, at the inſtigations of the Jeſuits, eager in the cauſe of perſecution, Lewis XIV. joined himſelf againſt Queſnel, and applied to the pope for a more definite decree; his holineſs, for ſo the moſt wicked as well as moſt virtuous of the popes have ever been denominated, in conſequence of this application, eſtabliſhed a congregation of cardinals, prelates, and divines, to enter into a particular examination of the doctrines and maxims which Queſnel had advanced. That his work might not be condemned without any efforts on his part to vindicate it from the accuſations of his enemies, our author wrote, on this occaſion, two letters to the pope, which were ſafely conveyed to Rome, but Clement did not deign to give a reply. State policy had already determined what meaſures he ſhould adopt, and, after the ſeſſions of the congregation were ended, he iſſued the celebrated bull Unigenitus, in September 1713, which pronounced a ſentence of condemnation upon 101 propoſitions extracted from the "Moral Reflections."

Father Queſnel ſpent the laſt years of his life at Amſterdam, where he formed ſome Janſeniſt churches, and publiſhed his apologetic and controverſial pieces againſt the bull Unigenitus, and its abettors. He died in 1719, in the 86th year of his age. Independently of his "Moral Reflections," he was author of ſeveral other works of high reputation, of which we may mention, a treatiſe on "Predeſtination and Grace," in four vols. 12mo. under the fictitious name of ſieur Germain; and "The Diſcipline of the Church deduced from the New Teſtament," in two vols. 4to. A liſt of this author's works may be ſeen in Moreri.

QUESNOI, Francis du, called the Fleming, an excellent ſculptor, was born at Bruſſels in 1594. He learned his art under his father, who was a ſculptor, and at an early age diſplayed ſo much ability, that the archduke Albert gave him a penſion and ſent him into Italy. After the death of that prince, he was patronized by the conſtable Colonna; and the celebrated Pouſſin reſiding with the conſtable at the ſame time, the two artiſts contracted an intimate friendſhip, and ſtudied together. Queſnoi formed himſelf upon the taſte of the ancients, and chiefly excelled in making basreliefs and models in a ſmall ſize, repreſenting cupids and children, to which he gave ſingular grace and delicacy. He employed himſelf ſeveral years on a marble ſaint, for the chapel of Loretto, in which he imitated the genuine beauties of the antique. When the canopy of St. Peter's was finiſhed, pope Urban VIII. ordered four coloſſal ſtatues to be placed in the niches. That of St. Andrew was given to Queſnoi, and although one of his competitors ventured to affirm that he would only produce a great child, yet when the figure was completed, it entirely effaced his own performance. Notwithſtanding the talents of this artiſt, which were united to much perſeverance and induſtry, he could barely earn a ſubſiſtence, and was in a very low ſtate of health and ſpirits, when, in 1642, Lewis XIII. engaged him as his ſculptor, and as the head of an intended ſchool for that branch of art, at a very liberal ſalary. This change of fortune he was unable to bear, and as he was on the point of ſetting out, he ſunk into a melancholy derangement, from which he never recovered. His death, which happened at Leghorn in 1646, has been imputed, but probably on inſufficient evidence, to poiſon, adminiſtered by the hand of a brother with whom he lived on very bad terms. He was mild in his manners, but of a reſerved diſpoſition. His reputation is chiefly founded upon the exquiſite ſoftneſs which he gave to marble, and the peculiar grace and beauty of his infantile groups, finiſhed with perfect anatomical exactneſs.

QUESNOY, Le, in *Geography*, a town of France, in the department of the North, and chief place of a canton, in the diſtrict of Aveſnes. The place contains 2960, and the cantons, to which belong the eaſt and weſt diviſions, 9099 each, on a territory of 235 kiliometres, in 29 communes. N. lat. 50° 15'. E. long. 3° 43'.

Quesnoy-*ſur-Deule*, a town of France, in the department of the North, and chief place of a canton, in the diſtrict of Lille. The place contains 4002, and the canton 15,047 inhabitants, on a territory of 82½ kiliometres, in nine communes.

QUEST, or Inquest, an inquiſition, or inquiry, made upon oath of an impannelled jury. See Inquest, and Jury.

The word is formed from the French *quete*, *ſearch*; of the Latin *quæſitum*, *a thing ſought*.

Quest, in *Hunting*, the ſeeking out of hounds, or the venting and winding of ſpaniels. See Hound.

QUESTEMBERT, in *Geography*, a town of France, in the department of Morbihan; five miles W.S.W. of Rochfort. The place contains 3668, and the canton 12,118 inhabitants, on a territory of 257½ kiliometres, in nine communes.

QUESTION, *Quæstio*, in *Logic*, &c. a propoſition, whoſe truth a perſon being inquiſitive about, propoſes by way of interrogation to another.

Logical queſtions are variouſly diſtributed; the ordinary

diviſion is into *firſt* or *primary* queſtions; as, *Quid eſt? What is ſuch a thing?* And *ſecondary*, which ariſe out of the former; as, *How is it?*

QUESTION, *Quodlibetical.* See QUODLIBETICAL.

QUESTION, in *Law.* The *quæſtio de jure* is generally to be diſtinguiſhed from the *quæſtio de facto.*

QUESTION is alſo ſometimes uſed for *torture;* which ſee.

QUEST-MEN, perſons choſen yearly in each ward, to inquire into abuſes and miſdemeanors, eſpecially ſuch as relate to weights and meaſures.

QUEST-MEN, in *Eccleſiaſtical Law.* See SIDESMEN.

QUESTOR, QUÆSTOR, formed *a quærendo, ſeeking, ſearching,* or *collecting the revenues of the ſtate,* an officer in ancient Rome, who had the care of the public treaſure.

The queſtorſhip, *quæſtura,* is very ancient, as having been eſtabliſhed under the kings, probably in the time of Romulus or Numa, or at leaſt under Tullus Hoſtilius. Tacitus (Annal. xi. 22.) ſays, that the firſt queſtors were elected by the people, 64 years after the foundation of the republic; but he is of opinion that they had, long before that period, been annually appointed by the conſuls, and even by the kings. But this obſcure point of antiquity is conteſted by other writers. Dionyſius and Livy date the original of queſtors about A. U. C. 269. Plutarch refers the inſtitution to the time of Valerius Poplicola, when he allotted the temple of Saturn for the treaſury, and granted the people the liberty of chooſing two young men for the treaſurers. Afterwards, *viz.* A. U. C. 332, two others were created to take care of the payment of the armies abroad, of ſelling the plunder and booty, &c. for which purpoſe they generally accompanied the conſuls in their expeditions; and they were diſtinguiſhed by the name of *peregrini* from the other queſtors, who aſſumed the title of *urbani.* This number continued till the entire conqueſt of Italy; and then, A. U. C. 439, it was again doubled. The four that were added reſided with the proconſuls and proprætors, in the provinces, where they were employed in regulating the taxes and cuſtoms due to the ſtate.

In the time of the republic, the ſenate appointed queſtors in each province, to aſſiſt the proconſuls, as lieutenants or treaſurers, in the adminiſtration of the revenues; but, under the emperors, there was properly but one queſtor, or treaſurer-general of the empire; thoſe other inferior or ſubordinate queſtors were then called aſſiſtants of the queſtor, *adjutores quæſtoris.*

The queſtor's office was originally confined to the army. They paid the ſoldiery, and took charge of monies coming by ſpoil and plunder, &c.

At length there were new ones erected to reſide in the city, and to receive the public money, taxes, tribute, &c. Their number was increaſed as the empire increaſed. Sylla augmented it to twenty; Julius Cæſar to forty; ſome being nominated by the emperor, and the others by the people. Tacitus (Annal. xi. 22.) ſeems to conſider twenty as the higheſt number of queſtors; and Dion (lib. xliii. p. 374.) inſinuates, that if the dictator Cæſar once created forty, it was only to facilitate the payment of an immenſe debt of gratitude. Under ſucceeding emperors their number was not fixed. Of theſe, two were appointed for the city, to take care of the public treaſure, and to keep the laws and decrees of the ſenate; the others pertained to the provinces and the armies.

The queſtorſhip was the firſt office which any perſon could bear in the commonwealth, and might be undertook at the age of twenty-four or twenty-five years. Accordingly, the quæſtorſhip was called the firſt ſtep of honour, and the queſtors, who were generally employed in the provinces abroad, aſſigned to them ſeverally by lot, no ſooner returned from their provincial adminiſtration than they took their places in the ſenate; and from that time forward, from the rank of equeſtrians, or what we commonly call knights, became ſenators for life.

The youth and inexperience of the queſtors, who entered on that important office in the 25th year, engaged Auguſtus to remove them from the management of the treaſury; and though they were reſtored by Claudius, they ſeem to have been finally diſmiſſed by Nero. In the provinces of the imperial diviſion, the place of the queſtors was more ably ſupplied by the procurators, or, as they were afterwards called, "rationales." But in the provinces of the ſenate we may ſtill diſcover a ſeries of queſtors till the reign of Marcus Antoninus. From Ulpian we may learn, that under the government of the houſe of Severus, their provincial adminiſtration was aboliſhed; and in the ſubſequent troubles, the annual, or triennial elections of queſtors, muſt have naturally ceaſed.

There was alſo another kind of queſtors, called *quæſtores parricidii,* whoſe office was to enquire into, and take cognizance of capital crimes, after the conſuls were denied this privilege.

QUESTOR *ſacri palatii,* or of the *ſacred palace,* was one of the firſt dignities under the emperors of Conſtantinople.

It was this queſtor that ſubſcribed the reſcripts of the emperor, and the anſwers to the petitions and ſupplications preſented to him. He alſo drew up and ſigned the laws and conſtitutions which the emperor thought fit to publiſh; and took care of the adminiſtration of juſtice.

Some compare his function to that of our lord high chancellor. It was uſually one of the juriſconſulti that was charged with this office; it being required, that he ſhould know the laws of the empire, be able to preſcribe and ſee them executed, and judge of cauſes brought by way of appeal before the emperor.

Conſtantine was the firſt who erected queſtors of the ſacred palace.

QUESTUS, or QUÆSTUS. See QUÆSTUS.

QUESTUS *eſt nobis,* a writ of nuſance, which, by ſtat. 15 Edw. I. lies againſt him to whom a houſe, or other thing, that breeds a nuſance, is deſcended, or alienated; whereas before that ſtatute, the action lay only againſt him who firſt levied, or cauſed the nuſance, to the damage of his neighbour.

QUETIF, JAMES, in *Biography,* a learned French Dominican monk, was born at Paris in the year 1618. He embraced the monaſtic profeſſion among the preaching friars when he was not more than 17 years of age, and having completed his philoſophical courſe at Paris, he was ſent by his ſuperiors to Bordcaux, where he ſtudied divinity, and received prieſt's orders in 1648. He lived to a great age, exerciſing his talents in various ways, and died in the year 1698, highly reſpected for his great erudition, his extenſive knowledge, and his virtues. He publiſhed a new edition of the "Summa Theologiæ" of Aquinas, in three vols. folio, with notes. He did the ſame by a work entitled "Concilii Tridentini Canones." He was editor of "The Spiritual and Aſcetic Letters of Savonarola;" and he publiſhed, with his own notes, "The Life of Savonarola," from the Latin of John Picus, count of Mirandula, with conſiderable additions. He wrote the preface to "The Letters of Peter Morin," which he publiſhed from the author's manuſcripts; as he alſo did his treatiſe "On the good Uſe or Abuſe of the Sciences." He was author of a conſiderable part of the work

work entitled "Scriptores Ordinis Prædicatorum, cum notis Hiſtoricis," which was completed by father Echard.

QUETREVILLE, in *Geography*, a town of France, in the department of the Channel; ſix miles S. of Coutances.

QUETTEHOU, a town of France, in the department of the Channel, and chief place of a canton, in the diſtrict of Valognes; nine miles N.E. of Valognes. The place contains 1291, and the canton 14,956 inhabitants, on a territory of 150 kiliometres, in 18 communes.

QUETTENBRUN, a town of Auſtria; eight miles E. of Laab.

QUETZ, a town of Saxony, in the circle of Leipſic; two miles S.S.E. of Zorbig.

QUEVACAMPS, a town of France, in the department of Jemappe, and chief place of a canton, in the diſtrict of Tournay. The place contains 955, and the canton 10,264 inhabitants, on a territory of 107½ kiliometres, in 15 communes.

QUEVAUVILLERS, a town of France, in the department of the Somme; eight miles S.W. of Amiens.

QUEUE, in *Commerce*, a wine meaſure uſed in ſome parts of France. A queue of Champaigne contains 384 pintes of Paris, or about 95 Engliſh gallons; a queue of Burgundy contains 432 pintes of Paris, or 107 Engliſh gallons.

QUEUE, *Fr.* tail, as applied to the heads of muſical notes; the minim is the only white note with a tail to it, and the crotchet the firſt black note with a tail to it.

QUEUE, in *Heraldry*, the tail of a beaſt.

If a lion has a forked tail, he is blazoned by double-queued.

QUEUE *d'Aronde*, q. d. *ſwallow's tail*, in *Fortification*, a term applied to outworks, when narrower at the gorge than at the face or front; *i. e.* where the ſides open towards the champaign, and contract towards the gorge. The name is occaſioned by its reſemblance, in figure, to a ſwallow's tail, which the French call queue d'aronde.

Of this kind are ſome ſingle as well as double tenailles; and ſome horn-works whoſe ſides are not parallel.

On the contrary, when the ſides are leſs than the gorge, the work is called *contre queue d'aronde*.

QUEUE *d'Aronde*, in *Carpentry*, a method of jointing, called alſo dove-tail.

QUEVEDO DE VILLEGAS, FRANCISCO, in *Biography*, a celebrated Spaniſh writer, was born at Madrid in 1570. He became diſtinguiſhed at an early period for his literary attainments, and obtained the honour of knighthood, but indulging his ſatirical vein too freely againſt the adminiſtration of count d'Olivares, he was thrown into priſon, from whence he did not make his eſcape till the diſgrace of that miniſter. He died in the year 1645, at the age of 75. He is regarded by his countrymen as having attained to a conſiderable degree of excellence in moſt of the different kinds of compoſition. His heroical poems are ſaid to be characterized by energy and ſpirit; his lyrical by ſweetneſs and beauty; and his humorous poems by eaſe, pleaſantry, and ingenious invention. His printed works fill three vols. 4to. of which two are occupied by poetry and one by proſe. The former were collected by Joſeph Gonzales de Salas, who illuſtrated them with notes and diſſertations. They were publiſhed in 1650, at Madrid, under the title of "Il Parnaſſo Eſpagnol." The humorous pieces of Quevedo have rendered his name beſt known in foreign countries, and have been tranſlated into the Engliſh and other languages.

QUEVILLY, in *Geography*, a town of France, in the department of the Lower Seine; three miles W. of Rouen.

QUEULEN, a river of Chili, which runs into the Pacific ocean, S. lat. 39° 10′.

QUEYPO, a town of Mexico, in the province of Coſta Rica, near the Pacific ocean.

QUEYRAS, a town of France, in the department of the Higher Alps; 12 miles S.E. of Briançon.

QUEYTOR, a name ſometimes given to the river Ava, at leaſt to that part which runs between Ava and Prom.

QUI, in *Rural Economy*, a common term frequently applied to the female of the cow kind of animals while in the young ſtate. It is the moſt generally employed in the northern parts of the country. See WHY.

QUI-*Calf*, a name uſually made uſe of in the northern parts of the iſland, to ſignify a female or heifer calf. See WHY-*Calf*.

QUI *Tam*, in *Law*, is uſed where an information is exhibited againſt any perſon on a penal ſtatute at the ſuit of the king and the party who is informer, when one part of the penalty for breach of the ſtatute is to be given to the king, the poor, or to ſome public uſe, and the other part to the informer or proſecutor; and the party informing proſecutes for the king and himſelf. The ſuit is called a *qui tam* action, becauſe it is brought by a perſon, "qui tam pro domino rege, &c. quam pro ſe ipſo in hac parte ſequitur." If the king, therefore, himſelf commences this ſuit, he ſhall have the whole forfeiture. (2 Hawk. P. C. 268.) But if any one hath begun a "qui tam" or "popular" action, no other perſon can purſue it; and the verdict paſſed upon the defendant in the firſt ſuit is a bar to all others, and concluſive even to the king himſelf. This has frequently occaſioned offenders to procure their own friends to begin a ſuit, in order to foreſtall and prevent other actions; which practice is in ſome meaſure prevented by a ſtatute made in the reign of a prince very ſharp-ſighted with regard to penal laws, *viz.* 4 Hen. VII. c. 20.; which enacts, that no recovery, otherwiſe than by verdict, obtained by colluſion in an action popular, ſhall be a bar to any other action proſecuted *bonâ fide*. A proviſion, ſays judge Blackſtone, that ſeems borrowed from the rule of the Roman law, that if a perſon was acquitted of any accuſation, merely by the prevarication of the accuſer, a new proſecution might be commenced againſt him. Ff. 47. 15. 3. See INFORMATION.

QUIA, in *Logic*. See REASON.

QUIA *dominus remiſit curiam*, in *Law*. See RECTO.

QUIA *emptores*, a denomination given to the ſtatute of Weſtm. 3. 18 Edw. I. which directs, that upon all ſales or feoffments of land, the feoffee ſhall hold the ſame, not of his immediate feoffor, but of the chief lord of the fee, of whom ſuch feoffor himſelf held it; and hence it is held that all manors exiſting at this day muſt have exiſted by immemorial preſcription, or at leaſt ever ſince this ſtatute was made: for no new manor can have been created ſince that ſtatute; becauſe it is eſſential to a manor, that there be tenants who hold of the lord, and that ſtatute enacts, that for the future no ſubject ſhall create any new tenants to hold of himſelf.

QUI *improvidé*, a ſuperſedeas granted in many caſes where a writ is erroneouſly ſued out, or miſawarded.

Such is that granted in behalf of a clerk of the chancery ſued againſt the privilege of the court, in the common pleas, and purſued to the exigent.

QUIADKOUA, in *Geography*, a town of Pruſſia, in the province of Bartenland; nine miles S.E. of Allerſburg.

QUIBBLETOWN, a town, or rather a village of America,

rica, in Middlesex county, New Jersey; six miles N. of New Brunswick.

QUIBERON, a fortified town of France, in the department of Morbihan, and chief place of a canton, in the district of L'Orient, situated at the extremity of a peninsula, to which it gives name, opposite to the island of Belle Isle; remarkable for an unfortunate expedition of English troops and emigrants against France, in the year 1795; 17 miles S.E. of Port Louis. The place contains 1916, and the canton 5618 inhabitants, on a territory of 95 kiliometres, in three communes. N. lat. 47° 30'. W. long. 3° 2'.

QUIBO, a small island on the outer part of the bay of Panama; it is uninhabited, but affords wood and water for shipping.

QUIBONDO, a small island in the Indian sea, near the coast of Africa. S. lat. 8° 8'.

QUIBOR, a town of South America, in the government of Caraccas; 15 miles S.W. of Segovia Nuova.

QUIBURI, a town of New Navarre; 20 miles S.S.E. of Casa Grande.

QUICAPOUX, a river of America, which runs into the Mississippi, N. lat. 43° 4'. W. long. 92° 5'.

QUICARO, a town of New Navarre; 150 miles S.S.E. of Casa Grande.—Also, a small island in the Pacific ocean, near the coast of Veragua. N. lat. 7° 54'. W. long. 82° 42'.

QUICI, in *Entomology*, a species of the cerambyx, mentioned by Marcgrave.

QUICK, in *Gardening*, a term applied to signify any sort of young plant, but especially those of the white-thorn kind. By it is also often understood a live hedge, but more properly the shrubs of which such live hedge is formed. In a strict sense it is, however, applied to the cratægus oxyacantha, or hawthorn, the young plants or sets of which are commonly sold by the nursery gardeners under the name of quicks.

In the choice of these sets, those which are raised in the nursery are in general to be preferred to such as are drawn out of the woods, as the latter have seldom good roots: many persons, however, prefer them, as they are larger plants than are commonly to be had in the nursery. See Cratægus.

Quick. See Medlar and Pyrus.

Quick-*Beam*. See Pyrus, and Service-*Tree*.

Quick-*Beam*, in *Planting*, a name given in some places to the tree usually known by the title of mountain-ash. It has been recommended as useful for forming fences, in some cases, by Dr. Anderson, and others. Where it is employed in this way, the plants must be kept down to the proper height, by being cut over as often as there may be occasion; and thus encouraging them to throw out lateral branches in a greater abundance, and, of course, induce the fence to become more close and thick in its lower parts. By these means a tolerably perfect hedge may be raised, from plants of this sort, in situations where the white-thorn will not succeed in any proper manner.

Quick-*Hatch*, in *Zoology*. See Ursus *Luscus*.

Quick-*Hedges*, in *Agriculture*, a name given to all such as are raised from quicks, or any other sort of living plants. The proper forming and planting of quick-hedges have hitherto been much too little attended to by the farmer, as it is a matter of great importance, and which interests him in a very high degree. Whatever sort of plants may be employed for this purpose, the work should constantly be well performed in the first instance, and the hedges and plants be afterwards kept in due order and regularity by suitable pruning, cutting in, and other proper management. There is a great number of different methods of raising and making hedges of this kind, as by planting the sets on the plain surface, or the mould a little raised above it, or on mounds, formed by the sods and mould dug up in the line of the hedge, elevated to different considerable heights; by setting the plants out in one row only, in double ones, or sometimes in a still greater number; by putting them in, in straight lines, in irregular manners, in the triangular form, or in the quincunx method. They are sometimes cut over at certain heights, at others not cut down at all; the sides are also in some cases clipped or cut in, but in others this is avoided altogether. When planted on banks, they are mostly cleaned and moulded up annually.

A great variety of different sorts of plants is employed in forming and constructing these hedges, as those of the hawthorn, the black-thorn, the crab-tree, the hazel, the willow, the beech, the elder, the poplar, the alder, and several other kinds, according to particular circumstances and situations. And on the exposed coasts or shores of the southern parts of the kingdom, a new sort of shrub or plant has lately been recommended for this use, which is that of the tamarisk, or *tamarix gallica*, as it thrives rapidly, it is said, when planted in situations most exposed to the blast or stroke of the sea; forms an admirable shelter, and being of quick growth, soon comes to answer the end designed. The writer of the agricultural report of the county of Cornwall has known a hedge of it, which he has been told was planted about seven years ago, and the bushes, apparently, cannot be less now than from ten to twelve feet in height, and are feathered to the very bottom. It thrives well about the Lizard, bears cutting perfectly well, and in exposed situations, where it might be injured if left to grow high, may be kept close and low to much advantage. It unfortunately, however, will not stand the frost, and should never be attempted, of course, in situations exposed to the severe effects of it. The propagation of it is by cuttings, which take root without any difficulty. It is supposed that this shrub was brought by the monks from Normandy to Mont St. Michael in the above county, and thence spread to other parts. See Hedge, and Quickset *Hedge*.

The quick-hedges of this country are in a very great degree raised from the white-thorn, which unquestionably forms the cheapest and most durable kind, where the nature of the soil, situation, and other circumstances are favourable for the purpose. It will not, however, flourish in bad land, in exposed situations, where the bottom is wet and springy, or where the growth of weeds is very abundant. In all such cases other kinds of plants are therefore had recourse to in the formation of them.

In many upland districts beech-hedges have been planted to considerable extents, and found, when kept under proper management, to be very handsome, and of great service in such expositures. Birch-hedges have likewise been tried in different cases, and found to grow remarkably fast, even in cold bare tilly soils, but they require to be cut over at the time they are about four feet in height and carefully plashed. Both these sorts of hedges have this in their favour, that they will grow in very poor soil as well as in very exposed situations; and both will flourish and grow strongly where the white thorn cannot live. Their want of prickles, however, is a great objection to them in this view: but they afford good shelter.

Quick-hedges constitute the ordinary sort of fences in this country, and unless in particular situations, and for particular purposes, are the most proper and eligible. It has been

been obſerved by the writer of a late work, that in parts which have been long incloſed without arable cultivation, hedges, of ſeemingly great age, are met with, which are many times crooked, ragged, and irregular, as though they had been, in the firſt inſtance, formed and laid out from the wild underwood of ſuch places. While in other caſes, low plants of the various coppice kinds riſe and grow on dikes or mounds but little raiſed above the ſurface of the land, ſeemingly as though they had formerly been collected from bruſh-woods and replanted on ſuch banks, in ſomewhat the ſame manner as is ſtill practiſed on higher banks in particular diſtricts towards the weſt, and in South Wales. But taking the country at large, the method of raiſing quick-hedges by ſetting grown plants taken from ſuch ſituations, has long ceaſed to exiſt and prevail as a general practice; young plants of white-thorn, or other ſorts, ſet out in the bank and ditch mode with a low protecting dead fence on the ſide contrary to the ditch at firſt, is the plan commonly had recourſe to, ſuch plants being firſt raiſed in ſmall grounds for the purpoſe in regular rows, and not taken, as formerly, from bruſh-woods and waſte commons.

Quick-*Lime*, in *Rural Economy*, ſuch lime as is in the cauſtic or moſt active ſtate, and which poſſeſſes the greateſt power of operating upon different ſubſtances with which it may come in contact. It is quite the oppoſite in its qualities and properties, to that which has fallen down into a powdery ſtate, in conſequence of being ſaturated with water and carbonic acid gas, or fixed air, or which is ſlaked and become effete. Its powers, when applied upon land in this condition, have already been noticed in ſpeaking of lime. See Lime.

But it poſſeſſes qualities and properties in the way of a cement, the utility of which for building, for various domeſtic purpoſes, properly belong to this place. According to Dr. Anderſon, lime is in the beſt and moſt fit ſtate for this uſe when the moſt perfectly cauſtic, or in the moſt cryſtallizing condition. It is remarked, that the powder of lime, when reduced by means of water into a thin or fluid ſort of paſte-like form, and then ſuffered to become dry, concretes into a coherent maſs, which fixes to ſtones and other rough bodies in a very firm manner, and in this way becomes a proper cement for building any ſort of walls. And that, after this paſty material has once become firmly dry, it is quite indiſſoluble in water, and incapable of ever being ſoftened again by the moiſture of the atmoſphere or other ſimilar cauſes. Hence it excels many other ſorts of cements.

When compoſed for the purpoſe of building walls, &c. it is uſually denominated *mortar;* but when formed as an application in the way of a ſmooth coating upon any plain ſurface without intermixture with ſtony matters, it is commonly here termed *plaiſter*.

When made from the lime of the purer ſort of lime-ſtone, it is found to be more ſoft and crumbly, and to acquire a leſs degree of hardneſs, and to be broken with much leſs force, than where the lime-ſtone from which it is made contains a large proportion of ſand, in which caſe it becomes much more hard, firm, and durable.

It has, however, been diſcovered that the pureſt lime may be rendered a firm cement by adding a proper proportion of clean hard ſand to it; hence the practice of blending ſand with lime, when intended for mortar, has become ſo univerſal. This is fully ſhewn to have been very early the caſe, by the oldeſt lime-built walls which are now to be met with.

It nevertheleſs ſtill remains a deſideratum to aſcertain the due proportion of ſand which is neceſſary, as both writers and practical maſons greatly diſagree in opinion on this matter, as well in their directions about the mode of mixing the materials, as of applying the cement; ſome of the more modern, eſpecially, aſcribing extraordinary effects to a ſmall variation in theſe particulars, while others deny that theſe circumſtances have any ſenſible effect on the durability and firmneſs of the cement.

It is conceived that theſe different and contradictory opinions ariſe from an imperfect knowledge of the nature of quick-lime, and the variations it may admit of; for theſe variations are ſo very great, as to render it impoſſible to afford any general rules that can poſſibly apply in all caſes. It is, therefore, conceived to behove thoſe who are deſirous of acquiring any conſiſtent and ſatisfactory knowledge on this head, to endeavour to aſcertain, in the firſt place, the circumſtances which render calcareous ſubſtances *at all* capable of becoming a cement, and then to trace the ſeveral changes that may be produced upon it by other extraneous cauſes.

Having explained the circumſtances which cauſe the differences in lime-ſtone, and pointed out the different conſtituent principles of it, as well as various other peculiarities; it is ſtated that lime, which has in any way abſorbed its full quantity of air from the atmoſphere and become mild, is altogether unfit for becoming a cement, and that, of courſe, it is evident, that a great change may be produced upon the quality of any lime, by having allowed leſs or more of it to be in this ſtate before it is worked up into mortar. And further, that if a large quantity of water be put to freſh ſlaked quick-lime, and beat up with it into a thin ſort of paſte, the water diſſolves a ſmall portion of the lime, which as it gradually abſorbs its air, is converted into cryſtals; between the particles of which cryſtals, that part of the lime which was not diſſolved, and the other extraneous matters which may have been mixed with it, are entangled, ſo as to form a firm coherent maſs of the whole. And that the paſty ſubſtance formed in this manner, is the well-known article mortar; and this heterogeneous, imperfectly ſemi-cryſtallized maſs, conſtitutes the common cement employed in building ordinary walls or other erections. Theſe circumſtances, therefore, being known, it is thought that it will not be difficult to comprehend what are the particulars that are neceſſary to form the moſt perfect cement of this nature. That ſince lime becomes a cement only in conſequence of a certain degree of cryſtallization taking place in the whole maſs, it is ſufficiently obvious that the firmneſs and perfection of that cement muſt depend upon the perfection of the cryſtals; and the hardneſs of the matters that are entangled among them; for if the cryſtals are ever ſo perfect and hard of themſelves, if they be ſeparated from one another by any brittle incoherent medium, it is evident that the whole maſs muſt remain in ſome degree brittle and incoherent. That as water can only diſſolve a very ſmall proportion of lime, even when in its moſt perfect ſaline or cauſtic ſtate, or while it remains deprived of its carbonic acid gas, and as happens in other ſimilar caſes, no more of the lime can be reduced to a cryſtalline maſs than has been actually diſſolved in the water; it happens of courſe, that if mortar be made of pure lime and water alone, a very ſmall proportion only can be diſſolved by that ſmall quantity of water that is added to it: and as this ſmall proportion alone can afterwards be cryſtallized, all the remaining undiſſolved particles of the lime will be entangled among the few cryſtals that are formed. And as the undiſſolved lime in this maſs will in time abſorb its air, and be converted into *mild* calcareous earth without having had a ſufficiency of water to allow it to cryſtallize, it muſt concrete into a friable maſs exactly reſembling chalk; it follows, that this kind of mortar,

tar, when as dry as it can be made, and in its higheſt degree of perfection, will always be ſoft, and eaſily crumbled into powder.

But that, if, inſtead of forming the mortar of pure lime alone, a large proportion of ſand be added to it, the water will in this caſe diſſolve as much of the lime as in the former; and the particles of hard ſand, like ſticks or threads, when making ſugar-candy or other cryſtals, while ſurrounded by the watery ſolution, will help to forward the cryſtallization, and render it more perfect than it otherwiſe would have been, ſo as firmly to cement the particles of ſand to one another. And as the granules of ſand are perfectly hard of themſelves, ſo as not to admit of being broken down like the particles of chalk, it neceſſarily follows, that the cement made of theſe materials muſt be much more perfect in every reſpect than the former.

After conſidering a variety of circumſtances in regard to the ſolubility of lime in water, and its cryſtallization, it is remarked, that when a large quantity of ſand is mixed in the mortar, that ſand will of courſe bear a great proportion to the whole maſs; ſo that the water that may be mixed with the mortar will be much greater in proportion to the quantity of lime contained in this mortar, than if the whole had conſiſted of pure calcareous matter. And that, as the ſand abſorbs none of that water,—that water, now pure, is at liberty to act once more upon thoſe few particles of cauſtic lime that may ſtill remain in the mortar, which will be diſſolved and converted into cryſtals in their turn. In this way it may happen, in ſome circumſtances, that a very large proportion of the lime may become cryſtallized; ſo that the mortar will conſiſt almoſt entirely of ſand enveloped in cryſtalline matter, and become in due time as hard as ſtone itſelf; whereas mortar, conſiſting of pure lime, without ſand, can hardly ever be much harder than chalk. It is not, however, to be ſuppoſed, that in any caſe this dried mortar will aſſume that tranſparent cryſtalline form, or the compact firmneſs of ſome ſorts of calcareous matters, ſuch as marble and lime-ſtone. In mortar, in ſpite of the utmoſt care that can ever be taken, a very conſiderable quantity of the lime muſt remain undiſſolved; which undiſſolved lime, although it may be ſo much ſeparated by the ſand and cryſtalline lime-ſtone as not much to affect the hardneſs of the mortar, yet it muſt ſtill retain its white chalk-like appearance. As marble and lime-ſtone are, however, always formed by thoſe particles of lime that have been wholly diſſolved in water, and from which they have been gradually ſeparated by a more ſlow and more perfect mode of cryſtallization, they have nothing of that opaque calx-like appearance, but aſſume other colours, and appear more firm, uniform, and compact; the ſand and other matters that may be enveloped in them being entirely ſurrounded with a pure cryſtalline matter.

But to obtain the moſt perfect kind of mortar, it is not, however, enough that a large proportion of ſand ſhould be employed, and that the ſand ſhould be intimately mixed with the lime; it is alſo of the utmoſt importance that a large proportion of water be added; for without this it is impoſſible that a large proportion of the lime can be cryſtallized: and the mortar, in that caſe, would conſiſt only of a mixture of chalky matter and ſand, which could hardly be made to unite at all, and would be little more coherent than ſand by itſelf, and leſs ſo than pure chalk. In that caſe, pure lime alone muſt afford rather a firmer cement than lime with ſand. It is alſo of very great importance that the water be retained as long in the mortar as poſſible: for if it be ſuddenly evaporated, it will not only be prevented from acting a ſecond time upon the lime, after a part of what was firſt diſſolved has been cryſtallized, but even the few cryſtals that would be formed when the water was ſuddenly evaporating, would be of themſelves much more imperfect than they otherwiſe moſt certainly would have been. In proof of which, inſtances of the cryſtallization of common ſalt, lump ſugar, and ſugar-candy, are adduced; after which it is noticed, that every one knows what a difference there is between the firmneſs of the different ſubſtances; and that as great muſt be the difference between the firmneſs of that cement which has been ſlowly dried, and that which has been haſtily hardened by the powerful action of a warm air.

It is contended, that it is owing to this circumſtance that the lime, which remains all winter in a mortar tub filled with water, is always found to be much firmer and more coherent than the mortar that was taken from the ſame tub and uſed in any work of maſonry, although in this caſe the materials were exactly the ſame. From the ſame cauſe, any work cemented with lime under water, if it has been allowed to remain undiſturbed and uninjured until it has once become hard, is always much firmer than that which is above the ſurface of the water.

In order to render the force of the above reaſoning more ſtrong and convincing, lime cement or mortar is compared to a maſs of matter conſiſting of a congeries of ſtones cloſely compacted together, and united by a ſtrong cementing matter that had, while in a fluid ſtate, pervaded all the interſtices between the ſtones, and afterwards become a ſolid indiſſoluble ſubſtance. If the cementing matter be exceedingly hard and coherent, and if the ſtones bedded among it be alſo very hard and firm, the whole maſs will become like a ſolid rock, without fiſſures, that can hardly be broken to pieces by the power of man. But, although the cement ſhould be equally firm, if the ſtone, of which it conſiſts, be of a ſoft and friable nature, ſuppoſe chalk or ſand-ſtone, the whole maſs will never be capable of attaining ſuch a degree of firmneſs as in the former caſe; for when any force is applied to break it in pieces, although the cement ſhould keep its hold, the ſolid matter cemented by it would give way, and the whole would be eaſily broken to pieces. Whereas in mortar, the ſand that is added to it repreſents the ſtones of a ſolid matter in the compoſition, the particles of which are united together by the lime which had been formerly diſſolved, and now cryſtallized, which becomes an exceedingly ſolid and indiſſoluble concretion. And as the particles of ſand are of themſelves exceedingly hard, and the cement by which they are united equally ſo, it is plain that the whole concretion muſt be extremely firm, ſo as to require very great force to diſunite any particle of it from the whole maſs. But if, inſtead of employing ſand, the only ſolid body that is entangled among the cementing matter ſhould be chalk, (as in all caſes where the mortar conſiſts of pure lime alone,) or any other ſlightly cohering ſubſtance, let the cementing particles of that compoſition be ever ſo perfect, it is impoſſible that the whole can ever attain a great degree of firmneſs, as theſe chalky matters will be eaſily broken aſunder.

It is remarked, in addition, that a variety of conjectures have been made about the nature of the lime cement employed by the ancients. It has been thought that they poſſeſſed an art of making mortar, which has been long ſince entirely loſt; as the cement in the walls which have been built by them, appears to be, in many caſes, much firmer than that which had been made in modern times. Yet, when the mortar of theſe old buildings is analyſed, it is found to conſiſt of the ſame materials, and nearly in the ſame proportions, in which they are now made uſe of.

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And it is thought probable, that their only ſecret conſiſted in mixing the materials more perfectly than the rapidity or avarice of modern builders will permit, in employing their mortar in a much more fluid ſtate than is done now, and in allowing it to dry more ſlowly, which the immoderate thickneſs of many of their walls would naturally produce, without any preconcerted deſign on their part. Tradition has even handed down to the preſent times the memory of the moſt eſſential of theſe particulars; as the lower claſs of people, in every part of the nation, at this moment invariably ſuppoſe and believe that theſe old walls were compoſed of a mortar ſo very thin, as to admit of its being poured, like a fluid, between the ſtones, after they were laid in the wall: and the appearance of theſe old walls, when taken down, ſeems to favour this popular tradition. Nor is it doubted but that this may have been the caſe. The ſtones in the outer part of the wall, it is thought, were probably bedded in mortar nearly as is practiſed at preſent; and the heart, after being packed well with irregular ſtones, might have the interſtices between them entirely filled up with fluid mortar, which would inſinuate itſelf into every cranny, and in time adhere as firmly as the ſtones themſelves, or even more ſo, if the ſtones were of a ſandy friable nature. And that, as theſe walls were uſually of very great thickneſs, it might often happen, that the water in this mortar, by acting ſucceſſively upon different particles of cauſtic lime, would at length be entirely abſorbed by ſucceſſive cryſtallizations, ſo as to become perfectly dry, without any evaporation at all; in which caſe, a very large proportion of the original lime muſt have been regularly cryſtallized in a ſlow and tolerably perfect manner, ſo as to attain a firmneſs little inferior to lime ſtone or marble itſelf.

It is ſuppoſed that, upon theſe principles it is eaſy to account for the ſuperior hardneſs of ſome old cements, when compared with that of modern times, in which a practice very different is uſually followed, without having recourſe to any wonderful *arcana* whatever.

Monſieur Loriot, a late French writer, imagined that he had made a perfect diſcovery of the way in which the ancients employed their quick-lime, ſo as to obtain ſuch an extraordinary firm cement; from which diſcovery, he conceived, very important benefits might be derived to ſociety. According to his opinion, the ancient cement conſiſted of lime and ſand nearly in the ſame proportions as are commonly employed for that purpoſe at preſent. But inſtead of making it of ſlaked lime entirely, as is done now, he contends that they employed a certain proportion of their lime *unſlaked*, which they mixed with their mortar immediately before it was uſed. And it is further noticed, that this newly diſcovered cement dries and hardens almoſt under the hand of the operator, without cracks or flaws of any ſort; that it neither expands nor contracts with the air;—that it is impervious to moiſture, and may not only be employed for making roofs of houſes that are ſubjected to the continual dropping of water, baſons, aqueducts, canals, &c. which will inſtantly contain water in any quantities, but even finer works of the pottery kind; that it perfectly reſiſts froſts, and has a variety of other intereſting qualities. The trials of Dr. Anderſon with the ſame ſort of materials do not, however, confirm the great certainty and utility of this diſcovery. "That ſuch effects as the writer deſcribes," ſays the doctor, "will invariably be produced, merely by adding a certain proportion of unſlaked lime in powder to mortar, or even by making the mortar entirely with powdered quick-lime, I may without heſitation venture to deny, not only from the reaſoning that has been given, but from actual experiment, again and again repeated by myſelf; and which is likewiſe, in ſome meaſure, corroborated by the experience of Mr. Doſſie."

On theſe accounts, it is ſuppoſed, that if Monſieur Loriot, has really experienced theſe uncommon effects from the mortar he has tried, it muſt have been occaſioned by ſome other unobſerved peculiarity, and not merely by the circumſtance to which he ſeems to aſcribe it. Poſſibly the doctor ſuppoſes the lime he employed may have been impregnated with a gypſum, or the ſulphate of lime, as is probable, for many reaſons. The effects and qualities of which, as to becoming a fine powder, and of ſuddenly ſetting, are well known, but it never acquires the ſtony hardneſs that lime cement is ſometimes endowed with, although it takes the ſmootheſt poliſh of any cement we know: on which account, it has long been employed as a plaiſter where fine ornaments are required.

There are unqueſtionably, however, many doubtful and myſterious circumſtances connected with this matter, which require the aid of further trials and experience in their full explanation.

There are ſtill further a few other circumſtances that may influence the quality of common lime-mortar. If lime-ſtone be ſufficiently calcined, it is deprived of all its moiſture, and of all its carbonic acid gas, or fixed air. But experience ſhews, that lime-ſtone will fall to powder on the effuſion of water upon it, when it is much leſs perfectly calcined, and while it ſtill retains almoſt the whole of its fixed air. And that as maſons have hardly any other rule for judging whether lime-ſtone be ſufficiently calcined, except this ſingle circumſtance of its falling to a powder when water is poured upon it, it may thus eaſily be perceived, that the ſame lime may be more or leſs fitted for making good mortar, according to a circumſtance that, in a great meaſure, eludes the obſervation of operative maſons; for if it ſhould happen that all the pieces of lime drawn from a kiln at one time, were juſt ſufficiently calcined to make it fall to a powder with water and no more, that powder would be altogether unfit for making mortar of any kind. This is a caſe that can ſeldom happen: but as there are a great many intermediate degrees between that ſtate and perfect calcination, it muſt often happen that the ſtone will approach nearer to one of theſe extremes at one time than at another; ſo that the mortar may be much more perfect at one time than at another, owing to a variation in this particular.

All thoſe who have written on the ſubject of lime as a cement, have endeavoured to aſcertain what is the due proportion of ſand for making the moſt perfect cement. But a little attention to the matter will ſhew, that all rules, which could be preſcribed as to this particular, muſt be ſo vague and uncertain, as to be of little utility to the practical maſon; as, beſides the variation which may ariſe from a more or leſs perfect degree of calcination as above, it is a certain fact, that ſome kinds of lime-ſtones are much more pure, and contain a much ſmaller proportion of ſand than others do; ſome being found almoſt perfectly pure, while others contain eleven-twelfths of ſand and all the intermediate proportions of it. Therefore it would be abſurd to ſay that pure lime would require as ſmall a proportion of ſand when made into mortar, as that which originally contained in itſelf a much larger proportion of ſand than any writer has ever ventured to propoſe for being put into mortar.

Beſides, there are differences cauſed by the different nature of the calcination in the different ſorts of lime-ſtone, from which it may, upon the whole, be concluded, that

about one-tenth of *pure* lime-ſtone is not enough calcined to admit of being made into mortar; and that of the moſt impure ſorts of lime-ſtone, not above one-fourth part of the lime contained in it is ſo much calcined as to be in a cauſtic ſtate.

The variation that is produced by theſe means in regard to the proportion of ſand that will be required to the lime in the one or the other caſe, is found to be ſo extremely great as hardly to be conceived. It is, however, ſtated, that the beſt mortar that has been ſeen made, was formed of lime which had been found to contain eleven parts of ſand to one of lime: to this there was added between twice and thrice its whole bulk of ſand by meaſure; which may be allowed to have been at leaſt three times its quantity *by weight*. Therefore, ſuppoſing that every particle of that lime had been ſo perfectly calcined as to be in a cauſtic ſtate, there could not be leſs than forty-ſeven parts of ſand to one of lime. As much may, however, be allowed for the uncauſtic part of the lime as is pleaſed, and the calculation made accordingly. But it is hardly poſſible to ſuppoſe that above one-hundredth part of this maſs, independent of the water, conſiſted of pure cauſtic calcareous earth.

On theſe conſiderations it is conceived, that it is impoſſible to preſcribe any determinate proportion of ſand to lime, as that muſt vary according to the nature of the lime and other incidental circumſtances, which would form an infinity of exceptions to any general rule. But it would ſeem that it might be ſafely inferred that the moderns in general rather err in giving too little ſand, than in giving too much. It deſerves, however, to be noticed, that the ſand, when naturally in the lime-ſtone, is more intimately blended with the lime than can poſſibly be ever effected by any mechanical operation; ſo that it would be in vain to hope to make good mortar artificially from pure lime, with ſuch a ſmall proportion of cauſtic calcareous matter as may ſometimes be effected when the lime naturally contains a very large proportion of ſand. But there ſeems to be no doubt, that if a much larger proportion of ſand were employed, and if that were more carefully blended and expeditiouſly worked than is common, the mortar would be much more perfect than is uſual in modern times, as has been proved by actual trials.

Another circumſtance that tends greatly to vary the quality of cement, and to make a greater or ſmaller proportion of ſand neceſſary, is the mode of preparing lime before it is beaten up into mortar. When for plaiſter, it is of great importance to have every particle of the lime-ſtone ſlaked before it is worked up; for, as ſmoothneſs of the ſurface is the moſt material point, if any particles of lime ſhould be beaten up in it, and employed in work before ſufficiently fallen, the water, ſtill continuing to act on them after it was worked up, would infallibly ſlake ſuch particles, which forcibly expanding themſelves, would produce thoſe excreſcences on the ſurface of the plaiſter commonly termed bliſters. Conſequently, in order to obtain a perfect kind of plaiſter that will remain ſmooth on the ſurface and free of bliſters, there is an abſolute neceſſity to allow the lime to lie for a conſiderable time macerating or *ſouring* in water, before it is worked up. And the ſame ſort of proceſs is neceſſary for the lime when intended for uſe as mortar, though not ſo abſolutely. Great care is, however, required in the management in this reſpect; the principal things being the getting of well-burnt lime, and the allowing it to macerate or *ſour* with the water for only a *very ſhort time* before it is uſed; but that which is the beſt burnt will require the maceration of ſome days in the water before it is ſufficiently ſlaked in the whole maſs for this purpoſe. See SOURING *Lime for Mortar and Plaiſter*.

It has been almoſt univerſally admitted, that the hardeſt lime-ſtone affords a lime that will conſolidate into the firmeſt cement; and hence generally concluded, that lime made of chalk, produces a much weaker cement than what is made of marble or lime-ſtone. It would ſeem, however, that if ever this be the caſe, it is only incidentally, and not neceſſarily ſo. As from the nature of calcareous matter, every kind of lime is equally fit for becoming a firm cement, if it be firſt reduced to a proper degree of cauſticity, and has afterwards a due proportion of ſand properly mixed with it, before it be employed in work. Different ſorts of lime, without doubt, differ much from each other in the proportion of ſand they naturally contain, and, of courſe, require very different proportions of ſand to be added to them before they can be made equally perfect as a cement; which is an economical conſideration, of no ſmall moment in ſome caſes, as it may make one ſort of lime a great deal cheaper than another on ſome occaſions, and, of courſe, deſerves the attention of builders in general. See LIME.

The excellencies and defects of other ſubſtances that may be occaſionally mixed with lime in making cement may be juſt noticed. Thoſe commonly uſed as an addition to mortar, beſides ſand of various denominations, are powdered ſand-ſtone, brick-duſt, and ſea-ſhells. And for forming plaiſter, where cloſeneſs rather than hardneſs is required, they are lime that has been ſlaked and kept long in a dry place, till it has become nearly effete, powdered chalk or whiting, and gypſum in various proportions; beſides hair and other materials of that nature. But ſome others have been more lately adviſed, ſuch as earthy balls, ſlightly burnt and pounded, powdered and ſifted old mortar rubbiſh, and others of a ſimilar kind. All of which ſubſtances are found objectionable in ſome reſpect or other for this uſe, ſand being the only perfectly ſuitable material that can be eaſily met with; on which account it has been always juſtly preferred. Pure firm cryſtallized ſand is the beſt, but all pure ſands are not equally proper in this intention. See theſe ſubſtances reſpectively. See alſo CEMENT and SAND.

It is ſtated by ſir Humphry Davy, in his work on "Agricultural Chemiſtry," that there are two modes in which lime acts as a cement; in its combination with water, and in its combination with carbonic acid. When quick-lime is rapidly made into a paſte with water, it ſoon loſes its ſoftneſs, and the water and the lime form together a ſolid coherent maſs, which conſiſts of ſeventeen parts of water, to fifty-five parts of lime. When this hydrate of lime, while it is conſolidating, is mixed with red oxyd of iron, alumina, or ſilica, the mixture becomes harder and more coherent than when lime alone is uſed; and it appears that this is owing to a certain degree of chemical attraction between hydrate of lime and theſe bodies; and they render it leſs liable to decompoſe by the action of the carbonic acid in the air, and leſs ſoluble in water. It is thought that the baſis of all cements that are uſed for works which are to be covered with water muſt be formed from hydrate of lime; and that the lime made from impure lime-ſtones anſwers this purpoſe very well. Puzzolana, it is ſaid, is compoſed principally of ſilica, alumina, and oxyd of iron; and it is uſed mixed with lime, to form cements intended to be employed under water. It is ſtated that Mr. Smeaton, in the conſtruction of the Eddyſtone lighthouſe, uſed a cement compoſed of equal parts, by weight, of ſlaked lime and puzzolana. Puzzolana, it is ſaid, is a decompoſed lava. Tarras, which was formerly imported in conſiderable quantities from Holland, is found

to

to be a mere decompoſed baſalt: two parts of ſlaked lime and one part of tarras form the principal part of the mortar uſed in the great dykes of Holland. It is ſuppoſed that ſubſtances which will anſwer all the ends of puzzolana and tarras, are abundant in the Britiſh iſlands. An excellent red tarras may be procured in any quantities from the Giant's Cauſeway, in the north of Ireland: and decompoſing baſalt is abundant in many parts of Scotland, and in the northern diſtricts of England in which coal is found.

It is obſerved that Parker's cement, and cements of the ſame kind made at the alum-works of lords Dundas and Mulgrave, are mixtures of calcined, ferruginous, ſiliceous and aluminous matter, with hydrate of lime.

It is noticed, that the cements which act by combining with carbonic acid, or the common mortars, are made by mixing together ſlaked lime and ſand. Theſe mortars at firſt ſolidify as hydrates, and are ſlowly converted into carbonate of lime by the action of the carbonic acid of the air. It was found by Mr. Tennant, that a mortar of this kind, in three years and a quarter, had regained ſixty-three *per cent.* of the quantity of carbonic acid gas, which conſtitutes the definite proportion in carbonate of lime. The hardneſs of the mortar in very old buildings is alſo thought to depend upon the perfect converſion of all its parts into carbonate of lime. The pureſt lime-ſtones are the beſt adapted, it is ſaid, for making this kind of mortar. The magneſian lime-ſtones make excellent water cements, but act with too little energy upon carbonic acid gas to make good common mortar. The Romans, on Pliny's authority, made their beſt mortar a year before it was uſed; ſo that it was partially combined with carbonic acid gas before it was employed, it is ſuppoſed.

It is likewiſe ſuggeſted, in regard to the cultivation and improvement of land by means of this material, that quick-lime in its pure ſtate, whether in powder, or diſſolved in water, is injurious to plants; graſs in ſeveral inſtances having been killed by watering it with lime-water: but that lime, in its ſtate of combination with carbonic acid, is an uſeful ingredient in ſoils. Calcareous earth is found in the aſhes of the greater number of plants; and expoſed to the air, lime cannot long continue cauſtic, but ſoon becomes united to carbonic acid. That lime, when combined with about one-third of its weight of water, conſtitutes hydrate of lime; and that it becomes carbonate of lime by long expoſure to the atmoſphere, the place of the water being ſupplied by carbonic acid gas. On mixing freſhly burnt or ſlaked lime with any moiſt fibrous vegetable matter, a ſtrong action occurs between them, and they form a ſort of compoſt, part of which is commonly ſoluble in water. In this way, lime renders matter, before comparatively inert, nouriſhing; and from charcoal and oxygen, abounding in vegetable matter, it becomes converted into carbonate of lime at the ſame time. Mild lime, or powdered calcareous ſubſtances, have no action in this way on vegetable matter; by their operation they prevent the too quick decompoſition of bodies previouſly diſſolved; but do not tend to form ſoluble matters. Conſequently it is clear that the operation of quick-lime and mild calcareous ſubſtances, depend upon wholly different principles. The former, on being applied to land, tends to bring the hard vegetable matter contained in it into more rapid decompoſition and ſolution, as a proper food for plants. The latter only improve the texture of it, or its relation to abſorption: it is merely an earthy ingredient. Quick-lime, in becoming mild, has a ſimilar action, but while taking on that ſtate, prepares ſoluble out of inſoluble matter. On this depends the operation of lime in the preparation for wheat crops, its efficacy in fertilizing peats, and in bringing into cultivation all ſorts abounding in hard roots, dry fibres, or inert vegetable matter. The queſtion, of courſe, whether quick-lime ſhould be applied to land or not, depends on the quantity of inert vegetable matter it contains; and that whether mild lime, marle, or powdered lime-ſtone, ſhould be uſed or not, on the quantity of calcareous matter already in the land. All ſorts of land are improved by mild lime, and ultimately by quick-lime, which do not effervеſce with acids; and the ſandy ſorts more than the clayey kinds. In land deficient in calcareous matter, but containing much *ſoluble* vegetable manure, the uſe of quick-lime ſhould conſtantly be avoided, as tending either to decompoſe the ſoluble matters, by uniting to their carbon and oxygen in becoming mild, or to combine with the ſoluble matters, and form compounds with leſs attraction for water than the pure vegetable ſubſtance. The ſame is the caſe in regard to moſt animal manures; but its operation is different in different caſes, according to the nature of the animal matter. On the whole, it ſhould however never be employed with animal manures, except when too rich, or for preventing noxious effluvia. It is hurtful in mixture with common dung, and tends to produce inſolubility in the extractive matter. It is uſeful in mixture with ſimple vegetable barks, &c.

The ſolution of the queſtion about the inutility and diſadvantage of magneſian lime, which has lately been found uſeful in ſmall quantities on the poorer lands in Leiceſterſhire, as from twenty-five to thirty buſhels the acre, and in larger ones, on the rich ſoils; it is ſuppoſed to depend upon that ſort of lime having a leſs attraction for carbonic acid than the other, in conſequence of the portion of that ſubſtance in it, and thereby remaining longer in the cauſtic ſtate; and its becoming ſooner a carbonate of lime in the rich than in the poor ſoils. Magneſia, while in the cauſtic ſtate, is poiſonous to certain kinds of plants, and acts ſo in the mixture as lime. It may be uſefully applied in large quantities to peat-earths; and to lands injured by too much of this ſort of lime, peat-earth will be a proper and effectual remedy, when uſed in a ſuitable proportion.

More full information may be met with on this curious and intereſting ſubject in the firſt volume of Anderſon's Eſſays on Agriculture and Rural Affairs, in Doſſie's Memoirs of Agriculture, vol. ii. and in ſir Humphry Davy's "Agricultural Chemiſtry."

Quick-*Manure*, a term ſometimes applied to that ſort which is ſtrewed over crops upon the ſurface of the land, ſuch as ſoot, ſmall dungs, different ſorts of aſhes, &c. As manures in this intention on paſture lands, wheat, clover, tare, and other ſimilar crops, twenty buſhels of ſoot is recommended to the acre, ſixty buſhels of rabbit or poultry dung, and fifty of pigeons' dung and aſhes; but much larger as well as ſmaller proportions are made uſe of in different inſtances and circumſtances. The ſoot and dungs ſhould be ſown over the crops about the middle of March, the aſhes in February, and all in the moſt equal and exact manner poſſible, as much depends upon this being properly performed. See Ashes, Dung, and Soot.

In different counties there is much difference in the uſe of ſubſtances of theſe kinds in this way as manures. In Hertfordſhire the uſual quantities of ſoot employed in this manner are from about twenty to forty buſhels, on the wheat crops; but in ſome places they are uſed to the extent of fifty or more on the acre. The application of this material is univerſal throughout almoſt every pariſh in the whole county, in this mode and intention. Aſhes in the ſame diſtrict are conſidered by ſome as rendering the ſoil more light and open, without contributing, in any great degree,

to the nutrition of the crops over which they are ſown. The proportions in which they are uſed to the acre over the clover, and occaſionally the wheat crops, are from fifty to one hundred buſhels. They are ſuppoſed to be very ſerviceable to the two clover crops, and greatly beneficial to the ſucceeding wheat one, by ſome perſons; but others are of quite the contrary opinion, thinking them of very little uſe to the wheat, except by increaſing the quantity of the clover. They are alſo uſeful in deſtroying moſs in the ſurface of graſs lands. They are to be kept dry, and commonly ſown over the crops in November or January in mild moiſt weather.

In Oxfordſhire, peat-aſhes are made uſe of from about twelve to forty buſhels upon the acre; and thoſe of coal from ſixteen to upwards of fifty. They are ſown over the wheat, clover, ſaintfoin, and turnip crops, the coal being ſomewhat the beſt on the clovers, and the peat on the turnips.

In Berkſhire, peat-aſhes are uſed very generally for moſt ſorts of crops, except wheat, barley, and peas, either ſown with the ſeeds and harrowed in together, or ſown on the land as a top-dreſſing, only; but they are more preferred for all ſorts of artificial graſs crops, and on natural meadow and paſture graſſes, as well as turnips. The quantities employed are from fifteen to twenty buſhels and upwards on the acre. They are applied in March or April, ſeveral acres being capable of being ſown in the courſe of the day. They only laſt about a couple of years in the land. The aſhes of bean ſtubble are likewiſe found beneficial hereabouts, bringing up white clover when put upon the graſs lands.

Different ſorts of aſhes have been found very uſeful on the graſs lands in Suſſex, at the rate of from twenty to thirty buſhels on the acre, employed as a manure.

In Eſſex coal-aſhes are laid upon the clover, ſaintfoin, and graſs crops to the quantity of ſixty buſhels on the acre or more, with very great effects in promoting their increaſe.

In the county of Hertford they manure for turnips and ſome other crops with rabbit and poultry dungs, at the rates of from fifty to ſixty buſhels or more on the acre, with good ſucceſs. And in ſome part of the Oxford diſtrict, pigeons' dung is found an excellent manure when thrown over the young barley crops, mixed with that of poultry. In Eſſex too, it is found beneficial for promoting ſeed when ſown over the rape or cole crops in the proportion of eight buſhels to the acre.

There are ſeveral other articles which are occaſionally thrown over crops on the ſurface of the lands as a manure, in this intention, ſuch as thoſe of the duſt of malt, rape-cake, bones, plaiſter of Paris, and ſome others. Malt-duſt is made uſe of on wheat and barley in many parts of the county of Oxford, and on the young wheats in Hertfordſhire, in the quantity of five quarters to the acre. In Berkſhire thirty buſhels *per* acre. Rape-cake duſt is alſo uſed in the former of theſe laſt counties on the wheats with great ſucceſs. Pounded bones are likewiſe greatly beneficial when ſtrewed over the graſs and ſome other ſorts of crops, being ſometimes a very forcing manure, and at the ſame time laſting. The plaiſter of Paris has been uſed on clover, ſaintfoin, lucern, and other crops with immenſe effect, in ſome parts of Oxfordſhire, ſown over them about March, to the quantity of ſix buſhels *per* acre. But in Suſſex, in the proportion of eight buſhels to the acre, when ſown over natural graſs, bean, potatoe, pea, and barley crops, it had not the leaſt good effect. Nor even when tried on other ſorts in the quantity of ſix buſhels to the ſame extent of land.

Powdered oil-cake that has been ſpoiled by keeping, is an excellent application as manure in the above way. The ſame is alſo the caſe with chopped tanners' hair, which has been found ſuperior in this uſe to either malt-duſt or any ſort of calcareous matter. Horn-ſhavings are likewiſe very beneficial when laid on in this manner to graſs lands, in the proportion of from fifty to one hundred buſhels to the acre, laſting five or ſix years, and being of very eaſy carriage they ſhould be employed in damp weather about February or March. See MANURE.

All theſe different ſorts conſtitute excellent quick forcing manures, when applied in ſome of theſe ways for ſome of the above purpoſes, and ſhould be much more generally employed in ſuch methods than is at preſent the caſe.

QUICK *Match*, in *Artillery*, is formed of three cotton ſtrands drawn into length, and dipped in a boiling compoſition of white wine vinegar, ſaltpetre, and mealed powder. After this immerſion, it is taken out hot, and laid in a trough where ſome mealed powder, moiſtened with ſpirits of wine, is thoroughly incorporated into the twiſts of the cotton, by rolling it therein: thus prepared, they are taken out ſeparately and drawn through mealed powder, and then hung upon a line to dry. There is alſo quick match made of worſted inſtead of cotton. For its uſe, ſee FIRE-*Ships*.

QUICK *with Child*, in *Law*. See REPRIEVE.

QUICK *Pulſe*, in *Medicine*. See PULSE.

QUICK *Sand*, in *Sea Language*, denotes a looſe quaking ſand, into which a ſhip ſinks by her own weight, as ſoon as the water retreats from her bottom. See QUICKSAND.

QUICK *Thorn*, in *Agriculture*, a name frequently applied to young plants of the hawthorn or white-thorn kind, which are fit for being planted out for the purpoſe of forming a hedge-fence. See QUICKS, and QUICKSET.

It alſo ſignifies this ſort of thorn generally.

QUICKEN TREE, in *Gardening*, the common name of a tree of the ornamental fruit kind. See SORBUS.

QUICKENING, in *Midwifery*, the firſt perception women have of the motion of the fœtus. This uſually happens in the third or fourth month of pregnancy. It has puzzled phyſiologiſts to explain why the motion of the fœtus ſhould not be perceived earlier, as it is endowed with life from the firſt moment of conception. But, beſides that the parts of the fœtus are too ſoft and tender to affect the uterus by its motion, the membranes enveloping it are too thick, and there is then a proportionably larger quantity of fluid in the ovum than afterwards, which keeps the embryo from touching the ſides of it. The uterus alſo during this period is confined in the cavity of the pelvis, which being of ſmall capacity, and every way ſurrounded with bones, leaves little room for the motion of the fœtus. But as ſoon as the uterus emerges into the cavity of the abdomen, it readily yields to the motion of the incloſed fœtus, and the parts by which it is now ſurrounded being extremely delicate and ſenſible, they are affected by the ſlighteſt ſtirring of it. In ſome women of delicate habits, the moment of quickening is marked by a ſlight hyſteric paroxyſm. In theſe caſes it ſeems probable, that the uterus has ſlipped ſuddenly into the abdomen, but ordinarily it riſes ſlowly and gradually, whence the ſhock on the bowels is ſo inconſiderable, as ſcarcely to make any ſenſible impreſſion. See CONCEPTION.

QUICKING-DRAG, in *Agriculture*, a name ſometimes given in different diſtricts to the couch and quitch drag. See DRAG.

QUICKJOCK, in *Geography*, a town of Sweden, in the Lapmark of Lutea; 15 miles N.W. of Lutea. N. lat. 67° 20'. E. long. 17°.

QUICKS,

QUICKS, in *Agriculture*, a name commonly given to the young ſets of the white-thorn, which are uſed in planting hedges of that ſort. See QUICKSET *Hedge*.

It is thought to be indiſpenſably neceſſary to the ſucceſs of this ſort of ſets, as hedge plants, in every ſituation, that they be well provided with roots and root fibrils of the healthy kind, by Mr. Nichol, who has had much experience upon the ſubject. And that this is beſt ſecured by taking them from a ſeminary of rich mould at the end of the firſt or ſecond year, according to their ſtrength; and nurſing them, after that, likewiſe in rich earth, for one or two ſeaſons longer at the fartheſt: but, in the latter caſe, removing them into freſh rows at the end of the firſt year. It is contended, that plants of this age, and thus treated, will outgrow thoſe of greater ſize in any ſort of ſoil or ſituation. This has been repeatedly proved by impartial trials; and the cauſe, it is ſuppoſed, is obviouſly this, that ſmall plants, even by the ſame treatment, are raiſed with better roots, in proportion to their ſtems, than large ones. Therefore in the choice of quicks, regard ſhould be had to the roots, not the tops of the plants. Their being nurſed the ſeaſon previous to their being removed for hedging purpoſes, in rich mellow earth, and being allowed a ſufficiency of room, kept clear of weeds and other matters, is the beſt mode of preparation, it is imagined, that can poſſibly be adopted.

There is, however, it is maintained, a double advantage in making uſe of young plants of this nature. They are cheaper and fitter for expoſed ſituations than thoſe of older growths; not becauſe their tops are leſs buſhy, which, ſince they are to be cut over about half their lengths before being planted, is immaterial, but becauſe they have better proportioned roots to the ſize and ſtrength of the ſtems, and of courſe are better fitted to ſeek paſturage for their common ſuſtenance and ſupport.

The ſtems of the plants, as has been ſuggeſted above, ſhould be cut over about half their lengths, or, in general, about ſix inches above the ground mark: an operation which may be performed by the common hedge ſhears, a large ſharp knife; or by gathering a handful of them evenly, and laying them upon a block or other ſimilar body, and chopping them off by means of a hatchet. They ſhould always be carefully raiſed, and even the ſmalleſt fibre be retained. And at all times, until replanted, the roots ſhould be expoſed as little as poſſible to the air or atmoſphere. See QUICKSET.

QUICKS is alſo a term ſometimes applied to the weed called couch-graſs, in different places, and which is of a very troubleſome nature, not being extirpated out of the land without much difficulty. See COUCH.

QUICKSAND, any ſort of ſpot or bed of running ſand, either near to the ſurface of the ſoil, or at any depth below it, which has a ſhaking quaggy feel under the foot at certain times or ſeaſons, in conſequence of containing certain proportions of water. The writer of the work on "Landed Property" has remarked, that they are for the moſt part topical, and in general only temporary, commonly appearing in and after wet ſeaſons only; cloſing and becoming firm when their ſupplies of moiſture are exhauſted by long drought. In theſe caſes the ſurfaces are free from the depoſition of the moory earth of bog plants, which demand a conſtant coolneſs, if not a perpetual ſupply of moiſture, being cauſed by heads or ſmall beds of ſand or gravel riſing through firmer ſtrata to the ſurface. They are of courſe apt to be ſcorched in dry hot ſeaſons. In order to remove them, the ſame writer adviſes, that the centre of the part which is affected ſhould be marked out when the ſeaſon is wet, in order that a drain may be cut, when it is dry, of a ſufficient depth quite up to the mark, letting it have the neceſſary deſcent, and then filling it with ſuitable materials to admit of the water being conveyed off as it is collected in the ſub-ſoil. When the defect has been thus removed, where it is ſituated in the area of a field, it is a good practice to cover the part by ſoil of the ſame nature as that of the field where it is ſituated, by bringing it from thoſe parts which are the moſt elevated, as by this means it may be rendered of an uniform quality with the reſt, and of courſe have a better appearance, as well as be more advantageous in the growth of crops.

Dangerous tracts and ſpots of this nature are frequently found in marſhy and ſandy lands, which are occaſionally covered by the tides. And large deep beds or layers of quick or running ſand are often met with in digging pits, quarries, mines, and other ſorts of ſhafts, to great depths under the ground, and cauſe much trouble and difficulty in getting on with ſuch kinds of work, on account of the quantities of water which they contain and let paſs off into them: thus occaſioning the neceſſity of much difficult drainage, and other inconveniences. See QUARRIES, *Pits*, &c. *Draining of*.

QUICKSAND *Bay*, in *Geography*, a bay on the weſt coaſt of North America. N. lat. 45° 50'. W. long. 124°.

QUICKSET, in *Agriculture*, a term generally applied to the white, or hawthorn plant, the ſets or young plants of which are raiſed by nurſerymen for ſale, for the purpoſe of planting and forming hedge-fences. The roots of the thorn will, however, anſwer equally well, and in ſome caſes much better, as there is a certainty of their being of the right ſort, or ſuch as have prickles upon them, which does not always happen in uſing the quickſets, as they are liable to diſappear when raiſed in this method, but which is never the caſe in the root-mode. See FENCE-*Thorn*, and WHITE-*Thorn*.

Young plants of the quickſet kind are beſt raiſed in ſmall portions of ground ſet apart for them; in which, after they are come up from the ſeed to ſome height, they ſhould be tranſplanted in lines at narrow diſtances, in a ſtraight manner, with ſmall intervals between the rows; where they are to remain from three to five years or more, being annually well cleaned and moulded up. Some, however, tranſplant them more than once, and think it an advantageous way, but they do well in either method. Well grown plants, with ſtout clean ſtems, are the moſt proper for planting out as hedge plants.

QUICKSET *Hedge*, a name given to all ſorts of hedge-fences which are conſtituted of any ſort of living plants; but more eſpecially of thoſe of the white-thorn kind. Hedges of this nature compoſe the principal fences of this country. In the drier and better ſorts of ſoil, thoſe of the thorn kind generally prevail; but in moſt other ſituations, thoſe of ſome other ſorts of plants, according to the particular nature of the ſoils and expoſures. The quicks or quickſets of the thorn ſorts are commonly ſuppoſed to form the beſt hedges, when planted in the raiſed bank or dike method. The manner of placing them out in theſe, is different in different caſes, both in reſpect to the form and number of the rows, as well as the diſtances of the plants from each other. Some think one regular or irregular row the moſt proper, others prefer two ſtraight ones; and ſome ſuppoſe a few inches diſtance from plant to plant the moſt beneficial; while others think eight or nine inches to be much better. Strong well-grown quickſets are commonly preferred in all caſes. It is remarked in the Eſſex Report, by one of the perſons engaged in drawing it up, that in the

pariſh of Birdbrook, in the north-eaſt part of it, "ſome excellent hawthorn hedges have been lately raiſed, by planting one row only at ſix inches aſunder, rather than two rows nine inches or a foot apart. The hedges have not been cut down, nor do they require it, to thicken their bottoms, as they are, at this time, a complete protection againſt hogs, and in other reſpects form a beautiful and effectual fence. Nothing can be more evident, it is thought, than that a row of plants ſet thus, ... ſix inches diſtant from each other, muſt form a more complete and effectual fence at the bottom, than an equal number planted thus, .·.·.·.· at a double diſtance, and occupying the ſame length, but a greater depth of ground upon the hedge row." This reaſoning of Mr. Vancouver's, Mr. Young obſerves, may, for aught he certainly knows, be concluſive, but it ſtrikes him in a different light. It is true, that the plants in each row are, in the latter mode, at double the diſtance from each other than they are in the former; but it is to be obſerved, that in the double row, the plants are diagonally as near each other as in the ſingle row, and, conſequently, there is the ſame vacant ſpace for any animal to paſs through in the ſingle row as in the double; and what muſt be a great advantage to the latter, the plants will ſhoot out their branches laterally on the outſides at leaſt, juſt as far as thoſe in the ſingle row, and twice as far lengthwiſe, meeting with no obſtruction in their progreſs. Of courſe, it is naturally to be concluded, that the double-rowed plantation muſt form a fence, if not altogether twice as ſtrong and ſecure, yet vaſtly ſtronger and ſecurer than the ſingle one. He does not, however, preſume to ſet ſpeculation againſt fact, as he has not ſeen the hedge noticed above, while Mr. Vancouver has. He has, however, himſelf planted one in a ſingle row, as above deſcribed and recommended; the plants have grown well; the hedge is a good one, but would, he thinks, have been ſtill better, if there had been two rows inſtead of one, as ſome others are that he has of that deſcription.

In Suſſex, the quickſet hedges at Goodwood are capital, and deſerving of every attention, being raiſed and trained in a moſt maſterly manner. The duke of Richmond planted them about eighteen or twenty years ago. They ſurround a very conſiderable farm, and are in a wonderful ſtate of preſervation. They form an excellent fence, without the aſſiſtance of any ditch, bank, rail, or pale; conſiſt of three rows of white-thorn plants, which ſpread three or four feet at bottom, but are clipped regularly and gradually to a thin edge at top; the ſhoots are ſo numerous, and trained with ſuch care, that even in winter, without a leaf, the thickneſs is uncommon. By the young hedges now in training, it appears that one method purſued has been to plant the centre row firſt, and when that is well eſtabliſhed, to add another on each ſide of it; at leaſt this is done in theſe new hedges. They are kept in a ſtate of garden cleanneſs; the branches are drawn into the line deſired, by being tied with mat, or other lines, and the clipping done with the exacteſt attention; the union of the hedges with the gate-poſts is cloſe and perfect, and as to gap, &c. there is no ſuch thing. How they have been preſerved from cattle, but eſpecially from ſheep, is marvellous, if either are ever allowed to enter theſe cloſes;—an attention never ceaſing, and a boundleſs expence, ſo far as neceſſary, muſt have been exerted. They cannot be recommended to the imitation of farmers on account of the trouble and expence of them, but they are beautiful as an object to the farming eye, and for their perfection, they merit all that can be ſaid of them.

On the Walburton farm in the ſame diſtrict, there are ſome very good quickſet hedges, which were planted about twenty-three years ago; the quick was ſet about two inches aſunder, and ſingle; they are cut twice in a year; are four and a half feet high, and two feet thick. There is very little ground loſt by the hedge, as it occupies only four feet. The ſame excellent ſort of quickſet hedges has alſo been made in ſome other places.

Here two rows of white-thorn plants are common, which are put on the bank of the ditch, care being taken not to have them too near it, for fear of its draining them too much and preventing their growth.

In ſome diſtricts, where the cultivation is principally of the arable or tillage kind, and in expoſed upland ſituations, there is frequently a great prejudice and objection to the introduction and formation of any ſort of live hedges, whether of the quickſet or any other deſcription, as they take up much ſpace, harbour birds and inſects, greatly ſhade the grain, and tend to promote blight, ruſt, and mildew, by preventing the free circulation of air. Alſo in bleak expoſures they are not raiſed without great difficulty. Such objections, however, ſpeedily vaniſh where they are kept ſufficiently low and well cut in and trained on the ſides. See HEDGE and FENCE.

QUICKSILVER, a very ponderous fluid mineral, by the chemiſts called *mercury*. For the method of gaining, preparing it, &c. with its properties, uſes, &c. ſee MERCURY.

Quickſilver, when rubbed down and blended with unctuous matters, forms a ſort of ointment, which is uſeful in the curing of different diſeaſes of the cuticular kind, as well as in deſtroying lice and other vermin that infeſt animals of different kinds, which form the live-ſtock of the farmer.

It has alſo been ſtated on the authority of Mr. Bradford, as communicated to the Society for the Encouragement of Arts, &c. to have been found uſeful in its crude ſtate in deſtroying inſects on fruit trees. On a plum-tree he made the following trials: he took a ſmall awl, and pierced, ſloping, through the rind, and into part of the wood of the branch, but not to the heart or pith of it; and poured in a ſmall drop or two of the quickſilver, and ſtopt it up with a ſmall wooden plug, made to fit the orifice: and the reſult was, he ſays, that the inſects all dropt off from that very branch the next day; and in a day or two more, from off the other branches of the tree, without any other puncture: and the tree continued in full vigour, and throve well all the ſummer after. Encouraged by this ſucceſs, he next tried it upon an honeyſuckle, the leaves of which were quite covered with them: and here he ſcraped away the top of the ground with a trowel, and run his awl, in the ſame ſloping manner, into the main ſtem, juſt above the roots; but with the ſame caution as above, not quite to the inner pith; and the ſucceſs was the ſame as before. The inſects all dropt off dead the next day after the experiment was made.

Theſe trials are ſaid to have been confirmed by other experiments; but they are ſtill in want of full and ſatisfactory confirmation.

QUICKSILVER, *Virgin*. See VIRGIN.

QUICKSILVER *Water*. See WATER.

QUICKSTADT, in *Geography*, a town of Norway, in the province of Aggerhuus; 42 miles N. of Chriſtiania.

QUICK-WORK, in a *Ship*, is a general name given to all that part of a ſhip which is under the ſurface of the water, when ſhe is laden fit for a ſea-voyage. The term is alſo applied, occaſionally, to that part of the ſide which is above the ſheer-rail, and which is uſually painted with trophies, &c. on the outſide. Falconer.

QUICK-WORK is likewiſe applied to the ſtrakes that ſhut in the inſide, between the ſpirkitting and clamps.

QUID,

QUID, *What*, in the *Schools*, is uſed to denote the definition of a thing.

It is thus called, becauſe the definition anſwers to the queſtion, *quid eſt? what is it?*

Hence we have two kinds of quids; nominal, *quid nominis;* and real, *quid rei.*

QUID *juris clamat*, in *Law*, a writ that lies where I grant the reverſion of my tenant for life by fine in the king's court, and the tenant will not attorn; then the grantee ſhall have this writ to compel him.

This writ ſeems to be obſolete, ſince the fourth and fifth of Anne. See ATTOURNMENT.

QUID *pro quo*, q. d. *what for what*, denotes the giving one thing of value for another; or the mutual conſideration and performance of both parties to a contract.

QUID *pro quo*, or QUI *pro quo*, is alſo uſed, in *Phyſic*, to expreſs a miſtake or cheat of an apothecary, in adminiſtering one medicine for another: or in uſing an ingredient in a compoſition different from that preſcribed.

A northern phyſician, in a printed theſis on *quid pro quos*, owns ingenuouſly, that they are very frequent. He diſtinguiſhes very accurately a great variety of kinds of *quid pro quos;* ſome with regard to the operation, others with regard to the ſubject; and others with regard to their form, or effects. The firſt comprehends the *quid pro quos* of the phyſician; the ſecond, thoſe of the patient; the third, thoſe of the apothecary.

QUID *Loſt*, a term which ſignifies the loſs of the ruminant power in animals of the live-ſtock kind. It is moſtly produced by local weakneſs of the ſtomach, cauſed by eating improper coarſe kinds of food in too large quantities, or other ſimilar means. It may be beſt reſtored by the uſe of ſtrong acids of the vegetable and other kinds, and its return prevented by ſtrong bitter infuſions, as thoſe of gentian, bark, &c. See CUD.

QUIDDEINEN, in *Geography*, a town of Pruſſia, in Oberland; 6 miles S.E. of Holland.

QUIDDENY, QUIDDANY, (of the Latin *cydonium*, or *cydoniatum*,) a conſerve of quinces, called alſo marmalade.

QUIDDITY, QUIDDITAS, in the *Schools*, a word of the ſame ſignification with *eſſence*.

The name is derived hence, that it is by the eſſence of a thing that it is *tale quid*, ſuch a quid, or very thing, and not another. When upon ſeeing, or hearing, the name of a thing, with whoſe nature, &c. we are unacquainted, we aſk, *Quid eſt? What is it?* we mean no more by the interrogation, but that we deſire to have its nature and eſſence explained by a definition. Whence quiddity is uſually defined the eſſence known or expreſſed in a definition.

And hence what is eſſential to a thing is ſaid to be quiddítive; as quidditive knowledge, &c.

QUIEBOU, in *Geography*, a town of France, in the department of the Channel; 6 miles S.W. of St. Lo.

QUIEN, MICHAEL LE, in *Biography*, a learned Dominican monk, who flouriſhed in the latter part of the 17th and in the 18th century, was born in the year 1661. He received a liberal education, having been inſtructed in claſſical learning at his native place, and he was then ſent to ſtudy philoſophy at the college du Pleſſis, at Paris. At twenty years of age he determined to renounce the world, and took the habit in a Dominican convent. Here he ſtudied with uncommon aſſiduity and proportionate ſucceſs, the Greek, Hebrew, and Arabic languages, criticiſm, divinity, the ſacred ſcriptures, and eccleſiaſtical antiquities. In the year 1690 he firſt appeared as an author, by publiſhing "A Defence of the Hebrew Text and the Vulgate Verſion," againſt a work, entitled "The Antiquity of Time reſtored," written by father Pezron. The latter having publiſhed a reply, Quien anſwered in a work entitled "The Antiquity of Time exploded." He next attacked him in "Remarks" on his "Attempt at a literal and hiſtorical Commentary on the Prophets," printed in the Memoires de Trevoux, for March 1711. During the following year he publiſhed "S. Joannis Damaſceni Opera quæ extant Gr. et Lat." in 2 vols. fol. accompanied with diſſertations abounding in erudition. He intended to have given a third volume, containing ſuch pieces as had been falſely attributed to that father, but it was never ſent to the preſs. The ſame fortune has attended his labours on "The Works of Leo of Byzantium," to which he had paid a conſiderable ſhare of attention. Towards the cloſe of his life he entered into a controverſy with father Courayer, concerning the validity of the ordinations of the church of England, in which the palm of victory was given to his opponent. Le Quien died in 1733, at the age of 72 years, reſpected for his piety, and uniform correctneſs of conduct. He was author of various "Diſſertations" to be found in Deſmolets "Memoires de Literature et d'Hiſtoire," and the "Mercure de France." At the time of his death he was engaged in printing the moſt conſiderable of his works, relating to the ancient and preſent ſtate of the eaſtern churches. "His plan includes the whole of his churches, under the four grand patriarchates of Conſtantinople, Alexandria, Antioch, and Jeruſalem; preſents a geographical deſcription of each dioceſe, and of the epiſcopal cities, and then gives a particular account of the origin and eſtabliſhment of the churches, their extent, their juriſdiction, their rights, their prerogatives, the ſucceſſion and order of their biſhops, their political government, the changes which they have undergone," &c. As the author did not live to finiſh his work, it was publiſhed with additions, in the year 1740, under the title of "Michaelis le Quien Oriens Chriſtianus, in quatuor Patriarchatus digeſtus, qua exhibentur Eccleſiæ, Patriarchæ, cæterique Preſules Orientis," &c. in 3 vols. fol. Moreri.

QUIENFIORD, in *Geography*, a bay on the coaſt of Norway; 27 miles N. of Chriſtianſand.

QUIENS, a river of Norway, which runs into the ſea, 18 miles N. of Cape Lindeſneſs.

QUIESCENT, ſomething at reſt.

QUIETISM, in *Eccleſiaſtical Hiſtory*, the ſentiments of the Quietiſts, a religious ſect, which made a great noiſe towards the cloſe of the 17th century.

Molinos, a Spaniſh prieſt, who died at Rome in the priſon of the inquiſition, paſſes for the author of Quietiſm; and yet the Illuminati in Spain had taught ſomething like it before.

A ſect ſimilar to this had appeared at Mount Athos, in Theſſaly, towards the cloſe of the fourteenth century, under the appellation of Heſychaſts, which denotes the ſame with Quietiſts. Theſe were a branch of the *Myſtics*, (which ſee,) or thoſe more perfect monks, who, by a long courſe of intenſe contemplation, endeavoured to arrive at a tranquillity of mind entirely free from every degree of tumult and perturbation. Theſe Quietiſts, in conformity to an ancient opinion of their principal doctors, (who imagined that there was a celeſtial light concealed in the deepeſt retirements of the mind,) uſed to ſit every day, during a certain ſpace of time, in a ſolitary corner, with their eyes eagerly and immoveably fixed upon the middle region of the belly, or navel; and boaſted, that, while they remained in this poſture, they found, in effect, a divine light beaming forth from the ſoul, which diffuſed through their hearts inexpreſſible ſenſations of pleaſure and delight. To ſuch as inquired what kind of light this was, they replied, by way of illuſtration, that it was the glory of God, the ſame celeſtial radiance that ſurrounded

Chriſt

Chriſt during his transfiguration on the mount. Barlaam, a monk of Calabria, from whom the Barlaamites derived their denomination, ſtyled the monks, who adhered to this inſtitution, Maſſalians and Euchites: and he gave them alſo the new name of Umbilicani. Gregory Palamas, archbiſhop of Theſſalonica, defended their cauſe againſt Barlaam, who was condemned in a council held at Conſtantinople in the year 1341.

The name is taken from a ſort of abſolute reſt, and inaction, which the ſoul is ſuppoſed to be in, when arrived at the ſtate of perfection, which in their language is called *the unitive life*. To arrive at this, a man is firſt to paſs through the purgative way; that is, through a courſe of obedience, inſpired by the fear of hell: hence he is to proceed into the illuminative way, before he arrives at perfection.

The ſentiments of the Quietiſts, with regard to God, are wonderfully pure and diſintereſted. They love him for himſelf, on account of his own perfections, independently of any rewards or puniſhments: the ſoul acquieſces in the will of God, even at the time when he precipitates it into hell; inſomuch that inſtead of ſtopping him on this occaſion, B. Angelo de Foligny cried out, "Haſte, Lord, to caſt me into hell: do not delay if thou haſt abandoned me: but finiſh my deſtruction, and plunge me into the abyſs."

At length the ſoul, after long travail, enters into reſt, into a perfect quietude. Here it is wholly employed in contemplating its God; it acts no more, thinks no more, deſires no more; but lies perfectly open, and at large, to receive the grace of God, who by means thereof drives it where it will, and as it will.

In this ſtate it no longer needs prayers, or hymns, or vows; prayers where the ſpirit labours, and the mouth opens, are the lot of the weak, and the imperfect: the ſoul of the ſaint is, as it were, laid in the boſom, and between the arms of its God, where, without making any motion, or exerting any action, it waits, and receives the divine graces. It then becomes happy: quitting the exiſtence it before had, it is now changed; it is transformed, and, as it were, ſunk and ſwallowed up in the Divine Being, inſomuch as not to know or perceive its being diſtinguiſhed from God himſelf. Fenel. Max. des Saints.

QUIETISTS, the diſciples of Mich. de Molinos; or the adherents to the opinions delivered in the article QUIETISM. The ſentiments of Molinos were contained in a book, which he publiſhed at Rome in the year 1681, under the title of the "Spiritual Guide:" in conſequence of which he was caſt into priſon in 1685, where he was ſoon obliged to renounce, in a public manner, the errors of which he was accuſed: and this ſolemn recantation was nevertheleſs followed by a ſentence of perpetual impriſonment, from which he was in an advanced age delivered by death, in the year 1696. Molinos had a conſiderable number of diſciples in Italy, Spain, France, and the Netherlands. One of the principal patrons and propagators of Quietiſm in France, was Marie Bouvieres de la Mothe Guyon, a woman of faſhion, remarkable for the goodneſs of her heart, and the regularity of her manners; but of an unſettled temper, and ſubject to be drawn away by the ſeduction of a warm and unbridled fancy. This female apoſtle of myſticiſm derived all her ideas of religion from the feelings of her own heart, and deſcribed its nature to others as ſhe felt it herſelf. Accordingly, her religious ſentiments made a great noiſe in the year 1687; and they were pronounced unſound, after accurate examination by ſeveral men of eminent piety and learning, and profeſſedly confuted, in the year 1697, by the celebrated Boſſuet. Hence aroſe a controverſy of great moment, between the prelate laſt mentioned, and Fenelon, archbiſhop of Cambray, who ſeemed diſpoſed to favour the religious ſyſtem of Madame Guyon, and who, in 1697, publiſhed a book, cited in the laſt article, containing ſeveral of her tenets. Fenelon's book, by the intereſt of Boſſuet, was condemned in the year 1699, by Innocent XII. and the ſentence of condemnation was read by Fenelon himſelf at Cambray, who exhorted the people to reſpect and obey the papal decree. Notwithſtanding this ſeeming acquieſcence, the archbiſhop perſiſted, to the end of his days, in the ſentiments which, in obedience to the order of the pope, he retracted and condemned in a public manner. See the article FENELON.

QUIETO, in *Geography*, a river of Iſtria, which runs into the Adriatic, two miles W. of Baſtia.

QUIETUS, *freed* or *acquitted*, a term uſed by the clerk of the pipe, and the auditors in the exchequer, in their acquittances or diſcharges given to accomptants, which uſually conclude with the words *abinde receſſit quietus*; which is called a *quietus eſt*.

A *quietus eſt* granted to a ſheriff, diſcharges him of all accounts due to the king.

QUIFORO, in *Geography*, a diſtrict of Africa, on the Gold Coaſt

QUIGNONES, FRANCIS DE, in *Biography*, an eminent Spaniſh cardinal in the 16th century, who embraced the religious life at an early age, in a monaſtery of Franciſcans, and ſubſequently afforded ſuch evidence of ſuperior talents, that he was elected general of his order in the year 1522. He obtained the office of confeſſor to Charles V. and upon the capture of Rome by the imperial army in 1527, and the impriſonment of pope Clement VII. in the caſtle of St. Angelo, his ſervices were ſolicited by that pontiff, in negociating for his liberty, and were afterwards rewarded with a cardinal's hat. After this, he was by the ſame intereſt nominated biſhop of Cauria, and ſent in the capacity of apoſtolical legate into Spain, and the kingdom of Naples. He died in the year 1540. He was author of a reformed breviary printed at Rome in 1536, which met with the approbation of popes Clement VII. and Paul III. but it was afterwards ſuppreſſed by Pius V.; hence it has become ſcarce, and is ſought after by collectors. Several ſpurious editions have been printed at different times. It is inſerted in the "Annales Minores" of Wadingus, and in the ſecond edition of Joly's treatiſe "De Reformandis Horis Canonicis."

QUIJUBATUI, in *Ornithology*, the name of an American ſpecies of paroquette.

It is of the ſize of a lark, and in general of a yellow colour. Its eyes are black, and its beak grey. The edges of its wings are of a duſky green, and its tail long and yellow. It is a very beautiful bird, and very eaſily tamed. See PSITTACUS *Guarouba*.

QUIKNE, in *Geography*, a town of Norway, in the province of Bergen; 105 miles N. of Chriſtiania.

QUIL, in *Zoology*. See QUIRPELE, and VIVERRA *Mungo*.

QUILAQUIL, in *Ornithology*, the name given by the people of the Philippine iſlands to a very beautiful ſpecies of parrots, which is commonly found wild in the woods there. It is all over of a fine green colour, and is ſmaller than the common parrots, and has a broad black bill, and black legs. It is a very wild bird, and will not learn any thing.

QUILATE, in Spaniſh and Portugueſe *Coinage*, a term uſed for *carat*; which ſee.

QUILEA, in *Geography*, a ſea-port town of Peru, near the Pacific ocean, which gives name to a fertile valley, in the juriſdiction of Arequipa. S. lat. 16° 45'.

QUILICI,

QUILICI, GAETANO, in *Biography*, an Italian opera-ſinger, with a baſe voice: a good muſician, who arrived here in 1759, during the performance and opera regency of the Mattei. He continued to perform on our lyric ſtage near thirty years, and is, we believe, ſtill living in London, we fear, in penury and obſcurity. Since quitting the ſtage, he has ſupported himſelf, a bed-ridden wife, and an ideot ſon, by teaching to ſing, and has made ſome admirable ſcholars.

QUILIMANCY, in *Geography*, a river of Africa, which runs into the Indian ſea, 20 miles S. of Melinda. S. lat. 3° 16′. E. long. 40° 10′.—Alſo, a ſea-port town of Africa, in the kingdom of Melinda, at the mouth of the before-mentioned river, belonging to the Portugueſe. S. lat. 3° 10′.

QUILIMANE, a town of Africa, in Mozambique. S. lat. 18° 15′. E. long. 37° 30′.

QUILLAJA, in *Botany*, a genus of plants found in Chili, and deſcribed by Molina. Juſſ. 444. Lamarck Illuſtr. t. 774.—Claſs and order, *Monoecia Dodecandria*. Nat. Ord. uncertain.

Eſſ. Ch. Male, Calyx five-cleft. Corolla none. Stamens twelve, or more.

Female, Calyx five-cleft. Corolla none. Germens five, ſuperior, oppoſite to the ſegments of the calyx. Styles five. Capſules five, coriaceous, of two valves, and one cell. Seeds numerous, oblong, inſerted into the bottom of the capſule, dilated and winged at the ſummit.

Such is the character made out by Juſſieu, from the publications of Molina and Frezier, and from ſpecimens of the fruit, brought to Europe by Dombey. They belong to a *tree*, whoſe *bark* has a ſoapy quality. The *leaves* are alternate, ſimple, evergreen. *Flowers* axillary.—The genus appears akin to the *Magnoliæ* of Juſſieu, but whatever it may be, the name is barbarous and quite inadmiſſible; only tolerable for a time, till ſome botaniſt, furniſhed with better materials to define the genus, ſhall be entitled to give it a more claſſical appellation. Juſſieu remarks, that another plant of Dombey's appears to belong to the above genus. This is a tree referred by him to *Dioecia Icoſandria*, whoſe fruit is called *Gayo colorado*, and which is the ſame with the "*Loque*, or Peruvian tree with five capſules," of Joſeph de Juſſieu, whoſe branches, according to his manuſcript account, are ſo long and pliant, as to be twiſted into cords, ſerving, in the province of Cuſco, for the ſupport of hanging bridges.

QUILLALA, in *Geography*, a town of Chili, on the Aconcagua; 30 miles E.N.E. of Valparayſo.

QUILLAN, a town of France, in the department of the Aude, and chief place of a canton, in the diſtrict of Limoux; 10 miles S. of Limoux. The place contains 1568, and the canton 9195 inhabitants, on a territory of 272½ kiliometres, in 22 communes. N. lat. 42° 52′. E. long. 2° 16′.

QUILLA-YACU, a town of Peru, in the dioceſe of Lima; 60 miles E.N.E. of Guanuco.

QUILLE, a town of Sweden, in Weſt Gothland; 23 miles N. of Uddevalla.

QUILLEBŒUF, a town of France, in the department of the Eure, and chief place of a canton, in the diſtrict of Pontaudemer, ſeated on the Seine; eight miles N. of Pontaudemer. The place contains 1200, and the canton 7272 inhabitants, on a territory of 107½ kiliometres, in 16 communes. N. lat. 49° 29′. E. long. 0° 38′.

QUILLET, CLAUDE, in *Biography*, born at Chinon, in Touraine, about the year 1602, was brought up to medicine, which he practiſed ſome years, till he was obliged to quit the country on account of his oppoſition to a meaſure of Richelieu, which is thus narrated. Quillet was at Loudun at the time that Loubardemont, a creature of the cardinal, was ſent thither to take informations reſpecting the pretended poſſeſſion of ſome nuns by the ſorceries of Urban GRANDIER (ſee his article), an impoſture which Richelieu thought fit to favour. The counterfeit Satan one day threatened, that on the morrow he would lift up to the roof of the church any one who ſhould preſume to call his power in queſtion. A large company appeared on the next day with M. Loubardemont, when Quillet, who alſo was preſent, challenged the devil to keep his word. To the ſurpriſe of the ſuperſtitious who had met on the occaſion, nothing followed, but the challenger found to his coſt that he had given offence to a mightier power than Satan, and felt it neceſſary to quit Loudun in haſte, and retire to Italy. He went to Rome, and was engaged as ſecretary to the French ambaſſador at that court. He probably returned to France with that miniſter, after the death of Richelieu, and in 1655 he publiſhed at Leyden, under the name of Calvidius Lætus, the poem by which he is chiefly known, entitled "Callipædia ſive de pulchræ Prolis habendæ ratione." In the firſt edition were ſome ſatirical lines againſt Mazarin. The cardinal ſent for him, and having gently remonſtrated with him for treating his friends with ſeverity, promiſed to give him the firſt vacant abbey. Quillet threw himſelf at the cardinal's feet, aſked pardon, aſſured him he would inſtantly obliterate the offenſive lines, and begged, as a ſign of his penitence, to be allowed to dedicate the poem to him. This was done in the Paris edition of 1656, and Quillet became the flatterer of him who had been the object of his ſatire. He died at Paris in 1661, repenting not of his adulation, but of the licentious caſt of ſome of his verſes. The Callipædia has gone through many editions, and has been tranſlated into various languages. "It is," ſays an able critic, "an ingenious performance, agreeably varied by fable and epiſode, but frivolous in its main topic, and in its reaſonings. Its details are frequently looſe and inflammatory, and that a cardinal ſhould have allowed it to have been dedicated to him, is a proof how little regard was paid, at that period, to the rules of decorum. The verſification, though generally free and flowing, is by no means correct, and the diction is frequently impure." Quillet compoſed a verſion of Juvenal in French verſe, and a Latin poem in twelve books, entitled "Henriados," or the actions of Henry IV. This, with other papers, he left to Menage, with 500 crowns to defray the charge of printing them, but the abbe took the money, and neglected the conditions.

QUILLIGA, in *Geography*, a country of Africa, in Upper Guinea, near the river Maqualbary.

QUILLOBO, in *Botany*, a name given by ſome to a ſpecies of ketmia, called alſo *quingombo*.

QUILLOT, KILLO, or *Kiſlo*, in *Commerce*, a Turkiſh corn meaſure, weighing, in wheat, about 23 okes, or 60lbs. avoirdupois: 4 killos make 1 fortin; 8½ killos anſwer nearly to 1 Engliſh quarter. A killo of rice contains 10 okes, and the oke is 400 drachms.

QUILLOTA, in *Geography*, a town and juriſdiction of Chili. The town does not contain above 100 families, but thoſe ſcattered over the country exceed 1000.

QUILLY, a town of France, in the department of the Lower Loire; 7 miles N. of Savenay.

QUILOA, a country and kingdom of Africa, ſituated near the eaſt coaſt, near the mouth of the Coavo, about 180 miles from north to ſouth; but the extent inland towards the weſt is unknown. This country was firſt diſcovered by the Portugueſe, in the year 1498. The king and his ſub-

jects are Mahometans; the latter partly black and partly tawny. They all ſpeak the Arabic and ſeveral other languages, which they learn from the nations they traffic with. Their dreſs is that of the Arabian Turks: the women eſpecially affect finery, with variety of ornaments about their necks, arms, wriſts, and ankles; particularly bracelets made of ivory, curiouſly wrought, which upon the death of a parent, huſband, or near relation, they break in pieces, in token of ſorrow, whilſt the men expreſs theirs by ſhaving their hair, and abſtaining from food. The capital of the kingdom is ſituated on an iſland near the mouth of the Coavo, and is ſaid to be large, rich, and well built. The houſes are of ſtone and mortar, handſome, and after the Spaniſh manner. They are ſeveral ſtories high, and have each a pleaſant garden behind, well watered and cultivated, here being plenty of ſprings of freſh water. The houſes are finely furniſhed within, and terraces on the top, with a kind of hard clay, and the ſtreets ſo narrow, that one may eaſily ſtep from one ſide to the other. On one ſide of the town is the citadel, where reſides the Mahometan prince. It is adorned with ſtately towers, and ſurrounded with a ditch and other fortifications. It hath two gates, one towards the port, whence one may ſee the ſhips ſailing in and out; the other looking towards the land. The country about Quiloa, though low, is yet very pleaſant and fertile in rice and millet, fruits and good paſture; ſo that they breed abundance of cattle, beſides poultry of all ſorts, both wild and tame. They have fiſh likewiſe in great plenty, and very good. The climate is likewiſe affirmed by moſt travellers to be very temperate and healthy; Sanut being the only author we know of who hath ventured to aſſert the contrary in all theſe reſpects. S. lat. 8° 35′.

QUILONNE, a province of Africa, in the kingdom of Sabia.

QUILOVIA, a ſmall iſland in the Indian ſea, near the coaſt of Africa. S. lat. 13°.

QUILTAINEN, a town of Pruſſia, in the province of Oberland; 8 miles S.E. of Holland.

QUILTAON, one of the Laccadive iſlands, in the Indian ſea. N. lat. 12°. W. long. 72° 45′.

QUILTING denotes the operation of weaving a ſort of coat or texture, formed of the ſtrands of rope, about the outſide of any veſſel, to contain water, &c. as a jar, caſk, bottle, &c.

QUIMICHPATLAN, in *Zoology*. See SCIURUS *Volucella*.

QUIMINATIN, in *Geography*, a ſmall iſland in the ſea of Mindoro. N. lat. 10° 55′. E. long. 120° 40′.

QUIMIRI, a town of Peru, in the dioceſe of Lima; 40 miles N.E. of Naſca.

QUIMO, a ſmall iſland on the eaſt ſide of the gulf of Bothnia. N. lat. 63° 17′. E. long. 21° 52′.

QUIMPER, a city of France, capital of the department of Finiſterre, and chief place of a diſtrict, ſeated on the Oder; before the revolution the ſee of a biſhop, the ſeat of a governor, an admiralty, &c. The place contains 6608, the canton 17,028 inhabitants, on a territory of 90 kiliometres, in ſeven communes. N. lat. 47° 59′. W. long. 4° 1′.

QUIMPERLE, a town of France, and chief place of a diſtrict, in the department of the Finiſterre. The place contains 4162, and the canton 9128 inhabitants, on a territory of 125 kiliometres, in 15 communes.

QUIN, DR., of Dublin, in *Biography*, an eminent phyſician, and one of the moſt enlightened dilettante muſicians with whom we have ever been acquainted. This gentleman, who, during his travels, reſided in Italy ſome years, had heard and ſtudied muſic with ſuch taſte and intelligence, that his opinions and converſation on the ſubject were equally entertaining and inſtructive. He reſided in Dublin at the time of Handel's arrival in that city, 1742, and perfectly remembering his performance, perſon, and manners, in 1788 wrote us word, that "he (Handel) was received in Ireland by perſons of the firſt diſtinction with all poſſible marks of eſteem, as a man, and admiration as a performer and compoſer of the higheſt order." And adds, "the Meſſiah, I am thoroughly convinced, was performed in Dublin for the *firſt time*, and with the greateſt applauſe. Mrs. Cibber and ſignora Avolio were the principal performers. Theſe, with the aſſiſtance of the choriſters of St. Patrick's cathedral and Chriſt-church, formed the vocal band; and Dubourg, with ſeveral good inſtrumental performers, compoſed a very reſpectable orcheſtra. There were many noble families here, with whom Mr. Handel lived in the utmoſt degree of friendſhip and familiarity. Mrs. Vernon, a German lady, who came over with king George I. was particularly intimate with him, and at her houſe I had the pleaſure of ſeeing and converſing with Mr. Handel; who, with his other excellencies, was poſſeſſed of a great ſtock of humour; no man ever told a ſtory with more. But it was requiſite for the hearer to have a competent knowledge of at leaſt four languages: Engliſh, French, Italian and German; for in his narratives he made uſe of them all."

QUIN, JAMES, was born in London in 1693. He was the ſon of an Iriſh gentleman, and received his education in the capital of that country. His father had, ignorantly, married a woman ſuppoſed to be a widow; whoſe huſband, after a long abſence, returned and claimed her. The ſubject of this article was the offspring of this connection, and was accordingly illegitimated, and upon his father's death, in 1710, was left almoſt deſtitute. For want of education he was, at the age of twenty-one, without a profeſſion, and was under the neceſſity of appearing on the ſtage at Dublin, in the very loweſt characters. He diſplayed, however, riſing talents, which induced a friend to adviſe him to attempt ſome better parts in London, and he was accordingly admitted into Drury-lane company in 1715. After the experience of a year or two, he entered himſelf under Rich at Lincoln's-Inn theatre, where he continued to perform during ſeventeen years. He was allowed, by the moſt competent judges, to ſhine both in tragedy and comedy. His utterance was weighty and impreſſive, which, however, was accompanied with various defects. He was, from cauſes not well aſcertained, continually changing from one theatre to another, and perhaps he may be ranked among that number with whom it was difficult to keep terms. His paſſions were ſtrong, his temper irritable, and his language often coarſe. He was of convivial habits, and, it has been ſaid, groſsly attached to the pleaſures of the table. There was, however, a fund of generoſity in his temper, which ſhewed itſelf in manly ſentiments, and, occaſionally, in benevolent actions. The circumſtance of his giving a 100*l.* to the poet Thomſon, when he was under an arreſt for debt, has often been told to his honour. It was the commencement of a ſtrong friendſhip between them. After Thomſon's death, he appeared in that poet's tragedy of Coriolanus, and ſpoke a prologue, written on the occaſion by lord Lyttleton, with a pathos that did honour to his feelings. His laſt performance was the favourite part of Falſtaff, for the benefit of his friend Ryan in 1753. He now retired to Bath, where his fund of anecdote, and ſtrong pointed ſenſe, rendered his company much ſought after. He had good breeding, which fitted him for the higheſt ſocieties, when he choſe to act the gentleman; and his ſenſuality and coarſeneſs were frequently

frequently put up with for the ſake of his companionable qualities. Quin died at Bath in 1766, at the age of ſeventy-three. Garrick, whoſe ſuperior talents are ſuppoſed to have driven him from the ſtage, but afterwards his ſteady friend, wrote a poetical epitaph for his monument. While Quin continued on the ſtage, he conſtantly kept company with the moſt celebrated geniuſes of the age. He was on intimate terms with Pope and Swift; and was frequently invited by the earl of Cheſterfield to his table. His peculiar judgment in the Engliſh language recommended him to his royal highneſs, Frederic prince of Wales, who appointed him to inſtruct his children in ſpeaking and reading with graceful propriety. When Quin was informed of the elegant manner in which his preſent majeſty had delivered his firſt gracious ſpeech from the throne, he was in raptures, and the king ſoon after gave orders, without any application on the part of Quin or his friends, that a genteel penſion ſhould be paid him during his life.

QUIN, in *Geography*, a village of the county of Clare, Ireland, where are the remains of a monaſtery, which was founded for Franciſcan friars in 1402, and repaired by the Roman Catholics in 1604. Biſhop Pococke ſpeaks of it as one of the fineſt and moſt entire monaſteries he ſaw in Ireland. It is ſituated on a fine ſtream, with an aſcent of ſeveral ſteps to the church: at the entrance one is ſurpriſed with the view of the high altar, entire, and of an altar on each ſide of the arch of the chancel. The building is quadrangular, with piazzas ſupported by a number of pillars; there are apartments on three ſides of the cloiſters, with a vaulted room under them all. A round tower and ſome other ruins are adjoining. Quin is 15 miles from Limerick, on the road to Galway, and about 106 miles W.S.W. from Dublin. Archdall's Monaſticon. Carliſle.

QUINA FOLIA, in *Botany*. See LEAF.

QUINABAUG, in *Geography*, a river of America, formerly called "Mobegan," which riſes in Brimfield, Maſſachuſetts, and is joined at Oxford by French river, which has its ſource in Sutton, Worceſter county. It runs a ſoutherly courſe, and diſcharges itſelf into Shetucket, about three miles above Norwich Landing, in Connecticut. In the firſt part of its courſe it furniſhes many good mill-ſeats: as it advances, the intervals in many places are wide, and afford a moſt excellent ſoil.

QUINA-QUINA, in *Botany*, a Peruvian name, generally applied to the Peruvian bark. (See CINCHONA.) Juſſieu, however, in his Gen. Pl. 366, informs us, that it properly belongs to a tree, nearly if not entirely agreeing in genus with *Myroſpermum* of Jacquin, or MYROXYLON of Linnæus. (See the laſt-named article.) An account of the *Quina-quina* may be found in the Memoires de l'Acad. des Sciences for 1738, p. 237.

QUINARIA, ſo called by Loureiro, Fl. Cochinch. v. 1. 272, from the prevalence of the number five in the parts of fructification, is the *Wampſe* or *Wampi* of the Chineſe, now eſtabliſhed as a genus by the name of COOKIA. (See that article.) This plant paſſed long, in the gardens of England, for *Guarea trichilioides*, according to the obſervation of the late Mr. Dryander.

QUINARIUS, QUINARY, in *Antiquity*, a little Roman coin, equal to half the denarius. See COIN.

The quinarius was properly the Roman halfpenny.

Medaliſts indeed uſe the term quinarius in the general for a medal of any matter, not exceeding the ſize of our ſixpence; but F. Chamillart, in an expreſs diſſertation, ſhews this to be an abuſe. The ſilver coins, current under the republic, he ſhews, were two: the one weighing a drachm, and called denarius, as containing ten aſſes; the other weighing half a drachm, and called quinarius, as containing five aſſes: which coins continued on the ſame footing under the emperors.

Hence the origin of the word quinarius: and hence, in propriety, it is only the ſilver medal of the weight of half a drachm that the name belongs to; the Romans having never given it to any other ſpecies of the ſame ſize with it. It is only by way of analogy, therefore, that the moderns apply it to the medals of gold, or copper, of the ſame ſize with the ſilver quinarius; thoſe of gold being fixed at a value much above, and thoſe of braſs much below five aſſes.

The only relation between theſe quinarii is, that the gold quinary is the half of a gold medal, as to weight and value; and the braſs quinary half a braſs medal, as the ſilver quinary is half a ſilver one.

Hence a ſeries of quinaries ſhould ſeem at leaſt a neceſſary in the cabinets of the curious, as the ſeries of great medals; they being all equally different ſpecies of money, which teach us how many kinds of pieces there were of any metal current in commerce.

Add to this, ſays our author, that the quinaries were of a finer and more finiſhed coin than the other medals, being wrought by the hands of the maſters; which ſeems owing to the nicety required in engraving whole figures in ſo ſmall a compaſs. He adds, that though quinaries are very ſcarce, yet M. the duke of Maine had almoſt a complete ſet of them.

QUINAULT, PHILIP, in *Biography*, a French poet, was born in 1636, probably in a low condition; though while ſome ſay he was the ſon of a baker, others maintain that he was deſcended from a family of conſequence at Paris. He had, however, very few advantages of education, but was ſoon found to poſſeſs a talent for poetry and the belles lettres. Before the age of twenty he brought out ſome pieces on the ſtage; and for a number of years, he continued to produce dramatic works of different kinds, which were much applauded by the public voice; but ſome of which drew upon the author the ſatires of Boileau, who carried the matter ſo far as to injure his own reputation. Quinault now aſſociated himſelf with Lulli in the compoſition of operas, and diſplayed an excellence in lyric poetry, or that adapted to muſic, which placed him beyond competition in that branch, and has ranked him among the diſtinguiſhed characters of the age of Lewis XIV. Nothing, it is allowed, can be more tender, delicate, and ingenious, than the turn of his ſongs and love-dialogues; and no one has more happily accommodated the melody of French verſe to muſical expreſſion. His "Armida" and his "Atthys" are ſpoken of as maſter-pieces of their kind. Notwithſtanding the high reputation which he enjoyed as a poet, he applied himſelf to the ſtudy of the law, and eventually made his fortune by marrying the rich widow of a merchant, to whom he had been uſeful in his profeſſion. After this, he purchaſed the place of an auditor in the chamber of accounts. He was received into the French academy, and, in the name of that ſociety, harangued the king on his return from the campaigns of 1675 and 1677. He died in 1688, having enjoyed a penſion from Lewis XIV. ſeveral years previouſly to his deceaſe. In his laſt illneſs he was extremely penitent, on account of his having devoted his talents too frequently to the excitement of the licentious paſſions. He left a family of five daughters, and was eſteemed in ſociety attentive, polite, and mild. Beſides his numerous pieces for the ſtage, he wrote occaſional poems. His works were printed at Paris in 5 vols. 12mo., 1739, and again in 1778.

It has been ſaid that Quinault's apprenticeſhip to poetry was ſerved under Triſtan l'Hermile, by being his domeſtic. The leſſons of Triſtan were probably of ſome uſe to him, as that author had had long experience in theatrical matters; but Quinault owed ſtill more to nature: as before he was twenty years old, he had diſtinguiſhed himſelf by ſeveral pieces for the ſtage, which had conſiderable ſucceſs: and before he was thirty, he produced ſixteen dramas, ſome of which were well received by the pit; but not all equally. It is ſuppoſed that ſome of theſe early pieces prejudiced Boileau againſt Quinault early in his career. There was neither regularity in the plan, nor force in the ſtyle: romantic lovers and common-place gallantry, in ſcenes which required a nervous pencil and vigorous colouring. Theſe were defects not likely to eſcape the laſh of the French Juvenal. He covered the young poet with ridicule; reproached him with the affectedly ſoft and languiſhing dialogue of his lovers, by whom even *I hate you* was ſaid tenderly.

Quinault, born with great ſenſibility, was ſo wounded by his ſeverity, that he applied to the magiſtrates, not only to ſilence Boileau, but oblige him to remove his name from his ſatires; but the attempt was vain. His enemy inſulted him ſtill more cruelly by an epigram on the ſubject.

" ——Peace! peace! my friend—
If from the public thou'dſt avoid diſgrace,
From thy own works, not mine, thy name efface."

It was not till after Quinault was inliſted by Lulli to write for the opera, that he ſilenced all his enemies, except Boileau and his party, who envied him his ſucceſs. The French nation knew no better muſic that that of Lulli, and thought it divine. Quinault's was thought of ſecondary merit, till after his deceaſe; and then, in proportion as the glory of Lulli faded, that of Quinault increaſed. Voltaire, in the firſt edition of his " Siècle de Louis Quatorze," in 1749, ſeems to have been the firſt who ſpoke out on the ſubject; not ſorry, perhaps, to lower Boileau a little in the eyes of the public. He there ſays, that " Quinault was celebrated for his beautiful lyric poetry, and for the gentleneſs with which he oppoſed the unjuſt ſatires of Boileau. His poetry was greatly ſuperior to the muſic of Lulli. It will always be read; and Lulli, except in a few of his recitatives, can no longer be ſupported. However, it was long believed that Quinault entirely owed his favour to Lulli. Time appreciates all things."

After this, his writings began to be examined and felt; and of late years, his name is never mentioned by his countrymen without eloge. His operas, though admirable to read, are ill calculated for modern muſic; and are obliged to be new written, ere they can be new ſet, even in France. Marmontel, who had modernized ſeveral of them for Piccini to ſet in 1788, gave M. Laborde a diſſertation on the dramatic writings of Quinault for muſic; which is publiſhed in the fourth volume of his " Eſſai ſur la Muſique."

He begins by aſſerting that Quinault was the creator of the French opera upon the moſt beautiful idea that could be conceived; an idea which he had realized with a ſuperiority of talent, which no writer has ſince approached.

His deſign was to form an exhibition, compoſed of the prodigies of all the arts; to unite on the ſame ſtage all that can intereſt the mind, the imagination, and the ſenſes. And this illuſive theatre Voltaire has admirably deſcribed:

" Il faut ſe rendre à palais magique," &c.

" Haſte to the magic palace, where abound
The joys ſublime of verſe, of dance, and ſound;
Where bright illuſion faſcinates the ſight,
And ſiren-notes the inchanted ear delight;
Where all the plaſtic powers of art are ſhewn,
And joys unnumber'd are combin'd in one."

For this purpoſe a ſpecies of tragedy is neceſſary, that ſhall be ſufficiently touching to move, but not ſo auſtere as to refuſe the enchantments of the arts that are neceſſary to embelliſh it. Hiſtorical tragedy, in its majeſtic and gloomy ſimplicity, cannot be ſung with any degree of probability, nor mixed with feſtivals and dances, or be rendered ſuſceptible of that variety, magnificence, ſhow, and decoration, where the painter and the machiniſt ought to exhibit their enchantments.

In Italy, where genuine tragedy has no theatre appropriated to its uſe, a people paſſionate for muſic have permitted Regulus, Themiſtocles, Alexander, and even Cato himſelf, to utter their ſpeeches in ſong; but a people, whoſe taſte ought to be more ſevere, and more delicate, as to probability, having for compariſon the ſchool of Corneille and Racine, would have been very unwilling to ſubſtitute the recitative of Lulli to the declamation of Baron. Melody itſelf is a fabulous and magical language; and in a theatre " where all is prodigy, it ſeems conſiſtent that the manner of ſpeaking ſhould be that of enchantment as well as the reſt. We are then in a new world: it is nature enchanted, and viſibly animated by a crowd of intelligences, whoſe wills are laws. Muſic there plays a marvellous part; muſic there conſtitutes the probability of the marvellous; but in a repreſentation where all paſſes for natural, according to truth and hiſtory, by what means can we be prepared to hear Auguſtus, Cornelia, Agrippina, or Brutus ſing?" Might it not be replied, " By the ſame means as the French are reconciled to theſe ſame exalted characters converſing in rhyme." When once it is ſettled that all the characters converſe in a muſical language, no other is expected, and the audience is ſoon reconciled to it. But all this is to prove that the French alone are right, and Italy and all the reſt of the world wrong as to the muſical drama. The reſt of Europe is tired and aſhamed of flying gods and goddeſſes, and have long ſince ſurrendered mythological wonders both in poetry and muſic to their children. But all people are thought barbarians, who do not implicitly adopt the taſte and faſhions of France.

But to return to Quinault, whom all the wits of the time tried to write down. Ignorant of muſic and its powers, they thought Lulli always right, and the poor, modeſt, unpretending Quinault always wrong. Poſterity has long diſcovered the converſe of this ſuppoſition to be the truth. Quinault's great miſtake and misfortune, ſays La Harpe, was the calling his pieces tragedies, and not operas. He would not then have been regarded as a rival of Racine, or have offended claſſical hearers or readers with the little reſemblance theſe compoſitions had to Greek and Roman dramas, or to the genuine tragedies of the moderns.

QUINCE Tree, in *Gardening*, the common name of a tree of the apple kind. See Pyrus *Cydonia*.

Quince, in the *Materia Medica*. The fruit of the quince is aſtringent and ſtomachic; and its expreſſed juice, in ſmall quantities, as a ſpoonful or two, is of conſiderable ſervice in nauſeæ, vomitings, nidorous eructations, and ſome kinds of alvine fluxes. This juice was formerly ordered in the Lond. Pharm. to be made into a ſyrup, called " ſyrupus cydoniarum," or ſyrup of quinces, prepared by digeſting three pints of the depurated juice with a drachm of cinnamon, half a drachm of ginger, and half a drachm of cloves, on warm aſhes,

aſhes, for ſix hours, then adding a pint of red port, and diſſolving in the ſtrained liquor nine pounds of ſugar. But the only preparation of the quince which it now directs is, a mucilage of the ſeeds, made by boiling a drachm of the ſeeds in eight ounces of water, till it acquires a proper conſiſtence. This has been recommended in aphthous affections, and excoriations of the mouth and fauces: however, though it may be a more pleaſant mucilage, it is certainly leſs efficacious than that of the ſimple quince. Lewis and Woodville.

An uſeful reſtringent marmalade is made by boiling the juice with fine ſugar to a due conſiſtence, in the proportion commonly of three pints to a pound. The juice of quinces becomes richer, by keeping them for ſome time, after they are gathered, in a dry airy place.

Quince *Iſland*, in *Geography*, a ſmall iſland near the S.W. coaſt of Ireland, and county of Cork; five miles W. of Gally-Head.

QUINCHAC, a ſmall iſland in the Pacific ocean, between the iſland of Chiloe and the continent of Chili. S. lat. 43° 30'.

QUINCHAMALA, in *Botany*, altered by Willdenow, one can ſcarcely ſee with what reaſon or advantage, from *Quinchamalium* of Juſſieu, a barbarous and totally exceptionable name, taken from the Peruvian *Quinchamali*.—Willd. Sp. Pl. v. 1. 1217. Mart. Mill. Dict. v. 4. Juſſ. 75. Lamarck Illuſtr. t. 142.—Claſs and order, *Pentandria Monogynia*. Nat. Ord. *Elæagni*, Juſſ. Rather perhaps *Rubiaceæ*.

Gen. Ch. *Cal.* Perianth ſuperior, of one leaf, in four deep, ovate, unequal ſegments, one larger than the reſt. *Cor.* of one petal; tube funnel-ſhaped, much longer than the calyx, quadrangular, curved; limb in five lanceolate, acute, ſpreading ſegments. *Stam.* Filaments five, very ſhort, inſerted into the top of the tube; anthers oblong, the length of the limb. *Piſt.* Germen roundiſh; ſtyle thread-ſhaped, the length of the tube; ſtigma capitate. *Peric.* Berry (rather drupa) roundiſh. *Seed* ſolitary.

Eſſ. Ch. Calyx in four unequal ſegments, ſuperior. Corolla funnel-ſhaped, five-cleft. Stigma capitate, undivided. Drupa dry.

1. Q. *chilenſis*. Willd. n. 1. (Quinchamali lini folio; Feuill. Plantes Médécinales, 57. t. 44.)—Gathered by Feuillée on the mountains of Chili, and by Dombey, among ſtones on the hills about Lima, flowering in December and January. The *root* is annual, compoſed of a few ſimple yellow fibres. *Stems* ſeveral, proſtrate, ſimple, round, leafy, from four to ſix inches long. *Leaves* ſcattered, ſeſſile, linear, entire, fleſhy, ſmooth, blunt iſh with a ſmall point. *Flowers* in ſimple, terminal, ſolitary, denſe ſpikes. *Corolla* green externally, of a ſaffron yellow within. *Seed* round, unconnected.—We have taken the generic character, and the deſcription, from Dombey's manuſcript, compared with one of his original ſpecimens. The *fruit* appears to be a *drupa*, (he terms it *bacca*,) the ſize of hemp-ſeed, whoſe coat becomes coriaceous by drying, and ſeparates, along with the permanent calyx at its ſummit, from the *ſeed*, or *nucleus*, to whoſe upper part the *corolla* remains attached. Juſſieu, Lamarck, and Willdenow, having formed their ideas from dried ſpecimens only, take the coat of the *drupa* for an inferior *calyx*, and the firſt of theſe writers conceives the *flower* to conſiſt of a ſuperior inner *calyx*, to which he was led by an idea of the affinity of this genus to *Theſium*. Willdenow, not adverting to any ſuch affinity, terms the inner calyx of Juſſieu, a *corolla*, which agrees with the opinion of Dombey, the only botaniſt who has examined the living plant, and by whoſe authority we are led to conſider the true *calyx* as ſuperior. If we are right, this genus will belong to the natural order of *Rubiaceæ*, notwithſtanding its ſolitary *ſeed*. Dombey expreſsly ſays it is akin to *Morinda*.

Feuillée relates, that the Indians take a decoction of this plant for internal diſorders, eſpecially when they believe themſelves labouring under an internal abſceſs, of which there is no external appearance. The decoction, taken warm, is ſuppoſed to break the abſceſs, and to cauſe an evacuation of its contents by the uſual paſſages.

QUINCUNX, *Quinque unciæ*, denotes a thing that conſiſts of five twelfth parts of another.

Quincunx, in *Gardening*, is the name of a form of planting in which trees are planted by fives, four of them forming a ſquare, and the fifth placed in the middle, thus,

* *
*
* *

and which may be repeated over and over again in one continued plantation, with as many trees in ſeveral ranges as may be proper. It was formerly a faſhionable mode of planting groves and other regular plantations, but is now leſs common. It is ſeen more fully below:

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Something of this mode of arrangement has always a good effect in the diſpoſition of ſhrubby plants, &c. though not in the regular order of it, but ſomething nearly ſo, which gives the ſhrubs a greater ſcope of growth, and ſhews them to greater advantage. It is likewiſe a mode of planting that is proper in the kitchen-garden, in tranſplanting many kinds of eſculent plants; ſuch as lettuces, endive, ſtrawberries, and even all the cabbage kinds, and many other plants, which gives them a greater ſcope to grow than if planted exactly ſquare at the ſame diſtance from each other.

It is of this kind of quincunx that Cicero ſpeaks, in his Cato Major; and Quintilian, lib. viii. cap. 3.

The modern quincunces, Daviler obſerves, are made like thoſe of the ancients, except for the fifth tree, which is now generally diſuſed; ſo that, being as it were netted, and their alleys viewed by the ſide of the rectangle, they formed a perfect chequer.

Quincunx, in *Aſtronomy*, &c. denotes a poſition, or aſpect of the planets when diſtant from each other a hundred and fifty degrees, or five ſigns.

QUINCY, in *Geography*, a town of France, in the department of the Seine and Marne; ſix miles S.W. of Meaux.

Quincy, a poſt-town of America, in Norfolk county, Maſſachuſetts, taken from Braintree; 10 miles S. of Boſton. It contains 1281 inhabitants, moſt of whom are farmers; but large quantities of ſhoes and boots are manufactured for exportation. The town has an epiſcopal and congregational church.

QUINDECAGON, in *Geometry*, a plain figure which has fifteen ſides and fifteen angles.

The word is formed ſomewhat irregularly, from the Latin *quinque*, *five*, and the Greek δεκα, *ten*, and γωνια, *angle*. *Pentedecagon* would be a more regular term.

If the ſides be all equal, it is a regular quindecagon.

Euclid ſhews how to inſcribe it in a circle, Prop. xvi. lib. 4. And the ſide of a regular quindecagon ſo deſcribed, is equal in power to the half-difference between the ſide of the equilateral triangle, and ſide of the pentagon; and alſo to the difference of the perpendiculars let fall on both ſides, taken together.

QUINDECIM VIR, XV. VIR. a Roman magiſtrate, who

who had fourteen colleagues joined with him in the ſame function.

Under Tarquin the Proud, there were firſt two magiſtrates erected to take care of the ſacrifices to be performed; theſe were called *duumviri*. Their number, at length, grew to ten, and then they were called *decemviri*. In the time of Cicero it had reached to fifteen, when they aſſumed the name of *quindecimviri:* and though their number grew to forty afterward, yet Servius obſerves, on the ſixth of the Æneid, that their name never after changed, but they ſtill continued to be called quindecimviri.

They were the perſons who examined the Sibyls' books, and were the interpreters of them; yet they never did this but by expreſs order of the ſenate, declared by a ſenatus conſultum. They alſo preſided at the ſacrifices, and all other extraordinary ceremonies of religion.

On medals, a dolphin joined with a tripod marks the prieſthood of the quindecimviri; who, to publiſh their ſolemn ſacrifices, uſed on the eve of them to carry a dolphin at the end of a pole throughout the city; that fiſh being eſteemed ſacred to Apollo, as the crow was among birds.

QUINEPAUGE, or *Eaſt River*, in *Geography*, a river of America, in Connecticut, which runs a ſoutherly courſe into the N.E. corner of New Haven harbour.

QUINGEY, a town of France, in the department of the Doubs, and chief place of a canton, in the diſtrict of Beſançon; nine miles S.W. of Beſançon. The place contains 1079, and the canton 11,734 inhabitants, on a territory of 272½ kiliometres, in 36 communes. N. lat. 46° 6′. E. long. 5° 57′.

QUINGOMBO, in *Botany*, the name given by the people of Congo to a ſpecies of ketmia, diſtinguiſhed by M. Tournefort by the name of the ketmia Braſilienſis folio ficus, fructu pyramidoto ſulcato, the fig-leaved Braſilian ketmia, with a pyramidal ſulcated fruit.

QUINISDAL, in *Geography*, a town of Norway, in the province of Chriſtianſand; 35 miles W.N.W. of Chriſtianſand.

QUINI-SEXTUM, in *Eccleſiaſtical Hiſtory*, denotes a council held at Conſtantinople in the year 692; called alſo the council in Trullo, and by the Greeks *Penthecte, q. d. five-ſixth;* as intimating that it was only a ſupplement of the two preceding councils. Though, in propriety, Fleury obſerves, it was a council itſelf.

Marſhall obſerves, that the fifth and ſixth general councils having made no canons relating to the external celebration of divine worſhip, the government of the church, and the lives and manners of Chriſtians, the Orientals judged it neceſſary to ſupply that defect by this; ſo that the 102 canons falſely attributed to thoſe, were in reality made here. See TRULLUM.

QUINNET, in *Mining*, the name of a tool uſed in the cleaving rocks by means of gunpowder. This is a ſort of wedge fitted to the flat ſide of what is called the *gun;* that is, a cylindric piece of iron, only flattened in one part to receive this, and drilled through. When a proper hole has been made in the rock by the borer, the powder is put in, and then the orifice being ſtopped by the gun, and that wedged in by this quinnet, the powder being fired by a train communicating with the hole drilled through the guns, exerts all its force on the rock, and ſplits it in ſeveral directions at one exploſion. Phil. Tranſ. N° 167.

QUINOLA, in *Geography*, a town of Mexico, in the province of Culiacan; 50 miles S.E. of Culiacan.

QUINQUAGENARIUS, among the Romans, was an officer in the army, who had the command of a company of fifty men.

QUINQUAGENARIUS was alſo an officer of policy, who had the inſpection of fifty houſes, or families.

And in the ancient monaſteries, quinquagenarius was a ſuperior who had fifty monks under his guidance.

QUINQUAGESIMA-SUNDAY, SHROVE-SUNDAY. It is thus called, as being about the fiftieth day before Eaſter. Anciently they uſed Quinquageſima for Whitſunday, and for the fifty days betwen Eaſter and Whitſunday; but to diſtinguiſh this Quinquageſima from that before Eaſter, it was called the Paſchal Quinquageſima.

QUINQUANGULAR LEAF. See LEAF.

QUINQUANNION, QUINQUENNIUM, in the *French Cuſtoms*, a reſpite of five years, which inſolvent debtors formerly obtained by virtue of the king's letters, to have time for the payment of their debts.

When the thing intended was only to prevent the ſale of their effects at an under-value, the term of one year was ordinarily granted, and this was called the benefit of *annion*.

But when the debtor would avoid the ſurrendering of his effects, upon proving that he was reduced by poverty, loſſes, &c. to make uſe of this expedient, the term of five years was granted, and called the benefit of *quinquannion*.

QUINQUATRIA, in *Antiquity*, a name given to the feaſts of Minerva, otherwiſe called Panathenæa.

Some think they were termed quinquatria, becauſe they laſted five days; but others, with more reaſon, think it was becauſe they fell out five days after the ides of the month.

QUINQUE PORTUS, the five cinque ports.

"Servitium quod barones quinque portuum præſcriptorum recognoſcunt facere ad ſummonitionem regis per annum, ſi contigerit per 15 dies ad cuſtum eorum proprium; ita quod primus dies computatur a die quo vela navium erexerunt, uſque partes ad quas tendere debent, vel ulterius, quamdiu rex voluerit ad cuſtum ejus." Thorn.

QUINQUEFOLIUM, in *Botany*, Cinquefoil, the old name of the Linnæan genus *Potentilla*, many, but by no means a majority, of whoſe ſpecies have five leaflets on a ſtalk. Gærtner, who, like many others, was diſcontented with *Potentilla*, ſubſtituted the word *Fentaphyllum*. See POTENTILLA.

QUINQUEMPOIX, in *Geography*, a town of France, in the department of the Lower Seine; ſeven miles N. of Rouen.

QUINQUENNALIA, in *Antiquity*, games, or feaſts founded at Tyre, celebrated every five years, in honour of the deified emperors.

The quinquennalia began to be expreſſed on medals about the middle of the third century. F. Pagi produces a medal whereon are engraven thoſe of the emperor Poſthumus; they are not found on any medals of his predeceſſors.

QUINQUENNALIS, a magiſtrate in the colonies, and municipal cities of the Roman commonwealth; much the ſame with ædile at Rome.

They were not thus called from their continuing in their office five years; but becauſe they were elected every fifth year, to preſide at the cenſus, and to receive the declaration each citizen made of his effects.

QUINQUENNES, in ſome old *Hiſtorians*, a name given to a certain people of India, among whom the women began to bear children at five years old, and ſeldom lived to more than eight years. Pliny gives us this account; and Solinus, who repeats it from him, increaſes the miracle by telling us, that

that they were a nation of women who had no men among them.

QUINQUEPARTITE LEAF, among *Botaniſts*. See LEAF.

QUINQUEPRIMI, among the Romans, the five principal men in the ſenate of every municipal town.

QUINQUEREMIS, in the *Naval Architecture of the Ancients*, a name given to a galley which had five rows of oars. They divided their veſſels in general into monocrota and polycrota: the former had only one tier of rowers; the latter had ſeveral tiers of them, from two or three, up to twenty, thirty, or even forty; for ſuch a veſſel we have an account of in the time of Philopater, which required no leſs than four thouſand men to row it. See POLYCROTA.

QUINQUERTIONES, among the Romans, an appellation given to thoſe who had gained the victory in the *quinquertium*, or *pentathlon*.

QUINQUERTIUM was the ſame with the Grecian pentathlon, comprehending the five exerciſes of running, leaping, throwing, darting, and wreſtling. See PENTATHLON.

QUINQUE VIR, frequently wrote V. VIR, a Roman magiſtrate, who had four colleagues joined with him in the ſame function.

There were various kinds of officers thus denominated. Pomponius the lawyer mentions quinqueviri on this and on that ſide of the Tiber, eſtabliſhed for the adminiſtration of juſtice in the night-time, in lieu of the ordinary magiſtrates, who were not judged proper to run up and down the ſtreets in the dark.

Roſinus tells us, that they were ſometimes the quinqueviri who conducted the colonies, and divided the lands aſſigned to them among the ſeveral families.

Sometimes the epulones were five in number; in which caſe they were called quinqueviri. See EPULO.

QUINQUEVIRI MONETARII, were officers firſt erected under the conſulate of Valerius Poplicola, to moderate the exceſſive uſury, or intereſt, which creditors or bankers uſed to exact from the people.

QUINQUINA. See CORTEX *Peruvianus*.

QUINSEY, ſometimes written *Quinanſey*, and *Quinzy*, in *Medicine*, a corruption of the French word *eſquinancie*, which again is derived from the Greek, *cynanche*, κυνάγχη, ſignifying ſore-throat, or inflammation and tumour of the internal fauces. The term is applied generally to inflammations of the throat, but more particularly to the acute inflammation of the tonſils. A tonſil, enlarged from inflammation, is alſo emphatically called a *quinſey*. See CYNANCHE *tonſillaris*.

QUINSEY, among domeſtic animals of the live-ſtock ſort, is an affection about the throat and breaſt, which often attacks them, and which is very obſtinate and troubleſome. In horſes it is uſually called anticor.

QUINSIEME, or QUINZIEME, in our old *Law Books*. See FIFTEENTH.

QUINSIGAMOND, or *Long Pond*, in *Geography*, a lake of Maſſachuſetts, between Worceſter and Shrewſbury. This is a beautiful lake, in form of a creſcent, about five miles long, and from 60 to 100 rods broad. It is interſected with a number of iſlets, one of which is upwards of 200 acres in extent.

QUINSON, a town of France, in the department of the Lower Alps; 25 miles S.S.W. of Digne.

QUINT, a ſequence of five cards of the ſame colour. See SEQUENCE.

QUINTA, Ital. QUINTE, Fr. (See FIFTH and DIAPENTE.) The chord of the $\frac{6}{5}$ in thorough-baſe is reſolved two ways: firſt, by the baſe riſing one note, and the loweſt treble note deſcending; ſecondly, by the higheſt note of the chord riſing, and the loweſt remaining ſtationary, when the diſcord is reſolved upwards. This is what Rameau calls *le double emploi de la diſſonance*.

QUINTA *Pars*, in old madrigals, a 5th vocal part, compoſed of the refuſe of the other four.

QUINTA *Eſſentia*. See QUINTESSENCE.

QUINTAIN, QUINTANA, in *Ancient Cuſtoms*, a poſt, or pillar, driven into the ground, with a buckler fixed to it, for the performance of military exerciſes on horſeback, the throwing of darts, breaking of lances, &c.

Matth. Paris deſcribes the quintain as a kind of mark, formed like a man from the navel upwards, holding a ſhield in his left hand, and in his right a ſword or ſtick; the whole ſo fitted as to turn round on its foot, and ſo as that a cavalier running a-tilt againſt it with a lance, if he hit it in the breaſt, it wiſked round, and, unleſs he were very dextrous, ſtruck him with the ſword held in the other hand.

In other places, at the top of a poſt, was erected a ſlender beam fitted to turn round a ſpindle; at one of whoſe ends was a ſlope or flat board, and at the other a bag of ſand or dirt. The ſport was, with a long ſtaff, or wooden lance, to ride a-tilt at the board, and to be either ſo ſkilful or lucky to eſcape the blow of the ſand-bag.

This ſome take to be the ſame with the *arietum levatio*, frequently prohibited in our old ſynods and epiſcopal conſtitutions.

The cuſtom is ſtill retained in Shropſhire, and ſome other counties, among the nuptial ſolemnities. He that breaks the moſt poles againſt the quintain, has the prize; which was anciently a peacock, but is now a garland.

Some derive the word from an ancient game called *quintus*; others from a man of the name of Quintus.

The vallus and palus, mentioned in Cæſar, are taken, by Vigenere, for a kind of quintain, or wooden man, fixed up as an adverſary, or man of ſtraw, to prove one's dexterity againſt.

Mention is made of this exerciſe in the Code, De Aleatoribus, and in the Paratitles of Cujas on the ſame. Juvenal ſpeaks of women engaging in it:

"Aut quis non vidit vulnera pali? &c."

QUINTAIN was alſo a right which the lord had to oblige all the millers, watermen, and other young people unmarried, to come before his caſtle every three years, and break ſeveral lances or poles againſt a poſt, or wooden man, for his diverſion.

QUINTAL, in *Commerce*, the weight of a hundred pounds.

The quintal admits of ſome difference in different places, according as the pound conſiſts of more or fewer ounces, and as the ounce is lighter or heavier.

Thus, *e. gr.* the Paris quintal, or hundred, in the old ſyſtem, yields 123lbs. at Montpelier; and the Montpelier hundred only 81lbs. 9 oz. 18 gr. French poids de marc, or 88lbs. avoirdupois nearly. The quintal of Conſtantinople is eſteemed the heavieſt of all thoſe uſed in the Levant: it contains 44 okes, or 100 rottoli; the oke being 4 yuſdromes or chequees, or 400 drachms, and the rottolo 176 drachms. The quintal, or kintal, of cotton yarn is 45 okes. The quintal, or cantaro, weighs about 123$\frac{3}{4}$lbs. avoirdupois, and the oke 2lbs. 13 oz.; the rottolo, 19$\frac{3}{4}$ oz. and the chequee, 11$\frac{1}{4}$ oz. avoirdupois. The quintal is equal to 112$\frac{3}{4}$lbs. of Amſterdam; 124lbs. of Venice; and 160 of Leghorn. The quintal of Liſbon contains 4 arrobas, the arroba 32 pounds, the pound, libra, or arrate, 2 marks, or 16 ounces; the ounce, 8 outavas: 13$\frac{1}{2}$ quintals make a ton. The

pound of Liſbon weighs 9552 Dutch aſes, 7084$\frac{3}{4}$ grains Engliſh troy weight; and therefore 83lbs. of Liſbon = 84lbs. avoirdupois weight.

The Engliſh quintal uſually conſiſts of 112lbs. avoirdupois, and is divided into four quarters.

QUINTAL was alſo formerly uſed for a weight of lead, iron, or other common metal, uſually equal to a hundred pounds, at ſix ſcore to the hundred.

QUINTE', *Iſle de*, in *Geography*, an iſle in lake Ontario, Upper Canada, which lies cloſe off the ſhore of Ameliaſburg, and oppoſite the W. point that forms Sandy bay.

QUINTE, in *French Muſic*, is the name of the inſtrumental tenor part in full pieces, uſually written in the mezzo ſoprano clef on the ſecond line. All the inſtrumental tenor or alto viola parts, in Purcell's time, were written in this clef, as may be ſeen in his overtures and act-tunes. This was an imitation of France, where all the tenor parts in Lulli and Rameau's operas are in the mezzo ſoprano clef.

QUINTELLO, Ital. QUINQUE, Fr. a vocal or inſtrumental compoſition in five parts, dialogued, and generally *a parte equale*. The inſtrumental quintets of Boecherini and Mozart are ſublime productions: there is, perhaps, no inſtrumental muſic in which more genius and abilities are manifeſt, than in the quintets of theſe great maſters.

QUINTENAR, EL, in *Geography*, a town of Spain, in New Caſtile; 37 miles S. of Hueta.

QUINTER, QUINTOIER, Fr. in the firſt attempts at harmony, was counterpoint in a ſeries of 5ths, any two of which, in aftertimes, would ruin for ever the reputation of a compoſer.

QUINTESSENCE, *quinta eſſentia*, in the old *Chemiſtry*, properly denoted the fifth eſſence, or the reſult of five ſucceſſive diſtillations. The term, now obſolete, was uſed to expreſs the higheſt degree of rectification to which any ſubſtance can be brought. It alſo ſignified a preparation conſiſting of the eſſential oil of ſome vegetable ſubſtance, mixed and incorporated with ſpirit of wine.

Thus, on a proper quantity, *e. gr.* of eſſential oil of fennel, pouring twelve times the quantity of pure alcohol prepared *per ſe*, they inſtantly unite into one ſimilar liquor, which is the quinteſſence of that plant.

The ancients were perfectly unacquainted with the method of diſſolving oil in ſpirit of wine; and even ſome of the moderns have queſtioned its reality: but the certainty of the thing is eaſily proved, from the inſtance above, and from a thouſand others.

If ſuch quinteſſence be ſeveral times digeſted, cohobated, &c. the oil will at length be broken ſo fine, as, like the ſpirit itſelf, perfectly to mix with water; which is one of the moſt extraordinary effects in all chemiſtry.

After the like manner is made a quinteſſence of camphor, by only pouring on it ſpirit of wine.

Quinteſſences, thus prepared, were ſuppoſed to have great medicinal virtues; on account of the pure and potent ingredients uſed in their compoſition; which retain, in a great degree, all the virtues of the plants they are procured from: and hence their denomination.

Boerhaave thinks, they might properly be called vegetable ſulphurs made potable, and raiſed to their utmoſt degree of power and efficacy.

Dry quinteſſences may be made from the liquid ones, by adding to them ſome more eſſential oil of the ſame vegetable from whence the liquid quinteſſence was procured, with a little ſugar, all mixed together, and diſtilled, by a very gentle heat, till all the moiſture is come over; the matter remaining is then a dry quinteſſence.

This form was deemed principally uſeful for travellers, ſailors, &c. inaſmuch as it renders the quinteſſence portable; ſo that the quantity, *e. gr.* of a pin's point, ſhall be an efficacious medicine.

QUINTESSENCE, in *Alchemy*, is a myſterious term, ſignifying the fifth, or laſt and higheſt eſſence, or power, of a natural body.

This is ſuppoſed to be, as it were, the ſoul drawn from the groſs body and its four elements, by a moſt perfect diſtillation; and, by means of which, the thing is ſaid to be ſpiritualized, *i. e.* rendered exceedingly pure, ſpirituous, and, as it were, incorruptible.

The ancients, who allowed nothing to be real but what has a body, would have the ſoul of man to be a fifth element, a kind of quinteſſence without a name, unknown here below, indiviſible, immoveable, all celeſtial, and divine. Fenelon.

QUINTESSENCE *of the Elements*, is the hermetical mercury.

QUINTESSENCE *of Wine*, a term uſed by Glauber to expreſs an eſſential oil of wine, which he directs to be made by a careful diſtillation; and which he is very fond of, as having a power to meliorate, improve, and even to ſpecificate the poorer wines into the nature of thoſe from which it was obtained.

This is one of the ſchemes of Glauber, generally eſteemed an impracticable one, though very plauſible in theory: but though in general there is a diſagreeable flavour in the quinteſſence drawn after his method, which is different from the true flavour of the wine, and ſpoils the liquor it is added to; yet, by proper care, there is a poſſibility of ſucceeding ſo far as to render this extraneous flavour almoſt imperceptible, and produce an oil that will mend poor wines extremely, and give a truly vinous flavour to ſuch as are in themſelves taſteleſs. But whatever may be done by this method, may alſo be done with much more certainty, and much leſs trouble, by the concentration of wines by freezing. This may be eaſily practiſed in the wine countries; and by this means Burgundy, Champaigne, and other the moſt valuable wines, may be reduced into thick extracts and robs, by the means of which wines may be made in England; a very ſmall quantity of theſe concentrated wines being ſufficient to convert the whole of any of the poor taſteleſs and inſipid wines, which are of themſelves of little or no value, into the very wine from which the rob was made; and that in ſuch perfection, that the niceſt judge cannot find out the difference.

Theſe robs of wine, made and preſerved upon the ſpot, would alſo be of infinite uſe in the wine countries, as they might be kept to improve the wines of bad years. Stahl, De Concentr. Vin. Shaw's Chem. Eſſ.

QUINT-EXACT, in old *Law Books*, the laſt call of the defendant ſued to an outlawry. If he appear not to it, he is, by the judgment of the coroners, returned outlawed, if a feme, waived.

QUINTI, *Bay of*, in *Geography*, a bay and harbour in the N.E. part of lake Ontario, at the mouth of the Trent; formed by a large peninſula, conſiſting of the townſhips of Ameliaſburg, Sophiaſburg, and Maryſburg, extending eaſterly from an iſthmus, where is a portage at the head, or W. end of the bay, to Point Pleaſant, the eaſternmoſt extremity of the peninſula, oppoſite to Amherſt iſland. The river Trent diſcharges itſelf into the head of the bay, weſtward of the portage, and ſupplies it with the waters of the Rice lake. Weſtward of the portage in lake Ontario, is the harbour of Preſque Iſle de Quinté, now called Newcaſtle. The fertility of the ſoil about the bay of Quinté is generally allowed. The land is rich and eaſily wrought, and produces ſeveral crops without manure; 25 buſhels of wheat being often

often produced from an acre. The timber, like that of the other parts of the province, conſiſts of oak, elm, hiccory, maple, &c. The bay is narrow throughout, and about 50 miles long, through which diſtance it is navigable for the ſmall veſſels that are uſed on the lakes. It abounds with wild fowl, and various kinds of fiſh. The river Trent affords a ſalmon fiſhery. In paſſing from the head of the bay of Quinté into lake Ontario, you croſs a ſhort portage, in front of the townſhip of Murray, being the iſthmus between it and the peninſula of Prince Edward. At the end of the portage, and before you enter lake Ontario, is a ſmall but very beautiful lake, having very good land on its banks. To the northward of this portage it has been propoſed to make a canal for connecting the waters of the bay with thoſe of the lake. A little to the weſtward of the portage and propoſed canal, is the harbour of Newcaſtle, a ſituation well ſuited for commerce and protection, and ſheltered from all winds. A knoll on the peninſula affords a healthy ſcite for the town.

QUINTILE, Quintilis, in *Aſtronomy*, an aſpect of the planets, when they are ſeventy-two degrees diſtant from one another, or a fifth part of the zodiac.

QUINTILIAN, Marcus Fabius, in *Biography*, a celebrated teacher of eloquence, was born about the year 42 of the Chriſtian era, during the reign of the emperor Claudius. He is ſuppoſed to have deſcended from a family originally Spaniſh, but that his father, or grandfather, had ſettled in Rome. The place of his birth is not known, but it ſeems certain that he was educated in that capital, where he ſtudied rhetoric under Domitius Afer, a celebrated orator. He opened a ſchool at Rome, and was the firſt who obtained a ſalary from the ſtate as a public teacher. After he had remained twenty years in this laborious employment, and obtained the applauſe of the moſt illuſtrious Romans, not merely as a preceptor, but as a pleader at the bar, Quintilian retired to enjoy the fruits of his labours and induſtry. In his retirement he aſſiduouſly devoted his time to the ſtudy of literature, and wrote a treatiſe on the "Cauſes of the Corruption of Eloquence." Some time after, he wrote his "Inſtitutiones Oratoriæ," the moſt perfect and complete ſyſtem of oratory extant. It is, in truth, one of the moſt valuable remains of antiquity. It was compoſed for the uſe of his ſon, whoſe early death he had occaſion to deplore, and is an inſtitute for the education of an orator, whom he takes up from the cradle, and conducts through all the periods of inſtruction to the exerciſe of his proper art. It accordingly contains many excellent precepts with reſpect to education in general, eſpecially the early parts of it, which are applicable in all times and countries, as being founded on the nature of the mind. The ſtyle of Quintilian is ſaid, by critics, to exhibit tokens of the deterioration of the Latin tongue; but, on the other hand, it muſt be obſerved, that every deviation from the uſage of the Auguſtan age has been too readily regarded as a depravation. Quintilian was appointed preceptor to the two young princes whom Domitian deſtined for his ſucceſſors on the throne; but the celebrity which the rhetorician received from the favours and attention of the emperor, and from the ſucceſs which his writings met with in the world, were embittered by the loſs of his wife, and of his two ſons, one of whom he deſcribes as a prodigy of early excellence. It is ſaid that Quintilian was poor in his retirement, and that his indigence was relieved by the liberality of his pupil, Pliny the younger. He is ſuppoſed to have died about the year 95. His "Inſtitutiones" were diſcovered in the year 1415, in an old tower of a monaſtery at St. Gall, by Poggio Bracchiolini. The treatiſe on the "Cauſes and Corruption of Eloquence" has not come down to us. The name of Quintilian is affixed to certain "Declamations," of which there are 19 of moderate length; but as the ſtyle, method, and manner, are totally different from the rules laid down in the "Inſtitutiones," no good judges attribute them to the name of Quintilian. Of the editions of Quintilian ſome of the moſt valuable are thoſe of Geſner, 4to. Gotting. 1738; of Lug. Batavorum, 8vo. cum notis variorum, 1665; of Gibſon, 4to. Oxon. 1693; and that of Rollin, re-publiſhed in London in 1792. There is an Engliſh tranſlation by Mr. Guthrie.

QUINTILIANS, Quintiliani, in *Eccleſiaſtical Hiſtory*, a ſect of ancient heretics, the ſame with the Pepuzians; thus called from their propheteſs Quintilia.

In this ſect, the women were admitted to perform the ſacerdotal and epiſcopal functions; grounding their practice on that paſſage of St. Paul to the Galatians, where he ſays, "That in Chriſt there is no diſtinction of males and females."

In their aſſemblies, it was uſual to ſee the virgins enter in white robes, perſonating the propheteſſes. The Quintilians bore ſome reſemblance to the modern Quakers.

QUINTILIS, in *Chronology*. See July.

QUINTIN, or Quint, in *Commerce*. See Quentin.

Quintin, in *Geography*, a town of France, in the department of the Northern Coaſts, and chief place of a canton, in the diſtrict of St. Brieuc; nine miles S.W. of St. Brieuc. The place contains 3976, and the canton 12,510 inhabitants, on a territory of 147½ kiliometres, in eight communes.

QUINTINIE, John de la, in *Biography*, famous for his ſkill in horticulture, was born at Poictiers in 1626. He received a learned education, and was brought up to the profeſſion of the law, in which he gained reputation as a pleader at the bar. A paſſion for agricultural knowledge led him to ſtudy, with great attention, all the authors, ancient and modern, upon that topic; and on a viſit to Italy as tutor to a youth, he made great additions to his knowledge from actual obſervation. On his return he devoted himſelf almoſt entirely to experiments on the culture of trees and plants, and made many diſcoveries which greatly improved the art of gardening. He was the firſt perſon who laid down juſt principles of the art of pruning fruit-trees. He alſo remarked that a tranſplanted tree grew only by the new roots which it threw out, and that the old fibres were uſeleſs, and ought to be cut off. It does not appear at what time he began to follow gardening as a profeſſion, but he had certainly acquired a high degree of reputation in it when he was invited to England by Charles II. who offered him a conſiderable penſion to engage him in his ſervice. He twice viſited London, and a paper of his was publiſhed in the Philoſophical Tranſactions, on the culture of melons. He was made, by Lewis XIV., director-general of the gardens in all the royal palaces. In 1690 he publiſhed "Inſtructions pour les Jardins Fruitiers et Potagers," which obtained a high degree of popularity, was frequently reprinted, and was tranſlated into ſeveral modern languages. The laſt edition was entitled "Parfait Jardinier," in two vols. 4to. The author died at Paris in the year 1700.

QUINTO, in *Geography*, a town of Spain, in Arragon; 20 miles S.E. of Saragoſſa.

QUINTUS Calaber, in *Biography*, a Greek poet, who wrote a ſupplement to Homer's Iliad, in 14 books, in which a relation is given of the Trojan war from the death of Hector to the deſtruction of Troy. He is ſuppoſed, from the ſtyle of his work, to have lived in the fifth century, but nothing certain can be collected concerning his perſon and country. His poem was firſt made known by

cardinal Beſſarion, who diſcovered it in St. Nicholas' church, near Otranto in Calabria; hence the author was named Quintus *Calaber*. It was publiſhed at Venice by Aldus, but there is no date attached to the title page.

QUINTUS CURTIUS. See CURTIUS.

QUINTUS *Femoris*, in *Anatomy*, a name given by Fallopius and many others to one of the muſcles of the thigh, now called the pſoas magnus.

QUINTUS *Oculorum*, a name given by Veſalius and ſome others to one of the muſcles of the eyes, more expreſſively called by others obliquus ſuperior oculi, and opifex circumgyrationis oculi.

QUINVA, in *Botany*, a name by which ſome authors have called the amaranth, or cockſcomb.

QUINZANO, in *Geography*, a town of Italy; 18 miles S.W. of Breſcia.

QUINZIEME, Fr. in *Muſic*, the double octave, above or below any ſound (ſee FIFTEENTH); which is the name of a ſtop in our organs, equidiſtant from the diapaſon.

QUIOPELA, in *Zoology*. See VIVERRA *Mungo*.

QUIPOS, in *Literary Hiſtory*, a name given to knots on cords of different colours, in Peru, which imperfectly ſupplied the place of writing. This device was adopted, as it has been ſaid, for rendering calculation more expeditious and accurate. The various colours denoted different objects, and each knot expreſſed a diſtinct number. Thus an account was taken, and a kind of regiſter kept of the inhabitants in each province, or of the ſeveral productions collected there for public uſe. But as by theſe knots, however varied or combined, no moral or abſtract idea, no operation or quality of the mind could be repreſented, they contributed little towards preſerving the memory of ancient events and inſtitutions. The Mexican paintings and ſymbols, rude as they were, conveyed more knowledge of remote tranſactions than the Peruvians could derive from their boaſted quipos. If, indeed, the latter had been of more extenſive uſe, and better adapted to ſupply the place of written records, they periſhed ſo generally, together with other monuments of Peruvian ingenuity, in the wreck occaſioned by the Spaniſh conqueſt, and the civil wars ſubſequent to it, that no acceſſion of light or knowledge is derived from them. Robertſon's Hiſt. Amer., vol. iii.

QUIQUI, in *Zoology*, a ſpecies of *Muſtela*; which ſee.

QUIRAZAI, or CURAPOA, in *Ornithology*. See CRAX *Alector*.

QUIRE *of Paper*, of the French *cahier*, the quantity of twenty-four or twenty-five ſheets.

QUIRICIA, a name given by ſome to the ſtone called *quiris* by the generality of writers.

QUIRICU, in *Geography*, a town of France, in the department of the Iſere; 12 miles E. of Ballay.

QUIRINACIUM OPIUM, in the *Materia Medica*, a name given by ſome to the gum we know by the name of aſſa fœtida.

QUIRINALIA, in *Antiquity*, feaſts celebrated, among the Romans, in honour of Romulus, who was called Quirinus. See QUIRITES.

The Quirinalia, called alſo *ſtultorum feriæ*, were held on the 13th of the calends of March, *i. e.* on our 17th of February.

QUIRINI, ANGIOLO-MARIA, in *Biography*, a learned cardinal, by deſcent a Venetian, was born in the year 1680. While young he entered into the order of the Benedictines of Monte Caſſino. At Florence he purſued a very extenſive courſe of ſtudy under ſeveral of the moſt eminent men in ſcience and literature of that age. Upon his entering a profeſſorſhip in his convent, he delivered an oration "De Moſſicæ Hiſtoriæ Preſtantia," which was printed. His ſtudies were interrupted ſome time, by an imagination that he was afflicted with a ſtone in his bladder; but the death of his phyſician, who fell a victim to a falſe impreſſion reſpecting his own caſe, freed him from his fancied complaint, and in the year 1710 he ſet out upon his literary travels. He viſited Germany, Holland, England, and France, making in the latter country an abode of more than two years, during the greateſt part of which time he reſided in the Benedictine abbey of St. Germain des Pres. In the courſe of his travels he formed an acquaintance with almoſt all the literary characters in thoſe countries, and viſited every object of learned curioſity, at the ſame time every where exciting a general eſteem of his talents, his induſtry, and his conduct. Upon his return to Italy he publiſhed a Diſſertation containing a Plan for a Hiſtory of Italy;—an Eſſay on the Hiſtory of Farfa, in the Duchy of Spoleto;—and an edition of the Office for Divine Service according to the Uſage of the ancient Greek Church. He was ſoon after created biſhop of Corfu, by pope Innocent XIII., a dignity which he filled in ſuch a manner as to inſpire the Greek ſeparatiſts with veneration for his perſon. His reſidence in Corfu was the cauſe of his compoſing a learned work, entitled "Primordia Corcyræ ex antiquiſſimis Monumentis illuſtrata," 4to. 1725. In the year 1727, Benedict XIII. raiſed Quirini to the cardinalate, after having nominated him to the biſhopric of Breſcia. His promotion to that ſee was followed by ſome publications relative to the literature of Breſcia. His attachment to the ſee of Rome was diſplayed by a life of pope Paul II. printed in 1740, the object of which was to defend the memory of that pontiff againſt the attacks of Platina. Soon after this he was appointed librarian to the Vatican; in this and other poſts he continued to ſerve the cauſe of literature. It was through his means that a new edition of the works of St. Ephrem was given in 6 vols. fol. in the Greek, Syriac, and Latin languages. He likewiſe edited the letters of cardinal Pole, written againſt the principles of the reformers. This prelate died, greatly regretted, at his epiſcopal reſidence, in 1755, at the age of 75. Though a vigorous champion of the papacy, he wrote with a ſpirit of candour and moderation, which obtained the applauſe of the Proteſtants themſelves. He was aſſociated to ſeveral literary ſocieties, among which were the academies of Peterſburg, Berlin, and Vienna, and the Inſtitute of Bologna. He enjoyed a large revenue, which he expended with munificence, on objects of charity and public ſplendour. At Rome he beautified the church of St. Mark, whence he derived his cardinal's title, and he contributed liberally to the fine Catholic church at Berlin. He laid the foundation, by a valuable gift of books, of a public library at Breſcia. His own ſelect and valuable library he preſented to the Vatican. His charities were numerous and extenſive, and he was indefatigable in performing his paſtoral duties, viſiting the alpine parts of his dioceſe in the moſt inclement ſeaſons. Beſides the works already mentioned, he publiſhed an account of his own life, and a narrative of his travels.

QUIRIQUING, in *Geography*, an iſland on the coaſt of Chili, near the entrance into the bay of Conception. S. lat. 36° 35'.

QUIRIS, *Quirinus lapis*, a name given, by the writers of the middle ages, to a ſtone famous among them for its imaginary virtues, but of which they have left us no deſcription.

QUIRISTER, CHORISTER, or *Choriſta*, a perſon appointed

pointed to ſing in the quire, or choir, of a cathedral. See ANTHEM, CHANTOR, and CHOIR.

QUIRITES, in *Antiquity*, an appellation given to the people of Rome, chiefly the common citizens, as diſtinguiſhed from the ſoldiery.

It took its riſe from the Curetes, the inhabitants of the Sabine town Cures. On this occaſion Romulus, and Tatius king of the Sabines, having united their two people, and their two ſtates, into one; upon Romulus's death and deification, the Sabines, outdoing the Romans in number, became maſters of the councils; and accordingly appointed, that Romulus ſhould be denominated Quirinus, from Cures, a city of the Sabines; or rather from Quirinus, the name of a god worſhipped in that city.

From the new Quirinus, all the people came afterwards to be called Quirites; unleſs we will ſuppoſe, that the ſame authority which denominated Romulus Quirinus, from Cures, did alſo denominate the people Quirites, immediately from the Curetes.

Some authors derive the word Quirinus from Curis; which, in the Sabine tongue, ſignified a pike, or halbert. Struvius adds, that Romulus was always painted with a pike in his hand.

Julius Cæſar, as Tacitus informs us, (Annal. i. 43.) appeaſed a ſedition by the uſe of this word *Quirites*, which oppoſed to *ſoldiers*, expreſſed contempt, and reduced the offenders to the leſs honourable condition of mere citizens. The emperor Alexander alſo applied it to the ſame purpoſe. See his biographical article.

QUIRK, in *Building*, a piece of ground taken out of any regular ground-plat, or floor.

Thus, if the ground-plat were ſquare, or oblong, and a piece be taken out of a corner, to make a court, or yard, &c. the piece is called a quirk.

QUIROGA, in *Geography*, a town of Spain, in Galicia; 24 miles N.E. of Orenſe.

QUIROS, CAPE, lies on the E. coaſt of the iſland of Eſpiritu Santo, in the South Pacific ocean. S. lat. 14° 56′ 8″. E. long. 167° 20′.

QUIRPELE, in *Zoology*, the name of a ſmall animal, called by ſome authors the *Indian ferret*, or *viverra Indica*, and by others *quil*. See VIVERRA *Mungo*.

Garcias and ſome authors give very remarkable accounts of the enmity this creature has to ſerpents of all kinds. They tell us, that when this little creature intends an attack upon one of theſe animals, it firſt prepares againſt danger, by gnawing a quantity of the root of the lignum colubrinum, or ſnake wood; and when it has thoroughly impregnated its ſaliva, it wets with it firſt its fore-feet, and with them daubs over its head and its whole body; and that thus prepared, it boldly attacks the ſnake, and never leaves off till it has killed it. Garcias aſſures us, that many of the Portugueſe have been eye-witneſſes of theſe combats.

It is probable enough, that this creature may attack a ſnake when thoroughly hungry, knowing its fleſh to be good food; but the ſtory of the antidote is to be ſuſpected. See ICHNEUMON.

QUIRPEN, in *Geography*, an iſland in the North Atlantic ocean, near the N. coaſt of Newfoundland. N. lat. 51° 40′. E. long. 52° 22′.

QUIRSWYCK, a town of Norway; 60 miles N.N.E. of Romſdal.

QUIS, in *Natural Hiſtory*, a kind of marcaſite of iron or copper, from which vitriol is drawn. It is more frequently called pyrites.

QUISBRO, in *Geography*, a town of Sweden, in Nericia; 12 miles S.W. of Orebro.

QUISCALA, in *Ornithology*, a ſpecies of *Gracula*; which ſee.

QUISIBI, in *Geography*, a town of Arabia, in the province of Oman; 180 miles W. of Julfar.

QUISIL AUREN, a town of Aſiatic Turkey, in Caramania; 15 miles W. of Cogni.

QUISONGALA ISLANDS, a cluſter of ſmall iſlands in the Indian ſea, near the coaſt of Africa. S. lat. 10° 40′.

QUISPICHANCHI, a juriſdiction in the dioceſe of Cuſco in Peru, beginning at the ſouth gates of Quito, and ſtretching from E. to W. about 20 leagues. The lands of this juriſdiction belong, in general, to the richer inhabitants of Cuſco, and produce plenty of wheat, maize, and fruits. Here are alſo manufactures of baize and coarſe woollen ſtuffs. Part of the juriſdiction borders on the foreſts inhabited by wild Indians, and produces great quantities of coca, or cacoa, an herb greatly uſed by the Indians working in the mines, and forming one of the principal branches of its commerce; the town lies 12 miles S. of Cuſco.

QUISQUALIS, in *Botany*, a name combined by Rumphius of *quis*, who, and *qualis*, what kind or manner, by which he intended to expreſs the ſingular variableneſs of the plant, as if nothing could be found like it.—Linn. Gen. 215. Schreb. 292. Willd. Sp. Pl. v. 2. 579. Mart. Mill. Dict. v. 4. Juſſ. 78. Lamarck Illuſtr. t. 357. —Claſs and order, *Decandria Monogynia*. Nat. Ord. *Vepreculæ*, Linn. *Thymelææ*, Juſſ.

Gen. Ch. *Cal.* Perianth inferior, tubular, thread-ſhaped, very long, deciduous, its border in five ſpreading ſegments. *Cor.* Petals five, inſerted into the mouth of the tube, ſeſſile, oblong, obtuſe, ſpreading, much larger than the ſegments of the calyx. *Stam.* Filaments ten, briſtle-ſhaped, inſerted into the tube of the calyx, five of them below the reſt; anthers oblong, in or above the mouth of the tube. *Piſt.* Germen ſuperior, ovate; ſtyle thread-ſhaped, longer than the ſtamens; ſtigma obtuſe, dilated. *Peric.* Drupa dry, with five unequal angles. *Seed.* Nut elliptic-oblong, pentagonal.

Eſſ. Ch. Calyx with a thread-ſhaped tube; five-cleft. Petals five. Drupa ſuperior, with five angles.

1. Q. *indica*. Linn. Sp. Pl. 556. (Quiſqualis; Rumph. Amb. v. 5. 71. t. 38. Q. pubeſcens; Burm. Ind. 104. t. 35. f. 2, and Q. glabra; t. 28. f. 2.)—Native of Java, and the Molucca iſles; naturalized by Rumphius in Amboyna. The *ſtem* is ſhrubby, at firſt low and ſtumpy, but ſubſequently throwing out long trailing or twining ſhoots, which become as thick as a man's arm. To this diverſity of habit, and the changeable hue of the *flowers*, the name alludes. The young *branches* are clothed with fine ſoft down. *Leaves* oppoſite, occaſionally ſcattered, on ſhortiſh downy ſtalks, ovate, pointed, entire, two or three inches long; their ultimate veins finely reticulated; both ſurfaces more or leſs downy, rarely ſmooth. *Flowers* in axillary or terminal bracteated ſpikes. *Bracteas* ovate, downy. *Corolla* two inches long, downy, whitiſh in the morning, turning pale red in the afternoon, roſe-coloured in the evening, and the next morning of a blood red. *Fruit* as big as one joint of the finger. *Nut* eatable when quite ripe, having the flavour of a filbert. When unripe, Rumphius compares its taſte to that of a radiſh. Theſe *nuts* are a popular remedy, among the Malays, for worms in children. Two or three of the pungent unripe ones, or five of thoſe that are arrived at maturity, are a doſe. Some perſons are attacked with a dangerous hiccup from eating two or three of the nuts in queſtion, whilſt others find no ſuch effect from a conſiderable number. The integuments are carefully removed. They probably partake of the

poiſonous qualities of the Mezereon tribe; though in a mild degree, as Rumphius ſpeaks of the flavour of ſeveral parts of the plant, without mention of any very hurtful properties. Even the kernels of our European *Daphnes* are highly acrimonious.

QUISQUISANA, in *Geography*, a town of Peru, in the dioceſe of Cuſco; 32 miles S.S.E. of Cuſco.

QUISSAC, a town of France, in the department of the Gard, and chief place of a canton, in the diſtrict of Le Vigan, having a mineral ſpring; 20 miles N. of Montpelier. The place contains 1310, and the canton 3884 inhabitants, on a territory of 160 kiliometres, in 12 communes.

QUISTELLO, a town of Italy, in the department of the Mincio; 15 miles S.S.E. of Mantua.

QUISTORP, JOHN, in *Biography*, a German Lutheran divine and profeſſor, was born at Roſtock in the year 1584. He purſued his academical ſtudies at his native city, at Berlin, and at Franckfort on the Oder; and afterwards travelled through Holland, Brabant, and Flanders, in the capacity of governor to the ſon of a patrician of Lubec. In 1614, his learning and abilities pointed him out as a fit perſon to fill the divinity chair at Roſtock; but before he entered upon the duties of his office, he was created doctor of divinity. He obtained other preferments in the church, particularly the archdeaconry of St. Mary's at Roſtock. In 1645 he was appointed paſtor of the ſame church, and ſuperintendant of the churches in the diſtrict of that city. He had the felicity of rendering important ſervices to the celebrated Hugo Grotius, during his laſt fatal illneſs at Roſtock. Upon the death of that great man, he wrote a Latin letter to Calovius, containing an account of his ſickneſs and laſt ſentiments, which is inſerted in the "Bibliotheque Choiſie" of Colomies; and in the "Vindiciæ Grotianæ," under the title of "Grotii Manes." Quiſtorp died in 1648, at the age of 64. He was the author of "Annotationes in omnes Libros Biblicos," "Commentarius in Epiſtolas Sancti Pauli," and ſeveral other works. He left a ſon of the ſame name, who was born at Roſtock in 1624, and died in 1669. He became paſtor, profeſſor of divinity, and rector of the univerſity in that city.

QUISTRUM, in *Geography*, a town of Sweden, in the province of Weſt Gothland; 9 miles N.W. of Uddevalla.

QUITANGONE, a river of Africa, which runs into the Indian ſea, 15 miles N. of Mozambique, S. lat. 14° 40′.

QUITAPABILLA, a river of America, being a branch of the Swetara, which falls into the Suſquehannah at Middleton.

QUITAPORA, a town of the ſtate of Georgia. N. lat. 33° 27′. W. long. 89° 58′.

QUITCH, in *Agriculture*, a name frequently applied, in many diſtricts, to a very troubleſome ſet of plants of the weed kind; for though it properly belongs to the couch-graſs plant only, it is much uſed to ſignify others of the creeping perennial rooted ſort, as the bent, creeping, ſoft, and tall oat-graſs, as well as ſome others, which are only capable of being deſtroyed by repeated ſummer ploughings, or forking them out and burning them on the ground. See COUCH.

QUITCH-*Graſs*, the common name given in ſome places to a very troubleſome ſort of weed, found in many diſtricts, and which requires great exertion to eradicate it out of the land. See COUCH.

QUITCH-*Drag*, that ſort of uſeful tool of the drag-kind, which is employed in the dragging out and removing this ſort of weed from ploughed lands. It is made in ſeveral different methods, according to circumſtances; but has moſtly ſomething of the long triangular form in the beam part, into which the teeth or tines are fixed. Theſe are ſeldom made ſo large in this as in the heavy ſorts of drags; but they are moſtly a little hooked, or bent forward, towards the points or lower ends. The frame-part is ſometimes ſet with two rows of tines, or more.

It is a ſort of tool which is frequently made uſe of for rendering arable ground perfectly clear of root weeds, being had recourſe to before the laſt ploughings. Where the land has been croſs-ploughed, this kind of drag may be employed with great advantage in bringing it into proper order. It has ſome other names in different counties. See COUCH-*Drag*, and DRAG.

QUITCH-*Rake*, a name given in many diſtricts to the rake employed in collecting the weed called couch, from the ſurface of ploughed ground, as well as ſome other ſorts in particular caſes. The head of this tool, into which the teeth or tines are faſtened, is uſually about five feet in length; the tines are made in a round form, having a projection of about eighteen inches below the head, each being gradually turned or crooked forward about two inches; the diſtance from each other alſo about two inches. There is commonly a ſmall beam made to faſten in the middle with two pieces of wood, which come from each corner of the rake-head, into which the tines are faſtened by means of a pin that goes through the beam, and keeps the rake ſteady. In working, this implement may be put on the carriage-part of a two-wheeled plough, to be drawn by one horſe; a man going behind to occaſionally lift up the rake when full, in order to leave the couch and other weeds in rows, for the purpoſe of burning them. In this manner, a great deal of weeds and trumpery may be collected together in the courſe of a day. See COUCH-*graſs Rake*.

QUIT-CLAIM, a releaſe, or quitting one's claim or pretenſions to a thing.

QUITERVA, in *Geography*. See SOFALA.

QUITEVA, or KITEA, a town of Africa, in the country of Darah, defended by a caſtle; 75 miles S.E. of Morocco. N. lat. 28° 6′. W. long. 5° 26′.

QUITO, an extenſive province of South America, which was ſubjected to the Peruvian empire, by Huana Capac, about the year 1526, at the time when the Spaniards firſt viſited the coaſt of Peru. Huana prevailed on his legitimate and eldeſt ſon Huaſcar to allow one of his natural children, Atahualpa, by the daughter of the laſt king of Quito, to hold this kingdom as a fief of the empire. Atahualpa, however, rebelled, ſeized the empire, impriſoned his brother, and ſoon after put him to a violent death. His proſperity was of ſhort duration; for in the year 1533 he ſuffered the ſame fate, by order of Don Franciſco Pizarro, who had deputed Sebaſtian de Benalcazar to conquer the kingdom of Quito. Having by a ſeries of victories made himſelf maſter of the kingdom, he proceeded in the year 1534 to rebuild the capital, which had ſuffered much from internal commotions, and called it "San Franciſco de Quito," a name which it ſtill retains, though it was not till ſeven years after this date that it obtained the title of city. The province, which the Spaniards found annexed to the kingdom of Peru, continued in that ſtate till the year 1718, when it was diſmembered from Peru, and attached to the viceroyalty of New Granada. At the ſame time the audience of Quito was ſuppreſſed, together with that of Panama, in the kingdom of Terra Firma: though the latter continued dependent on the viceroys of Lima. See *New* GRANADA and PERU.

This province is bounded on the north by that of Santa Fé de Bogota, and includes part of the government of Popayan; on the ſouth it is limited by the governments of

Peru

Peru and Chachapoyas; towards the eaſt it extends over the whole government of Maynas, and the river of the Amazons, to the meridian of demarcation, or that which divides the dominions of Spain and Portugal. Its boundary on the weſt is the ſea, from the coaſt of Machala, in the gulf of Puna, to the coaſt of the government of Atacames, and the juriſdiction of Barbacoas, in the bay of Gorgona. Its greateſt breadth from north to ſouth is about 200 leagues; and its length from eaſt to weſt, the whole extent from Cape de Santa Elena, in the South ſea, to the above-mentioned meridian, which, by the moſt accurate computation, is 600 leagues. All the parts, however, that can properly be ſaid to be peopled, and actually ſubject to the Spaniſh government, are thoſe intercepted by the two Cordilleras of the Andes, which, compared with the whole extent of the country, may be termed a ſtreet or lane, extending from the juriſdiction of the town of St. Miguel de Ibarra to that of Loja; the country from hence to the government of Popayan, and alſo that comprehended between the weſtern Cordillera and the ſea. With this limitation, the extent of the juriſdiction from eaſt to weſt will be 15 leagues, or ſomewhat more, being the diſtance intercepted between the two Cordilleras. But to this muſt be added the countries comprehended in the governments of Jaen de Bracamaros, which borders on the juriſdiction of Loja, and the extremity of the whole province, and ſituated on the eaſt ſide of the eaſtern Cordillera; and to the northward, the government of Quixos, and that of Maynas to the eaſtward of it, but ſeparated by large tracts of land inhabited by wild Indians; and on the north ſide of the province from that of Popayan; though the latter is properly a diſtinct province from that of Quito. Thus on the weſt ſide of that interval between the two Cordilleras lies the government of Atacames, and the juriſdiction of Guayaquil; on the eaſt ſide, the three governments above mentioned; and on the north, that of Popayan.

This province, excluſive of theſe five governments, conſiſts of nine juriſdictions, called in that country provinces, that of Quito being ſubdivided into as many others as there are governments and juriſdictions. Thoſe in the province of Quito, beginning with the moſt northern, are the following, *viz.* the town of San Miguel de Ibarra, the village of Otabalo, the city of Quito, the aſſiento of Latacunga, the town of Riobamba, the aſſiento of Chimbo, or Gaaranda, the city of Guayaquil, the city of Cuença, and the city of Loja.

The juriſdiction of Quito, the third of thoſe above enumerated, conſiſts of 25 pariſhes, beſides thoſe in the city, and extends more than five leagues, comprehending lands covered with plantations, producing a variety of plants and fruits, according to the quality, ſituation, and expoſure of the ground. Thoſe in the temperate parts yield plentiful harveſts of maize; and thoſe at the bottoms of deep cavities, being in a hot temperature, are planted with ſugar-canes, from which are extracted great quantities of ſugar and rum. The plantations near the ſummits of the mountains, having a variety of temperatures, produce wheat, barley, pot-herbs of all kinds, and potatoes. Above theſe plantations are fed numerous flocks of ſheep, producing that wool which affords employment to a great multitude of people. Some farmers breed cows, with the view to the advantage derived from their milk in making cheeſe and butter. In other farm-houſes, various occupations are obſerved, ſuch as breeding of cattle, agriculture, and manufactures, particularly of cloth, bays, and ſerges. The degree of cold and heat in this juriſdiction is ſubject to ſudden variations, according to the ſituation of different places; but in the ſame place viciſſitudes ſeldom occur. The villages in this juriſdiction are conſtructed with little regularity. They conſiſt principally of a church and parſonage, called the convent, the prieſts being formerly all religious; the other parts preſent a number of huts with mud-walls, ſcattered all over the country, where every one has his appropriate piece of ground, which he tills for his ſubſiſtence. A great part, and in ſome villages the whole, of the inhabitants are Indians, who live there when out of place; though in ſome parts the inhabitants are Meſtizos, and here and there a Spaniſh family; but theſe are extremely poor. Ulloa's Voyage, vol. i.

Quito, the capital of the above deſcribed province, rebuilt in the year 1534, (ſee the preceding article,) and ſituated in the inland parts of the continent of South America, on the eaſtern ſkirts of the Weſt Cordillera of the Andes; diſtant from the coaſt of the South ſea about thirty-five leagues to the weſt. On the N.W. is the mountain and deſert of *Pichinca* (which ſee), on the acclivity of which the city is built, and alſo among the breaches that are formed by the eminences of this mountain; ſo that many of the buildings ſtand upon arches, and the ſtreets are of courſe very irregular and uneven. With regard to magnitude, this city may be compared to one of the ſecond order in Europe; but the unevenneſs of its ſituation is a great diſadvantage to its appearance. Near the city are two ſpacious plains, one on the S., called Turu-bamba, three leagues in length; and the other on the N., termed Inna-Quito, about two leagues in extent; both of which are interſperſed with ſeats and cultivated lands, which much contribute to the variety and beauty of the ſcenery. Theſe plains contract as they approach the city, and at their junction form a neck of land, covered with thoſe eminences on which part of Quito ſtands. The principal ſquare in Quito has four ſides, in one of which ſtands the cathedral, and in the oppoſite the epiſcopal palace; the third ſide is taken up by the town-houſe, and the fourth by the palace of the audience: this ſquare is very ſpacious, and has in its centre an elegant fountain. The four ſtreets terminating at the angles of the ſquare are ſtraight, broad, and handſome; but at the diſtance of three or four *quadras*, (each quadra being about one hundred yards,) the troubleſome declivities commence; and on this account the inhabitants cannot enjoy the benefit of coaches, or wheel carriages. The principal ſtreets are paved; and thoſe which are not paved are almoſt impaſſable after rain, which is here very common. Beſides the principal ſquare, there are two others, that are very ſpacious, and ſeveral that are ſmaller. In theſe moſt of the convents are ſituated, and theſe make a handſome appearance, and ſome of them, particularly that of the order of Franciſcans, are elegant ſtructures. The principal houſes are large, and ſome of them have ſpacious and well-contrived apartments, though none are above one ſtory in height, but their doors and windows are low and narrow. The materials made uſe of in building at Quito are "adobes," or unburnt bricks and clay, cemented by a ſubſtance called "fangagua," a ſpecies of mortar that is uncommonly hard, uſed by the ancient Indians for building all kinds of houſes and walls. The city is divided into ſeven pariſhes; the cathedral is richly adorned with tapeſtry hangings and other coſtly decorations; but the pariſh churches are of mean appearance. The convents of monks are thoſe of the Auguſtines, Dominicans, and Fathers of Mercy, &c. colleges, &c. Quito has alſo ſeveral nunneries. The college of Jeſuits, as well as all the convents of monks, are large, well built, and very ſplendid. Here is alſo an hoſpital, with ſeparate wards for men and women, under the name of the order of our Lady

of

of Bethlehem. Among the courts whoſe ſeſſions are held at Quito, the principal is that of the Royal Audience, eſtabliſhed there in 1563; the exchequer or chamber of finances, a treaſury for the effects of perſons deceaſed, &c. The corporation conſiſts of a corregidor, two ordinary alcaldes choſen annually, and regidores. The cathedral chapter conſiſts of the biſhop, dean, archdeacon, chanter, treaſurer, a doctoral, a penitentiary, a magiſtral, three canons by preſentation, four prebends, and two demi-prebends, with the following ſalaries; that of the biſhop 24,000 dollars, the dean 2500, the four ſucceeding dignities 2000 each, the canons 1500 each, the prebends 600, and the demi-prebends 420. This church was created into a cathedral in 1545, and among other feſtivals celebrated in it, the moſt magnificent are thoſe of Corpus Chriſti, and the Conception of our Lady, when all the courts, offices, and perſons of eminence aſſiſt. In the former there is a ſingular pomp of the proceſſion of the hoſt, and here are alſo dances of a peculiar nature, which were performed before their converſion to Chriſtianity. The corporation and cathedral chapter keep, by vow, two annual feſtivals in honour of two images of the Virgin, which are placed in the villages of Guapulo and Quincha, belonging to this juriſdiction. Theſe images or ſtatues are brought with great ſolemnity to Quito, and each feſtival is ſucceeded by nine days' devotion, the audience and other courts aſſiſting on the occaſion. Theſe feſtivals are held in commemoration of the aſſiſtance vouchſafed by the holy Virgin, at the time of an earthquake and terrible ejection from Pichincha, by which Latacunga, Hambato, and a great part of Riobamba, were utterly deſtroyed; whereas by the ſuppoſed interpoſition of the Virgin, the city eſcaped even the ſlighteſt damage.

The celebrated city of Quito is ſaid by Alcedo to contain 58,000 perſons, ſome of whom are diſtinguiſhed by their rank. Theſe are the deſcendants either of the original conquerors, or of other perſons who in ſucceeding times came over from Spain inveſted with ſome lucrative office, and who have preſerved the luſtre, both of their deſcent and wealth, by intermarriages, without mixing with meaner families though famous for their riches. The lower orders of people conſiſt of four claſſes, Spaniards or whites, Meſtizos, Indians or natives, and Negroes, with their progeny. The former, according to the ſtatement of Ulloa, compoſe about a ſixth part of the population; the Meſtizos, or deſcendants of Spaniards and Indians, amount to about a third part; the Indians form about another third; and the others, who are about one-ſixth, are the Caſts. The Spaniards are prevented by their pride from applying to any kind of buſineſs, and therefore many of them are poor and wretched. The Meſtizos occupy themſelves in arts and trades, but principally in thoſe of the higheſt repute, ſuch as painting and ſculpture, in which they excel. Theſe men of talents, however, are indolent and ſlothful, ſo that they loiter about the ſtreets during the whole day. The Indians, who are generally ſhoemakers, bricklayers, weavers, or engaged in ſimilar occupation, are not more induſtrious. Perſons of fortune among the Spaniards affect great magnificence in their dreſs, wearing the fineſt gold and ſilver tiſſues; but that of the middling and lower claſs is a black cloak, and under it a long coat, reaching down to their knees, with a cloſe ſleeve, open at the ſides, without folds, and ornamented with rows of buttons. The Meſtizos generally wear blue cloth, manufactured in this country. The dreſs of the Indians conſiſts only of white cotton drawers, made either from the ſtuffs of the country, or from others brought from Europe, reaching down to the calf of the leg, and edged with lace ſuitable to the ſtuff. The uſe of a ſhirt is ſupplied by a black cotton frock, wove by the natives; and over this is a kind of ſerge cloak, through which the head paſſes, and a hat made by the natives. The men, both Creoles and Spaniards, are well made, of a proper ſtature, and of a lively agreeable countenance. The Meſtizos in general are alſo well made, often taller than the ordinary ſize, very robuſt, and have an agreeable air. The Indians, both men and women, are generally low, but well proportioned and very ſtrong. The Indians have no beard, nor have either males or females any indications of the age of puberty. The youths of family are inſtructed in philoſophy and divinity, and ſome, with reluctance, proceed to the ſtudy of the civil law. The country is obſerved to abound more in women than men; and it is obſerved, that nature begins to decay at the age of thirty in the male ſex, eſpecially among thoſe who have been tenderly brought up; whereas the females enjoy a more confirmed ſtate of health and vigour. This difference is aſcribed partly to the climate and partly to the food, but principally to early intemperance and voluptuouſneſs, and alſo the want of proper employments. The liquors that are uſed here are rum and brandy, in which they freely indulge, and alſo the infuſion of the Paraguay herb, which ſerves for tea. The vices prevalent here are idleneſs, drunkenneſs, and gaming. The common people and Indians are much addicted to theft, in which they are very artful and dextrous. In Quito, and in all the towns and villages of its province different dialects are ſpoken, Spaniſh being no leſs common than the Inga.

Quito is ſo happily ſituated, that neither the heat nor cold is troubleſome; though the extremes of both may be felt in its neighbourhood. An equality of temperature takes place throughout the whole year, the difference between the ſeaſons being ſcarcely perceptible. The winds are ſalubrious, and blow continually, but never with any violence. The rain occaſionally deſcends in impetuous torrents. Earthquakes are not uncommon, and when they occur very violent; that of 1775 was very deſtructive. The great earthquake on the 4th of February 1797, which changed the face of the whole province, and in one inſtant deſtroyed thirty-five or forty thouſand perſons, has ſo altered the temperature of the air, that the thermometer is now commonly 41° to 54°, and ſeldom riſes to 68° or 70°; whereas Bouguer obſerved it conſtantly at 66° or 68°. Since this cataſtrophe earthquakes are continually recurring; and ſuch ſhocks, it is probable, that all the higher ground is one vaſt volcano. Von Humboldt adds, that what are called the mountains of Cotopaxi and Pichincha are but little ſummits, the craters of which form different conduits terminating in the ſame cavity. The earthquake of 1797 afforded a melancholy proof of this; for the ground then opened every where, and vomited forth ſulphur, water, &c. Notwithſtanding the dangers and horrors that ſurround them, the people of Quito are gay, lively, and variable, and very much addicted to pleaſure, luxury, and amuſement. Humboldt informs us, that the volcanos of Quito eject pumice, baſalt, and porphyry ſcorified; with enormous quantities of water and liquid clay, which diffuſe fertility eight or ten leagues round. The fertility of this country is ſuch, that, as we are informed, a full deſcription of it would appear incredible. The equability of the climate, as well as the fertility of the ſoil, occaſion a regular ſucceſſion of the productions of the earth: when the fruits have obtained their maturity, and the leaves begin to change their colour, freſh leaves, bloſſoms, and fruits, are ſeen in their proper gradations on the ſame tree. The ſame inceſſant fertility is conſpicuous in the corn, reaping and ſowing being both carried on at the ſame time. This remarkable fecundity of the ſoil is naturally productive of excellent

excellent fruits and corn of every kind, as is evident from the delicacy of the beef, veal, mutton, pork, and poultry of Quito. One of the principal foods uſed by the inhabitants is cheeſe, of which it is computed that the quantity annually conſumed amounts to between ſeventy and eighty thouſand dollars of the money of that country. The vicinity alſo affords excellent butter. The manufactures of this province are cottons, ſome white, called tucuyos, and others ſtriped bays and cloths, which meet with a good market at Lima, for ſupplying all the inward provinces of Peru; and the returns are made partly in ſilver, and partly in gold and ſilver fringes made in that city, wine, brandy, oil, copper, tin, lead, and quickſilver. The products of the earth are chiefly conſumed within the province; except the wheat, part of which is ſent to Guayaquil. But this trade is carried on by Meſtizos and poor people. Goods, manufactured by the public, or woven by private Indians, are ſent, together with ſome kinds of proviſions, to the juriſdiction of Barbacoas. Theſe proviſions are exchanged for gold, found in that country, and which is afterwards ſent to Lima, and diſpoſed of at a greater price. Their ſtuffs find a vent in the governments of Popayan and Santa Fé. The coaſt of New Spain ſupplies this province with indigo, of which a great quantity is conſumed; blue being univerſally the colour which theſe people affect in their apparel. They alſo import, by way of Guayaquil, iron and ſteel, both from Europe and the coaſt of Guatemala. S. lat. 0° 13′ 27″. W. long. 78° 10′ 15″. Ulloa's Voyage, vol. i.

QUIT-RENT, q. d. *quiet rent*, a certain ſmall rent, payable yearly, by the tenants of moſt manors, in token of ſubjection; upon the payment of which, they are quiet, and free. It includes both rents of aſſiſe and chief rents.

Theſe rents differ very greatly in different manors, being in ſome a mere trifle, while in others they are very heavy and oppreſſive to the tenants. This part of the feudal ſyſtem is now conſiderably on the decline.

In ſome ancient records it is written white rent, becauſe paid in ſilver, to diſtinguiſh it from rent-corn, rent-pepper, &c.

QUITTA, in *Geography*, a town of Africa, on the Slave coaſt. N. lat. 6°. E. long. 0° 8′.

QUITTANCE. See Acquittance.

QUITTER, or Quittor, in horſes, is an ulcer formed between the hair and hoof, uſually on the inſide quarter of a horſe's foot; it often ariſes from treads and bruiſes, ſometimes from gravel, which by working its way upwards, lodges about the coronet; if it is only ſuperficial, it may be cured with cleanſing dreſſings, bathing the coronet every day with ſpirits of wine, and dreſſing the ſore with lime-water, or a detergent application, ſuch as red precipitate. But where the matter forms itſelf a lodgment under the hoof, there is then no way to come at the ulcer but by taking off part of the hoof; and if this be done well, the cure may be effected without danger.

When the matter happens to be lodged near the quarter, the farrier is ſometimes obliged to take off the quarter of the hoof, and the cure is then for the moſt part but palliative; for when the quarter grows up, it leaves a pretty large ſeam, which weakens the foot; this is what is called a falſe quarter, and a horſe with this defect ſeldom gets quite ſound.

If the matter, by its confinement, has injured or deſtroyed the coffin-bone, which is of ſo ſoft and ſpongy a nature that it ſoon becomes carious, it will be neceſſary to enlarge the opening, cut away the ſpongy fleſh, and apply the actual cautery, or hot iron, pointed pyramidically, dreſſing the bone with doſſils of lint dipped in tincture of myrrh, and the wound with the green or precipitate ointment. When the ſore is not enlarged by the knife, which is the beſt and leaſt painful method, ſublimate is generally applied; or blue vitriol powdered, and embued with a few drops of oil, is alſo uſed for this purpoſe, and is ſaid to act as effectually, and with leſs pain to the animal.

In the time of the action of theſe cauſtic remedies, the foot ſhould be kept in a poultice. And where ſinuſes form they ſhould be laid open by a knife, and be afterwards ſtimulated by the application of ſome detergent remedy. The following has been adviſed by a late writer: Take of corroſive ſublimate, red precipitate in fine powder, of each equal parts; honey ſufficient to form a paſte.

The wound is adviſed to be afterwards dreſſed with common digeſtive ointment, preſſure being given by means of a bandage. It is ſometimes written quittor.

Quitter-*Bone*, another term applied to the ſame diſeaſe by farriers and perſons engaged in huſbandry.

QUITY, in *Botany*, a Braſilian name uſed by ſome authors for the ſapindus, or ſoap-berry tree of the Weſt Indies.

QUIVER, ſeemingly corrupted from the Fr. *couvrir*, to cover, a caſe or ſheath for arrows.

QUIVISA, in *Geography*, a town of Hindooſtan, in Bahar; 25 miles S.W. of Bettyah.

QUIVISIA, in *Botany*, from the vulgar name of this tree or ſhrub in the iſles of Bourbon and the Mauritius, *bois de quivi*. Juſſ. Gen. 264. Cavan. Diſſ. 367. (See Gillibertia.) One cannot but wonder how a writer of Juſſieu's learning could, for a moment, tolerate ſo faulty a name; eſpecially as his authority leads heedleſs perſons into the adoption of ſuch, for want of reading his preface; where, in a note to p. 24, he declares theſe rude and barbarous names to be merely borrowed for a time, till the genera to which they belong are better determined.

QUIXOS, in *Geography*, a juriſdiction of South America, attached to the province of Quito, on the eaſt ſide of the Cordillera of the Andes. Quixos on the north ſide borders on the juriſdiction of Popayan; reaching eaſtward to the river Aguarico, and towards the weſt ſeparated from the juriſdictions of Quito, Latacunga, and the town of San Miguel de Ibarra, by the Cordilleras of Cotopaxi and Cayamburo. This country was firſt diſcovered, in 1536, by Gonzalo de Pineda, one of the officers ſent from Popayan by Sebaſtian de Belalcazar (or Benalcazar), to trace the courſe of the river Magdalena; and in conſequence of his report, Gonzalo Pizarro, in 1539, reconnoitred its whole extent, and eſtabliſhed ſettlements in it. But upon the failure of his expedition, the conqueſt of this country was ſuſpended till the year 1549, when the marquis de Canete, viceroy of Peru, gave a commiſſion to Gil Remirez Davalos, a man of undaunted courage, for reducing the Indians, and making ſettlements in the country. This object he accompliſhed, and founded the town of Baeza, the capital of the government, in the year 1559; and this was ſoon followed by other towns and villages, the principal of which are Archidona and Avila. The temperature of this country is hot and moiſt, the rains being almoſt continual. It is covered with thick woods, ſome trees being of a prodigious magnitude. In the S.W. part of the juriſdiction of Quixos is the canela or cinnamon tree, which led Gonzalo de Pineda to call the country Canelos, a name which it ſtill retains. The other products of Quixos are the ſame with thoſe in all the other lands under the ſame climate as this government. Adjoining to this is the diſtrict of Macas and Maynas. See Macas and Maynas.

QUIZA, in *Ancient Geography*, a town of Africa, in Mauritania Cæſarienſis. This was a fortreſs, according to Pomponius Mela and Pliny. Antonine makes it a municipium, and places it between Portus Magnus and Arſenaria.

QUIZAMA,

QUIZAMA, in *Geography*, a province of Africa, in the ſouthern part of Angola; the country is extenſive, mountainous, and badly cultivated; but it produces abundance of honey, wax, and ſalt. The inhabitants are warlike, and have not ſubmitted to the Portugueſe.

QUIZIBA, a ſmall iſland in the Indian ſea, near the coaſt of Africa. S. lat. 12° 30′.

QUIZIMAJUGO, a river of Africa, which diſcharges itſelf into the Indian ſea, S. lat. 8° 50′.

QUIZINA, or TEUSIN, a chain of mountains in Fez, 90 miles in extent.

QUIZUMGO, a river of Africa, which runs into the ſtraits of Mozambique, S. lat. 17° 20′.

QUO JURE, in *Law*, a writ that lies for him who has land, wherein another challengeth common of paſture time out of mind: its deſign is to compel the party to ſhew by what right or title he challengeth it. This is now out of uſe, as, on the claimant's putting his cattle in, the owner may bring treſpaſs, when the claimant muſt plead and prove his title.

QUO *Minus* is alſo a writ which lies for the king's farmer or debtor in the court of exchequer, againſt him to whom he ſelleth any thing by way of bargain, touching his farm, or againſt whom he hath any cauſe of perſonal action; becauſe by the vendee's detaining any due from him, the farmer is leſs able to pay the king's rent. This was formerly allowed only to ſuch perſons as were tenants or debtors to the king: at this day the practice is become general for the plaintiff to ſurmiſe, that, for the wrong which the defendant doth him, he is leſs able to ſatisfy his debt to his majeſty; which ſurmiſe gives juriſdiction to the court of exchequer to hear and determine the cauſe. Finch. 66. Old N.B. 148.

Quo minus is alſo a writ that lies for him who has a grant of houſe-bote and hay-bote in another man's woods, againſt the grantor making ſuch waſte, as that the grantee cannot enjoy his grant.

QUO *Warranto*, a writ that lies againſt any perſon or *corporation* (which ſee) who uſurps any franchiſe, or liberty, againſt the king; as to have waife, ſtray, fair, market, court baron, leet, or ſuch like, without good title; to inquire by what authority he ſupports his claim, in order to determine the right. Finch. L. 322. 2 Inſt. 282.

It alſo lies for miſ-uſer or non-uſer of privileges granted; and even, according to Bracton, againſt him that intrudeth himſelf as heir into land. See INTRUSION.

This writ was originally returnable before the king's juſtices at Weſtminſter; but afterwards only before the juſtices in eyre, by virtue of the ſtatutes of "quo warranto," 6 Edw. I. c. 1. and 18 Edw. I. ſt. 2. (2 Inſt. 498. Raſt. Entr. 540.); but ſince thoſe juſtices have given place to the king's temporary commiſſioners of aſſiſe, the judges on the ſeveral circuits, this branch of the ſtatutes hath loſt its effect: and writs of "quo warranto" (if brought at all) muſt now be proſecuted and determined before the king's juſtices at Weſtminſter. And in caſe of judgment for the defendant, he ſhall have an allowance of his franchiſe; but in caſe of judgment for the king, for that the party is entitled to no ſuch franchiſe, or hath diſuſed or abuſed it, the franchiſe is either ſeiſed into the king's hands, to be granted out again to whomever he ſhall pleaſe; or, if it be not ſuch a franchiſe as may ſubſiſt in the hands of the crown, there is merely judgment of "ouſter," to turn out the party who uſurped it. Cro. Jac. 259. 1 Show. 280.

The judgment on a writ of *quo warranto* (being in the nature of a writ of right) is final and concluſive even againſt the crown. (1 Sidd. 86. 2 Show. 47. 12 Mod. 225.) This circumſtance, together with the length of its proceſs, probably occaſioned that diſuſe into which it is now fallen, and introduced a more modern method of proſecution, by information filed in the court of king's bench by the attorney general, in the nature of a writ of "quo warranto," in which the proceſs is ſpeedier, and the judgment not quite ſo deciſive. This is properly a criminal method of proſecution, as well to puniſh the uſurper by a fine for the uſurpation of the franchiſe, as to ouſt him, or ſeiſe it for the crown; but hath long been applied to the mere purpoſes of trying the actual right, ſeizing the franchiſe, or ouſting the wrongful poſſeſſor; the fine being nominal only. Blackſt. Com. b. iii. See INFORMATION.

QUOAD HOC, a term often uſed in law reports to ſignify, "as to the thing named" the law is ſo, &c.

QUOCOLOS, the name of a ſtone found in Tuſcany, as hard as a flint, ſomewhat tranſparent, and, in ſome meaſure, reſembling marble. In the fire it loſes its tranſparency, and becomes leſs ponderous, and white; and a ſtrong fire readily converts it into glaſs. It has no medicinal virtues, but is uſed at ſome glaſs-houſes.

QUOD, CAPE, or *Quada*, a cape on the coaſt of Patagonia, in the ſtraits of Magellan. S. lat. 53° 33′. W. long. 74° 6′.

QUOD *clerici beneficiati de cancellaria*, in *Law*, a writ to exempt a clerk of the chancery from the contribution towards the proctors of the clergy in parliament. Reg. Orig. 261.

QUOD *clerici non eligantur in officio ballivi*, &c. is a writ that lies for a clerk, who, by reaſon of ſome land he hath, is made, or like to be made, a bailiff, beadle, reeve, or ſuch like officer.

QUOD *cum, that whereas*, being by way of recital, and not poſitively, is not good in indictments. 3 Salk. 188. See INDICTMENT.

QUOD *ei deforceat*, a writ for tenant in tail, tenant in dower, by the courteſy, or for term of life, having loſt their lands by default, againſt him that recovers, or his heir. Reg. Orig. 171. Stat. Weſtm. 2. cap. 4.

This, though not ſtrictly a writ of right, ſo far partakes of the nature of one, as that it will reſtore the right to him who has been thus unwarily deforced by his own default. (F.N.B. 155.) But in caſe the recovery were not had by his own default, but upon defence in the inferior poſſeſſory action, this ſtill remains final with regard to theſe particular eſtates, as at the common law: and hence it is, that a common recovery (on a writ of entry in the *poſt*) had, not by default of the tenant himſelf, but (after his defence made, and voucher of a third perſon to warranty) by default of ſuch voucher, is now the uſual bar to cut off an eſtate-tail.

This writ may be brought againſt a ſtranger to the recovery; as if a man recover by default, and maketh a feoffment, this writ may be had againſt the feoffee.

QUOD *medium*. See MEDIUM.

QUOD *permittat*, in *Law*, a writ that lies where a man is diſſeiſed of his common of paſture, and the *diſſeiſor aliens* or dies ſeiſed, and his heir enters; then if the diſſeiſee die, his heir ſhall have this writ. See DISTURBANCE *of Common*.

QUOD *permittat proſternere*. See *Aſſiſe of* NUSANCE.

QUOD *perſona nec præbendarii*, &c. a writ that lies for ſpiritual perſons, when diſtrained in their ſpiritual poſſeſſions, for the payment of a fifteenth, with the reſt of the pariſh. F.N.B. 176.

QUODLIBETICAL QUESTION, *Quæſtio quodlibetica*, a college term for a theſis, or problem, anciently propoſed to be debated in the ſchools, out of curioſity and entertainment, rather than for the ſettling of any uſeful point.

The term is formed from the Latin *quodlibet, any thing, what you pleaſe:* and ſo well ſatisfied were the public of the impertinences of theſe queſtions, that the term *quodlibet* has been ſince retained, to ſignify any little ridiculous quibble.

QUOJA, in *Geography*, a country of Africa, ſituated above 100 miles from the coaſt of the Atlantic, between the 8th and 10th degrees of W. longitude, and between the 7th and 9th degrees of N. latitude.

QUOIF, in *Ship-Building*, a piece of oak thickſtuff on the deck-hook, to which the deck water-way on each ſide is butted, otherwiſe the butt would come in the middle, and could not be caulked.

QUOIL, Quoyl, or *Coile*, in the *Sea Language*. A cable is ſaid to be quoiled, when it is laid round in a ring, one turn over another, on the deck of a ſhip.

The middle of ſuch ring, or quoil, is a good place to lay ſhot in: they are more ſafe there, than in lockers along the ſide, where the enemy's ſhot may fall into them.

Quoil, *Weather*. See Weather *Quoil*.

QUOIN, or Coin, formed from the French *coin*, of the Latin *cuneus, wedge*, aboard a ſhip, is a wedge faſtened on the deck, cloſe to the breech of the carriage of a gun, to keep it firm up to the ſhip's ſide, and prevent its rolling; and alſo to raiſe or depreſs it.

Quoins, *Cantic*, are ſhort three-legged quoins, put between caſks to keep them ſteady. See Coin.

Quoins, in *Architecture*, denote the corners of brick or ſtone walls.

The word is particularly uſed for the ſtones in the corners of brick buildings. When theſe ſtand out beyond the brick-work (their edges being chamferred off) they are called *ruſtic* quoins.

Quoin, in *Geography*, a ſmall iſland in the Indian ſea, near the W. coaſt of Madagaſcar. S. lat. 14°. E. long. 48° 14'.—Alſo, an iſland in the Eaſt Indian ſea, N. of the Nicobar iſlands. N. lat. 9° 56'. E. long. 93° 20'.

QUOITS, a kind of exerciſe or game, known among the ancients under the name of the *diſcus*. See Disc.

QUOLL, in *Zoology*, a name given by the natives of New Holland to an animal reſembling a pole-cat, with a brown back, ſpotted with white, and the belly of a pure white, in which it differs from others of theſe fetid animals. Cook's Voy. 1770. vol. iii. p. 626.

QUONDANGA, in *Geography*, a town of the Birman empire; 32 miles N. of Prone.

QUORUM, a term frequently mentioned in our ſtatutes, and often uſed in commiſſions, both of peace, and others. A juſtice of the quorum is thus called from the words in the commiſſion, *Quorum* C. D. or A. B. *aliquem veſtrum unum eſſe volumus*.

For an example: where a commiſſion is directed to ſeven perſons, or to any three of them, of which A. B. and C. D. are to be two; there A. B. and C. D. are ſaid to be of the quorum, becauſe the reſt cannot proceed without them.

So a juſtice of the peace and quorum is one without whom the reſt of the juſtices, in ſome caſes, cannot proceed. See Justices *of the Peace*.

Quorum *Nomina*. In the reign of king Henry VI. the king's collectors, and other accomptants, were much perplexed in paſſing their accounts, by new extorted fees, and forced to procure a then late-invented writ of *quorum nomina*, for the allowance and ſuing out their quietus, without the allowance of the king.

QUOTA, in *Law*, a tax to be levied in an equal manner.

QUOTATION, in *Literature*, a citation; or a paſſage rehearſed expreſsly in one author from another.

Quotations are uſually diſtinguiſhed by inverted commas.

The manner of quoting by book, and chapter, or ſection, is chiefly affected by men of erudition; but it is abuſed: this method ought only to obtain where the whole chapter or ſection is expreſsly on the ſubject. On other occaſions, quoting by page is more commodious; except in claſſics, and other ancient writings, of which there are many editions in different forms; where this method is of little uſe, unleſs the edition be alſo ſpecified.

The quotations from the Old Teſtament, found in the New, have occaſioned great doubt, diſpute, and criticiſm. The apoſtles are frequently referring to the Old Teſtament, and quoting paſſages and prophecies thence, as fulfilled in our Saviour; yet theſe paſſages, thus quoted, are frequently either not found in the Old Teſtament at all, or they are not urged in the New, according to the literal and obvious ſenſe they ſeem to bear in the Old.

A late ingenious author, in an "Eſſay upon the Truth of the Chriſtian Religion," frankly owns, that the evangeliſts ſometimes apply to the Meſſiah paſſages of the Old Teſtament, which, as they lie in our preſent copies, plainly relate to ſome other perſon, or thing. This is evident, *e. gr.* in the paſſage, Matthew, ii. 15. *Out of Egypt have I called my ſon;* which is quoted from Hoſea, xi. where it is plainly underſtood of the coming of the Iſraelites out of Egypt.

This circumſtance has been urged as a great objection to Chriſtianity, which the divines, commentators, critics, &c. have long laboured to remove, though by very different means.

Some have recourſe to a double completion; and imagine, that though the prophecies were primarily accompliſhed in other events, yet they might have a ſecondary accompliſhment in the Meſſiah: but others ſet aſide a double completion, except where the prophet himſelf declares as much, this otherwiſe making all prophecy uſeleſs. See Prophecy.

The generality chooſe, therefore, to have recourſe to an allegorical, typical, or ſpiritual meaning in the prophecies, &c. and ſuppoſe them to have been thus underſtood among the ancient Jews, thus fulfilled in our Saviour, and thus applied by the apoſtles.

In effect, the Jewiſh rabbins, it is allowed, took great liberty in quoting and interpreting ſcripture; and it is ſuppoſed the apoſtles might follow theſe rules in their quotations.

Accordingly, M. Surenhuſius, Hebrew profeſſor at Amſterdam, has endeavoured to retrieve theſe rules, long ſince loſt, in an expreſs treatiſe on this ſubject, publiſhed in 1713. This author obſerves a great deal of difference applied in the different forms of quoting uſed by the ſacred writers: as, *It has been ſaid; it is written; that it might be fulfilled which was ſpoken by the prophets; the Scripture ſays; ſee what is ſaid; the Scripture foreſeeing; it is not written*, &c. He adds that the books of the Old Teſtament having been diſpoſed in a different order at different times, and having had different names, it is thence, that one book or writer is ſometimes confounded with another.

For the rules of quoting and interpreting practiſed among the rabbins, he gives us ten; recovered with much ſtudy from the Talmud, and the ancient Jewiſh doctors: inſtances of which he gives us in the writings of the apoſtles; and by thoſe rules he endeavours to explain and juſtify all the quotations made from the Old Teſtament in the New.

The rules are, 1. Reading the words not according to

the points placed under them, but according to others ſubſtituted in their ſtead; as is done by St. Peter, Acts, iii. 23. by Stephen, Acts, vii. 43. and by Paul, 1 Cor. xv. 54. 2 Cor. viii. 15, &c. The ſecond is by changing the letters; as is done by Paul, Rom. ix. 33. 1 Cor. xi. 9 Heb. viii. 9. and x. 5. and by Stephen, Acts, vii. 43. The third is by changing both letters and points; as is done by Paul, Acts, xiii. 41. and 2 Cor. viii. 15. The fourth is by adding ſome letters and taking away others. The fifth is by tranſpoſing words and letters. The ſixth is by dividing one word into two. The ſeventh, adding other words to make the ſenſe more clear. The eighth, changing the order of the words. The ninth, changing the order of the words and adding other words. Both of which are done by the apoſtles. And laſtly, changing the order of words, adding words, and retrenching words; which is a method often uſed by St. Paul.

Other authors, as biſhop Kidder, M. le Clerc, Mr. Sykes, &c. ſolve the difficulty another way. That uſual form of quotation among the evangeliſts, "That it might be fulfilled which was ſpoken by the phrophets," according to theſe authors, means no more than an accommodation of the prophet's words to the caſe in hand.

The word πληρωθη, *fulfilled*, does not neceſſarily determine us to ſuch a ſenſe, as if the evangeliſts deſigned to ſpeak of a prediction of future events *accompliſhed;* but may barely expreſs an accommodation of borrowed words. In effect, ſays biſhop Kidder, a ſcripture may be ſaid to be fulfilled two ways; *properly*, as when that which was foretold comes to paſs; and *improperly*, by way of accommodation, as when an event happens to any place or people like to what fell out ſome time before. And thus it is that St. Matthew ſays, on occaſion of the murder of the innocents, that "then was fulfilled what was ſpoken by the prophet Jeremy, *In Rama was a voice heard*," &c.

This interpretation is confirmed by M. le Clerc, who obſerves that the Jews, in their language, uſed to ſay, that a paſſage of ſcripture was fulfilled, as often as any thing happened to which it might be applied; ſo that the evangeliſt Matthew, who was a Hebrew, and wrote, as is commonly ſuppoſed, in that language, intended no more in the paſſage juſt cited, but that a thing happened, to which one might apply what Jeremy had formerly ſaid on another occaſion.

Accordingly, ſays Mr. Sykes, the evangeliſts, in citing that paſſage of Iſaiah, *Behold, a virgin ſhall be with child*, &c. only uſe it as words of that prophet remarkably agreeing to the miraculous birth of Jeſus, and not as a prophecy of his birth.

It may be added that this way of ſpeaking was not unknown among the heathen writers. Thus in Ælian, Diogenes Sinopenſis uſed continually to ſay of himſelf, that he fulfilled and underwent all the curſes of tragedy.

The difficulty ſtated in this article has been already the ſubject of diſcuſſion under the terms ACCOMMODATION and PROPHECY. Whilſt it is allowed, that many paſſages in the New Teſtament, and alſo in the writings of the Chriſtian fathers, are very different from the correſpondent paſſages as they now ſtand in the Hebrew text; and that ſome words are introduced as quotations which are no where to be found: thoſe who urge the objection ſhould be diſpoſed to pay due attention to the various modes of replying to it, which biblical critics have propoſed. Some have ſuppoſed, with Whiſton, that thoſe early Chriſtian writers quoted from the LXX: others have alleged that they ſometimes quoted from their memory; and this, it is ſaid, is the more probable, becauſe the ſame paſſage is quoted in ſome caſes by different authors in very different words, even where the ſenſe agrees. It is moreover alleged, that the *ſenſe* of the paſſages ſuppoſed to be loſt is ſtill to be found in the Old Teſtament, though the *words* be not; ſuch eſpecially are Matt. ii. ult. and John, vii. 38. But if it were granted, that ſome of the verſes originally belonging to the Old Teſtament are loſt, or materially corrupted, no objection could be juſtly alleged againſt the authenticity and divine authority of the ſacred writings in general. As for the quotations that occur in the New Teſtament, the moſt probable opinion is, that ſome of them are made from the Greek verſion and ſome from the Hebrew text. To thoſe who aſſume, that though ſuch quotations are made from the Greek verſion, where that differs from the Hebrew, yet both the text and the verſion are in ſuch places always the ſame in ſenſe, we reply with Dr. Kennicott, that this is not the caſe: and he thinks, that the only way of doing juſtice to our Saviour and his apoſtles in their references to the Old Teſtament, is to ſay, that for whatever purpoſe ſuch quotations were made (whether by way of expreſs prophecy, or only of alluſion and accommodation) they were always conſonant to the true ſenſe of the Hebrew text. For he ſays, it is ſcarcely poſſible to conceive, how any ſpeaker or writer can quote juſtly ſuch and ſuch words, as (*e. g.*) from Moſes or from Iſaiah, when the words quoted are not the words of Moſes or Iſaiah, and do not expreſs even the ſenſe of Moſes or Iſaiah; but are only taken from ſome verſion, which (upon the preſent ſuppoſition) was no verſion at all in theſe inſtances, becauſe it did not agree here in ſenſe with its original. The foundation of this miſtake, as this learned writer adds, is the notion that has prevailed of the integrity of the modern Hebrew text; for the writers who have held this to be perfect, have never been able and never will be able to vindicate the prophetical quotations. Paſſages quoted from the ſeveral Jewiſh writers by inſpired men muſt (he thinks) have been quoted agreeably to the ſenſe of the Hebrew text; but ſuch quotations do not agree in ſenſe with the printed Hebrew text. Therefore ſome alterations have happened, either in the Greek text of the New Teſtament, or the Hebrew text of the Old. Collins ſays that the Hebrew text has been delivered down perfect, and therefore that the quotations are either forged or falſified in the New Teſtament. To this it is replied, that as it appears from a collation of the Greek MSS. of the New Teſtament, that the words of the quotations are not corrupted in the Greek text, ſo it appears from a collation of the Hebrew MSS. that the words have been corrupted in the Hebrew. And this is an anſwer which ſhould approve itſelf to all Chriſtians. See Kennicott's State of the Hebrew Text, vol. ii. p. 345—347, &c.

Upon the whole we obſerve, that the writers of the New Teſtament did not make it a conſtant rule to quote from the Greek verſion, becauſe there are many places where their quotations differ from that verſion and agree with the Hebrew. And as the quotations now agree with the Hebrew, frequently in the expreſs words, generally in the ſenſe; ſo it it is moſt probable, that they always agreed at firſt, and that where the Hebrew was expreſſed properly in the Greek verſion, they uſed the words of that verſion; and where the verſion was not proper, they tranſlated for themſelves.

With regard to Matt. ii. ult. the firſt of the paſſages above cited, Dr. Doddridge (Fam. Expoſ. in loc.) obſerves, that Nazareth was a little city on the confines of Zabulon and Iſſachar; ſo contemptible among the Jews, that it was a proverb among them, No good thing can be expected from thence. Thus was fulfilled what was ſpoken in effect by many of the prophets, "he ſhall be called a Nazarene;" *i. e.* he

ſhall

ſhall appear in mean and deſpicable circumſtances, and be treated as the mark of public contempt and reproach. If this ſenſe be not approved, Dr. Doddridge profeſſes to acquieſce in Chryſoſtom's opinion, that the paſſage referred to is loſt, avouching his diſſatisfaction with other interpretations of this paſſage. The ſecond paſſage, *viz.* John, vii. 38, our learned expoſitor thus explains. "He that believeth in me, as the ſcripture hath ſaid, out of his belly ſhall flow rivers of living water, *i. e.* as the ſcripture has in many places ſaid and promiſed, he ſhall receive thoſe ſupplies in ſo great an abundance, that he ſhall not only be refreſhed himſelf, but out of his belly, or from within him ſhall flow vital ſtreams, and as it were rivers of living water for the refreſhment and comfort of others." Chryſoſtom, and after him many other eminent writers, Caſtalio, Zegerus, and I. Capellus, refer the words "as the ſcripture hath ſaid," to the former clauſe, and underſtand them, as if our Lord had ſaid, "He that hath faith in me," which the ſcripture requires, and thus they avoid the difficulty, which ariſes from our not finding the following words in ſcripture. But Grotius, with whom Dr. Doddridge agrees, ſuppoſes, that here is a general reference to the ſeveral prophecies which refer to the effuſion of the ſpirit by the Meſſiah, under the ſimilitude of pouring out water. See Iſaiah, lii. 15. xliv. 3. lviii. 11. Joel, ii. 28.

QUOTIDIAN, in *Medicine*, ſignifying literally *daily*, is applied to all intermitting diſeaſes, which return once in twenty-four hours. As the moſt remarkable of theſe is the *ague*, or intermittent fever of marſhy countries; ſo the term *quotidian* ſignifies emphatically a quotidian ague. The paroxyſm uſually returns in the morning. See AGUE.

QUOTIDIAN, *Double*, returns twice in twenty-four hours.

QUOTIENT, QUOTIENS, formed from the Latin *quoties*, *q. d. how often is ſuch a number contained in ſuch another*, in *Arithmetic*, the number reſulting from the diviſion of a greater number by a ſmaller; and which ſhews how often the ſmaller is contained in the greater, or how oft the diviſor is contained in the dividend.

In diviſion, as the diviſor is to the dividend, ſo is unity to the quotient. Thus the quotient of 12 divided by 3 is 4; which is thus diſpoſed, 3) 12 (4 quotient.

QUOVEDO, in *Geography*, a town of Iſtria; ſix miles E. of Capo d'Iſtria.

QUOUSQUE. *Execution with a Quouſque.* See EXECUTION.

QUOYL. See QUOIL.

R.

R, A liquid conſonant, and the ſeventeenth letter of the alphabet.

The grammarians hold it a ſemi-vowel; eſpecially in the Greek, where, in common with the other vowels, it admits an aſpirate, &c. though whether the aſpirate ſhould be ſounded before or after it, is ſome doubt. We find inſtances of each.

Thus ῥεδη the Latins wrote *rheda;* and ῥοδον the Ætolians wrote βροδον; and in Engliſh words derived from the Greek it is followed by an *h*, as *rhapſody*. The ancient Goths, and Teutones, Littleton obſerves, always prefixed *h* to *r*. See H.

The ſound is formed by a guttural extruſion of the breath, vibrated through the mouth, with a ſort of quivering motion of the tongue drawn from the teeth, with the tip a little elevated towards the palate.

In ſome words, as *Rome*, *rape*, and *river*, it has a rough ſound; in others, as *bard*, *card*, *regard*, its ſound is ſmooth. *Re* at the end of many words is pronounced like a mute *er*, as in *theatre*, *ſepulchre*, and *maſſacre*. *Rh* is uſed in words derived from the Greek, as *myrrh*, *rheum*, and *rhyme*.

The Hebrews allow the *r*, or ר, the privilege of a guttural; that is, they never double it, which yet is done by the Arabs, Greeks, and Latins, &c.

Perſius calls the *r*, *litera canina*, becauſe the dogs ſeem to pronounce it in ſnarling; yet it ſhould ſeem to have had a ſofter ſound among the Romans than among us, by its being frequently interpoſed to prevent the claſhing of vowels; as in *rarus*, αραιος, *nurus* from νυος, *murex* from μυαξ, *mus muris* from μυς μυος; and this ſoftneſs was ſuch as frequently occaſioned its being dropt as uſeleſs in writing. Thus for *Hetruſci* they frequently wrote *Thuſci*, and even *Tuſci;* and for *ſurſum*, *rurſus*, *prorſus;* *ſuſum*, *ruſus*, *proſus*.

In effect, there was that agreement between the ſound of the *s* and *r*, that as the Romans avoided the doubling of their conſonants, it was no wonder they here dropped the *r* in ſuch words; the *s* ſupplying the place of both. Hence too it came to paſs, that what they at firſt pronounced *aſa*, *aſena*, *caſmen*, was afterwards *ara*, *arena*, *carmen;* and thoſe firſt named *Fuſii* and *Valeſii*, were afterwards called *Furii* and *Valerii*. Cicero tells us, the *Papirii* were firſt called *Papiſii;* and even fixes the time when the change was made, *viz.* in the year of Rome 415. Feſtus adds, that *olera*, *pignora*, *plurima*, were anciently written *oleſa*, *pignoſa*, *pluſima*.

From the ſame ſoftneſs of the ſound of the *r*, it came to be uſed indifferently with the *l*, in many words; *e. gr. Latiaris* and *Latialis*, *Palilia* and *Parilia*, &c.

Though the *r* more frequently degenerated into *l*; thus *remures* became changed into *lemures;* *interlego*, *perluxeo*, into *intelligo* and *pelluceo;* *frater* into *fratellus*, &c.; and the ſame is ſometimes done between *n* and *r*, as *æreus*, and *æneus*, &c.

In the notes of the ancients, *R.* or *RO.* ſignified *Roma;* *R. C. Romana civitas;* *R. G. C. rei gerendæ cauſa;* *R. F. E. D. recte factum et dictum;* *R. G. F. regis filius;* *R. P. res publica*, or *Romani principes;* and *R. R. R. F. F. F. res Romana ruet ferro, fame, flamma*.

R was anciently a numeral letter, ſignifying 80; according to the verſe,

"Octoginta dabit tibi R, ſiquis numerabit."

When a dash was added at top, as $\overline{R}$, it signified eighty thousand.

The Greek *r*, ῥ, with a small mark over it, signified a hundred; with the same mark under it, it denoted 1000 × 100; thus ῥ signified 100,000.

In the Hebrew numeration, ר denoted 200; and with two horizontal points over it, 1000 × 200; thus ר̈ = 200,000.

R on the French coins, denotes their being struck at Orleans.

R, or ℞, in *Medicinal Prescription*, stands for *recipe, take.*

RAA, in *Geography*, a town of Norway; 10 miles N.E. of Frederickstadt.

RAAB, Gyor, or *Javarin*, a town and fortress of Hungary, situated in a pleasant level country, at the conflux of the Danube, the Raab, and Rabnitz, which surround it. Its houses are constructed of stone, and its streets are large and straight. It is the see of a bishop. Its fortification consists of seven bastions, and it has always a strong garrison, provided with military stores. The fortifications of the city and castle are chiefly the works of the emperors Ferdinand I. and Maximilian II. In this place are seen some Roman antiquities; 56 miles S.E. of Vienna. N. lat. 47° 42′. E. long. 18° 45′.

Raab, a river of Stiria, which rises near mount Rettlstein, and runs into the Danube, near Raab in Hungary.

RAAF, or Raff, Anthony, in *Biography*, the most exquisite and celebrated tenor singer of the last century, was born at Bonn in 1710. He was a scholar of Bernacchi, and equally admired for his taste, expression, and style of singing, by the Italians and Germans. In 1729 his voice was settled from a high treble to a sweet and firm tenor, sufficiently for him to perform a capital part in an opera at Naples. After singing in all the great cities of Italy, he returned to Germany, where he was courted and caressed by all the princes of the empire. He was knighted by the elector of Bavaria, and appointed his chamber musician. In 1751 he performed again at Naples in Metastasio's "Attilio Rigolo," with the Mingotti, and in the letters of Metastasio of that period, we have the poet's opinion of his performance. (Mem. of the Life and Writings of Metastasio, vol. i. p. 403.) He performed in an opera composed by Christian Bach at Manheim in 1770, when the celebrated air "Non so donde viene" was in his part, and which was afterwards sung on our opera stage with such effect by Ciprandi. Raff was at Paris more than once; for in 1780, his 70th year, Laborde speaks of him with great respect. "This celebrated tenor has acquired great reputation, and though at present d'un certain age, he obliges us still to admire his taste, and regret all that he has lost." According to Gerber, Musical Lexicon, vol. ii. he sung at Manheim in 1783, and was living in 1792.

RAAGOE, in *Geography*, a small island of Denmark, near the N. coast of the island of Laland. N. lat. 54° 58′. E. long. 11° 19′.

RAAJAGUR, a town of Hindoostan, in the country of Malwa, near the river Nieunoudge; 74 miles N.E. of Ougein. N. lat. 24° 2′. E. long. 76° 56′.

RAALBRANN, a town of Austria; seven miles S.E. of Meissau.

RAAN, a town of Austria; four miles E.S.E. of Hooren.

RAASAY, an island of the Hebrides, or Western Islands, Scotland, is situated between the main land and the Isle of Skye, and is included within the parish of Portree and shire of Inverness. It is about fifteen miles in length, and from two to five in breadth. On all sides the coast rises to a great height above the level of the sea; and on the east side its ascent is peculiarly bold, and almost perpendicular. The interior is throughout its whole extent mountainous; and hence is better adapted for pasturage than for tillage, but there are nevertheless several spots of very fertile and well cultivated land. The supply of free-stone is almost inexhaustible, and there is likewise plenty of lime-stone. Formerly there were in Raasay several ancient chapels, but these are now ruinous and only used as places of burial. Here are likewise remains of two forts, the highest of which was situated at the southern extremity of the island, and is called Dunn-Cann, as tradition records, from Canne, cousin to one of the ancient kings of Denmark. The other fort, called Castle-Broichin, is a well-known land-mark among sailors. The rock on which it is situated is nearly round, covering an area of little more than seventy feet square; is forty feet high, except at the spot where the stair leads up to it; and is sixty feet above the level of the sea at its base. The castle is built of stone and lime, and seems to have been no less strongly fortified by art than by nature. It was anciently the chief seat of the lairds of Raasay. Now, however, the family residence is at Clachan, or Kirk-town, near the opposite extremity of the island. One of the old Highland alliances has continued for more than two hundred years, and is still subsisting between Macleod of Raasay, and Macdonald of Skye, in consequence of which the survivor always inherits the arms of the deceased; a natural memorial of military friendship. At the death of the late sir James Macdonald, his sword was delivered to James Macleod, esq. the present laird of Raasay. Dr. Johnson, in his Tour to the Hebrides, speaks in warm terms of the elegance and hospitality with which he was entertained by this truly respectable family. Carlisle's Topographical Dictionary of Scotland, 2 vols. 4to. 1813. Pennant's Tour through Scotland, vol. ii.

RAASS, a town of the duchy of Stiria; five miles W. of Marburg.

RAASTORF, a town of Austria; four miles N. of Entzerstorff.

RAAT, a town of Hindoostan, in the country of Agra; 128 miles S.S.E. of Agra. N. lat. 25° 37′. E. long. 79° 58′.

RABAÇAL, a town of Portugal, in the province of Beira; 12 miles S. of Coimbra.

RABANUS, Maurus Magnentius, in *Biography*, a celebrated German prelate in the ninth century, was born at Fulda in the year 785. He was educated partly at Fulda, and partly at Tours, under the famous Alcuin. In the latter situation he distinguished himself by an unwearied application to his studies, and his almost unequalled proficiency in all the learning of the times, both profane and sacred. Not long before the death of Alcuin he returned to Fulda, and embraced the religious profession in its abbey. In the year 810 he was placed at the head of a school belonging to the abbot Ratgarius, and the fame of his superior learning soon raised the seminary into great reputation, and filled it with pupils, many of whom were afterwards promoted to the highest ecclesiastical dignities, and proved the brightest ornaments of the age. In 815 he was ordained priest, and in 822 he was elected abbot of Fulda. About 830 he was, by his prudence and good conduct, the means of effecting a reconciliation between the emperor Lewis le Debonnaire and his sons. Shortly after this, Ebbo, archbishop of Rheims, who had been condemned for high treason, was committed to his custody. In 838, at the request

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of count Erlafrid, he ſent a colony of monks from Fulda, to occupy a monaſtery lately founded by him at Hirſchau; and at the ſame time, in order that he might be enabled to purſue his ſtudies with leſs interruption, he devolved upon another perſon the care of governing the abbey. In the following year the monks expelled him from his poſt, complaining, that in conſequence of his devoting himſelf to his ſtudies, the neceſſary affairs of the monaſtery were neglected, and its eſtates ſuffered to be much dilapidated. He now retired either to St. Peter's Mount, or, as others report, to an humble apartment in the outer court of the abbey, where he ſpent his time in devotion, the ſtudy of ſacred literature, and the compoſition of his various writings, deaf to the repeated entreaties of the monks who exhorted him to reſume his authority. In 847 he was elected to the archbiſhopric of Mentz, and in the following year he ſummoned a council, in which he procured the condemnation of Godeſchale, for maintaining the doctrine of St. Auguſtine reſpecting predeſtination and grace. Rabanus died in 856, at the age of 71. He is deſcribed by Dupin as "having excelled all his contemporaries in the learning of thoſe times, in explaining the principles of the liberal arts and ſciences, and the rules of grammar and rhetoric; in a readineſs in collecting from the fathers of the church common places upon the ſacred ſcriptures; in allegorizing the hiſtorical parts of the bible; in an expoſition of the myſtical reaſons of the ceremonies; in a facility at turning proſe into verſe, and in the manner of reducing all common places in precepts and inſtructions." And Moſheim ſays "he is deſervedly placed at the head of the Latin writers of this age; the force of his genius, the extent of his knowledge, and the multitude of productions that flowed from his pen, entitle him to this diſtinguiſhed rank, and render improper all compariſon between him and his contemporaries." He was denominated the great light of Germany and France, becauſe from his fund of knowledge thoſe nations derived principally their religious inſtructions. His writings were every where in the hands of the learned, and were held in ſo much veneration, that during four centuries, the moſt eminent Latin divines appealed to them as authority in religious matters. His writings conſiſt of Commentaries on the Scriptures; Homilies on the Epiſtles and Goſpels; Scripture Allegories, and a great many theological and literary pieces. Of which the moſt conſiderable number were collected and publiſhed at Cologne in 1627, in ſix vols. folio. Some other pieces of this author, not to be found in that collection, may be found in Baluze's "Miſcellanea," among Father Sirmond's publications, and in the eighth vol. of the Collect. Concil. Moſheim. Dupin.

RABASTENS, in *Geography*, a town of France, in the department of the Upper Pyrenées, and chief place of a canton, in the diſtrict of Tarbes; 10 miles N.N.E. of Tarbes. The place contains 750, and the canton 7422 inhabitants, on a territory of 150 kiliometres, in 25 communes.

Rabastens, or *Rabaſteins*, a town of France, in the department of the Tarn, and chief place of a canton, in the diſtrict of Gaillac; 21 miles S.S.W. of Alby. The place contains 6076, and the canton 8124 inhabitants, on a territory of 152½ kiliometres, in five communes. The principal article of its trade is wine.

RABAT, a town of Africa, in the empire of Morocco, ſituated on the S. ſide of the river Sallee. Rabat had formerly, at intervals, a number of European factories; but the difficulty of navigating the river, the obſtacles ariſing from the arbitrary power of the ſovereign, and the diſpoſition and prejudices of the Moors, have diſguſted the Europeans. Nevertheleſs, Rabat is the moſt proper place for trade of any upon this coaſt, both for its vicinity to Europe, and the quantity of wool, leather, and wax, which it is capable of furniſhing. From its central ſituation in the empire, it is alſo better adapted for the conveying the commodities imported to every part of the country; but a deſpotic government acknowledges no principle but the convenience of the moment; it commands, judges, and executes, without conſidering either cauſe or conſequence. At Rabat, near the mouth of the river, are the ruins of a caſtle, built in the twelfth century by Jacob Almanſor, but entirely deſtroyed by the late emperor. The walls, which ſtill remain, are near two miles round, and fortified by ſquare towers. They encloſe the caſtle, the town of Rabat, and a large ſpace of ground where J. Almanſor built beautiful palaces, and laid out delightful gardens, watered by plentiful ſtreams, which he brought from the neighbouring ſpring. Theſe walls, as well as the palace and the town, were built by Spaniſh ſlaves, whom he took priſoners in his firſt campaign. Within the ſame incloſure he alſo built a very large moſque, of which the ruins ſtill remain. The roof was ſupported by 360 columns of rough marble. Near it was a handſome ſquare tower, ſtrongly built with cut ſtone, near 200 feet high, and called the tower of Haſſan. From this tower may be had an extenſive view over the ſea, and ſhips may be diſcovered at a prodigious diſtance. This monument is in almoſt perfect preſervation. There are ſome docks for building ſhips both at Sallee and Rabat; but the difficulty of navigating the channel, and the probability that the ſand will continue to accumulate, give ground for apprehending, that very ſoon, only veſſels with oars will be able to enter the river. Chenier's Morocco, vol. i.

Rabat *Aſſarmacan*, a town of Perſia, in Farſiſtan; 120 miles E. of Schiras.

Rabat *Arvah*, a town of Perſia, in the province of Kerman; 40 miles E. of Kelvah.

Rabat *el Cadi*, a town of Perſia, in the province of Kerman; 40 miles E. of Maſtih.

Rabat *Maabad*, a town of Perſia, in the province of Kerman; 60 miles N. of Kabis.

Rabat *al Naſſi*, a town of Perſia, in the province of Kerman; 60 miles N.E. of Maſtih.

Rabat *Sheharifian*, a town of Perſia, in the province of Chorafan; 260 miles N.E. of Iſpahan.

RABATE, in *Falconry*. A hawk is ſometimes ſaid to rabate, when, by the motion of the hand of the bearer, the lure, call, &c. ſhe leaves purſuing her prey, or quarry, and recovers the fiſt.

Rabate, in *Commerce*. See Rebate.

RABBA, in *Ancient Geography*, a town of Judea, which belonged to the tribe of Gad; ſituated upon the torrent of Jaba; it was beſieged by Joab, after he had defeated the Ammonites. Here was ſeen the head of Og, king of Baſhan, who alone remained of the race of giants.—Alſo, a town of Paleſtine, in the tribe of Judah. See Rahabah.

RABBATH-AMMON, or Philadelphia, a town of Aſia, ſituated in the mountains of the ſouthern part of Paleſtine; S.E. of Tiberias, and S. of Boſtra.

RABBATH-MOAB, or Arcopolis, a town of Aſia, ſituated at ſome diſtance to the eaſt of the lake into which the river Jordan diſcharges itſelf.

RABBEN, in *Geography*, a ſmall iſland in the gulf of Bothnia. N. lat. 63° 14'. E. long. 22° 14'.

RABBET, in *Carpentry*, is a deep groove or channel, cut in a piece of timber longitudinally, to receive the edge of a plank, or the ends of a number of planks, which are to be ſecurely faſtened in it. The depth of this channel

is

is equal to the thickneſs of the plank, ſo that when the end of the latter is let into the rabbet, it will be level with the outſide of the piece. Thus, in ſhip-carpentry, the ends of the lower planks of a ſhip's bottom terminate upon the ſtem afore, and the ſtern-port abaft, with whoſe ſides their ſurfaces are even. The ſurface of the garboard ſtreak, whoſe edge is let into the keel, is, in the ſame manner, level with the ſide of the keel at the extremities of the veſſel.

RABBET-*Plane*. See PLANE.

RABBETING, the planing or cutting of channels, or grooves, in boards.

RABBI, or RABBIN, a doctor of the Jewiſh law.

The word in its original, רבי, ſignifies *maſter*.

The words *rabbi* and *rabbin* have the ſame ſignification; yet is there ſome difference in their uſe. When we ſpeak abſolutely, and without applying the term to any proper name, we ſay *rabbin*, not *rabbi*. Thus we ſay, it would be unjuſt to attribute to the ancient rabbins all the notions of the modern ones.

On the other hand, when we prefix the term to the proper name of ſome Jewiſh doctor, we ſay *rabbi*, not *rabbin*; rabbi Salomon Jarchi is of this opinion.

Yet rabbi having no plural, we ſay, the rabbins Juda Chiug, and Juda ben Chabin, are the authors of two ancient Hebrew grammars.

The title rabbi is ſaid to have been firſt aſſumed, as a diſtinguiſhing title of honour, by men of learning, about the time of the birth of Chriſt; though it had been anciently given to ſeveral magiſtrates and officers of ſtate, and to thoſe who were of ſuperior rank and condition in life. See Eſther, i. 8. Jer. xli. 1. Job, xxxii. 9.

The firſt Jewiſh rabbi ſaid to have been diſtinguiſhed with any title of honour, was Simeon, the ſon of Hillel, who ſucceeded his father as preſident of the ſanhedrim; and his title was that of *rabban*. The later rabbins tell us, that this title was conferred with much ceremony. When a perſon had gone through the ſchools, and was thought worthy of this degree, he was placed in a chair raiſed above the company; and then were delivered to him a key and a table-book; the key as a ſymbol of the authority conferred on him to communicate the knowledge he had acquired, which key he wore as a badge of honour, and when he died, it was buried with him; and the table-book was a ſymbol of his diligence in his ſtudies, and deſire of farther improvement. To theſe ceremonies were added the impoſition of hands by the delegates of the ſanhedrim, and the proclamation of his title. It has been diſputed, chiefly between Vitringa and Selden, whether our Lord had taken the degree and title of rabbi in the Jewiſh ſchools; Vitringa maintains the affirmative, and Selden the negative. See Jennings's Jewiſh Ant. vol. i. p. 400, &c.

The Jewiſh writers diſtinguiſh betwixt the titles *rab*, *rabbi*, and *rabban*.

In the Old Teſtament we find the term רב, *rab*, in compoſition with ſome other words, employed as a name of office and dignity, but not till the people became acquainted with the Chaldæans, concerning whom only it is uſed. The word, both in Hebrew and in Chaldee, ſignifies ſometimes *great*, ſometimes *many*, and when uſed ſubſtantively, denotes one who is at the head of any buſineſs, of whatever kind it be. Thus רב החבל, *rab hachebel*, is, in the LXX, πρωτευς, רב טבחים, *rab tebachim*, αρχιμαγειρος, *chief cook*. (Jonah, i. 6. Jer. xxxix. 11, ſee alſo Dan. i. 3.) It is uſed in the plural alſo for *chief men* in general, ſuperintendents, or thoſe at the head of affairs. Thus רבי המלך, *rabbi hammelech*, are the chief men employed by the king over the different departments of the ſtate. (Jer. xxxix. 13.) The original term ſuits entirely the import of the Latin word *princeps*, but not of the Engliſh word *prince*, at leaſt in its moſt common acceptation; for they are not the king's ſons, or nobles of any order, who are ſo denominated among the Chaldæans. The word evidently appears to have been equivalent to the term שר, *ſhar*, among the Hebrews. Accordingly, he who is ſtyled by Daniel, in the above cited paſſage, רב סריסים, *rab ſeriſim*, is four times, in the ſame chapter, called שר הסריסים, *ſhar haſeriſim*. (Dan. i. 7, 8, 9. 18.) And this uſe of the name *rab* ſeems to have continued long in Syria, as well as in Chaldea. Thus in the Syriac New Teſtament, it is found in the ſame manner, united with the common appellation of any ſort of officer, in order to denote the principal perſon in that office: thus, *rab-cohana*, (Matt. xxvi. 51.) is the high prieſt, *rab-machſa* (Luke, xix. 2.) is chief of the publicans, and *rab-raghoitha* (1 Pet. v. 4.) is chief ſhepherd. *Rab*, conſtrued in this manner, is equivalent to the Greek αρχι, as uſed in compoſition. The preceding titles are accordingly thus expreſſed in Greek, αρχιερευς, αρχιτελωνης, and αρχιποιμην.

Again, the word *rab* is ſometimes found in that verſion, combined not with the title of any ſort of officer, but with a term denoting the office or charge itſelf; in which caſe it always means the perſon who is principally entruſted with the buſineſs. Thus, *rabbeth* (Matt. xx. 8.) is the ſteward, επιτροπος, he who is over the houſehold; and *rab-conoſhetha* (Mark, v. 35.) is the ruler of the ſynagogue, αρχισυναγωγος. It is not unlikely, though no example occurs in ſcripture, that the term has at firſt been ſimilarly compounded with ſome word ſignifying a ſchool, or, perhaps, with the name of the art or ſcience taught, in order to denote the overſeer of ſuch a ſeminary, or the teacher of ſuch an art. When the term *rab* came to be peculiarly applied, as an honourable compellation of the learned, the word with which it was, at firſt, for diſtinction's ſake, compounded, would be ſuperſeded as unneceſſary. It is, at leaſt, certain, that the Jewiſh doctors, who reſided at Babylon about the time of our Saviour, were called ſimply *rab*. But in the Old Teſtament there is no trace of ſuch a title as *rab*, *rabbi*, or *rabban*, given to a man of letters; nor is any one of the old prophets, or ſcribes, or indeed any other perſon, diſtinguiſhed by this mark of reſpect prefixed to his name. Although the introduction of titles is always occaſioned by the erection of uſeful important offices, it is commonly in the decline of merit that pompous titles are moſt affected. At firſt, without doubt, vain-glory has led many to aſſume them, to whom they did not belong, in right of office, and an intereſted adulation has induced others to give them. Some of them, however, came ſoon, among the Jews, to be converted into a kind of academical diſtinctions, which, in order to give them more weight, are ſaid to have been conferred ſolemnly in their ſchools or colleges, accompanied with certain religious ceremonies. From this practice ſprung literary degrees in Chriſtian univerſities, to which there is nothing ſimilar in all Pagan antiquity, either Greek or Roman, but to which the Jewiſh cuſtom above-mentioned bears an evident and cloſe analogy.

As for *rab* and *rabbi*, the only difference, it hath been ſaid, betwixt them is, that *rab* was the title of ſuch as had had their education, and taken their degree in ſome foreign ſchool, *e. gr.* at Babylon; whereas *rabbi* was the title of ſuch as were educated in the land of Judea, and more honourable than the other. But the higheſt and moſt honourable title was *rabban*; which, they ſay, was never conferred on more than ſeven perſons; *viz.* on R. Simeon, five of his

his defcendants, and R. Jochanan, who was of a different family.

Thofe who belonged to the Jewifh fchools were divided into three claffes or orders. The loweft was that of the difciples or learners; the fecond, that of the fellows, or companions, who, having made conſiderable progrefs in learning, were occafionally employed by the maſters in teaching the young ſtudents: and the higheſt was that of the preceptors, or teachers, to whom they appropriated the reſpectful title of *doctor*, or *rabbi*, differing, as ſome have ſaid, from *rab* only by the addition of the affix pronoun of the firſt perſon. This title *rabbi* was the higheſt accademical honour. In the goſpels, διδασκαλος is given as the Greek tranſlation of the Syriac *rabbi*. (John, i. 38.) Yet this word does not, as the Greek, literally ſignify *teacher;* but, having been conferred at firſt, as a mark of reſpect on actual teachers, and afterwards on other learned men, was juſtly accounted as appoſite a verſion as the Greek language afforded.

In proceſs of time, the term *rabbi* was uſed with great latitude; being beſtowed on thoſe who were not actual teachers; and yet it always retained, ever ſince it had been appropriated to the learned, a relation to learning, and denoted that the perſon who enjoyed it, though not actually employed in teaching, was well qualified for the office. *Rabban*, as ſome have aſſerted, is not the name of a degree ſuperior to *rabbi*, though it ſeems intended for heightening the ſignification, and may be underſtood to denote eminent or learned rabbi, but it was very ſeldom uſed. The title *rabboni*, which we find to have been twice given to our Lord, (Mark, x. 51. John, xx. 16.) is *rabban*, with the addition of the affix of the firſt perſon, and accommodated to the pronunciation of Judea. The uſe of the term *rabban* does not ſeem to have extended far beyond Paleſtine, as we may conclude from the following circumſtance. Although the word *rabbi* is very common in the Syriac tranſlation, the Greek διδασκαλε being generally ſo rendered; yet in the only place where that tranſlator introduces the word *rabboni*, which is that quoted from John, he prefixes *in Hebrew*, that is, in the dialect of Paleſtine, which was then ſo called, adding the explanation given by the evangeliſt, *that is, teacher;* which plainly ſhews that the word *rabboni* was not Syriac. This is the more remarkable, as in the other paſſage, where the hiſtorian interprets, in the ſame manner, the word *rabbi*, adding (John, i. 38) "ὁ λεγεται ἑρμηνευομενον διδασκαλε," that interpreter omits this explanatory clauſe as intended only for the Grecian reader, and of no uſe to thoſe who underſtood Syriac. In the paſſage in Mark, where *rabboni* occurs, as the evangeliſt had added no explanation, his interpreter has not thought it neceſſary to change their own word *rabbi;* thus regarding the difference in ſignification between the two words as inconſiderable, to which we may add, that the apoſtle John explains both by the ſame Greek word. It may be here obſerved that it was cuſtomary to enhance the import of a title by doubling it. Thus our Lord, ſpeaking of the Phariſees, ſays, (Matt. xxiii. 7.) "they love to be called of men, *rabbi, rabbi.*" In this manner he was himſelf addreſſed by Judas, at the time when that diſciple choſe to aſſume the appearance of more than ordinary regard. (Mark, xiv. 45.) The title κυριε ſeems to have been uſed in the ſame manner. (Matt. vii. 21.) The words Jewiſh *rabbies* and Jewiſh *doctors* were commonly uſed ſynonimouſly. In Juſtin Martyr's dialogue with Trypho the Jew, the rabbies are always called διδασκαλοι. But ſome may object that this does not account for the application of the title to our Lord. As he did not derive his doctrine from any of thoſe learned ſeminaries, frequented by ſuch of the youth as were reckoned the flower of the nation, the name *doctor* could not, with propriety, be applied to him. To this objection it may be replied, that as in Judea at that time they ſpoke not Greek, but a dialect of Chaldee, not differing conſiderably from what is called Syriac, it is evident that the actual compellation by which our Saviour was addreſſed, was *rabbi*, equivalent to the Greek διδασκαλος. Beſides, though the title *rabbi* could regularly be conferred only by thoſe who had the ſuperintendency of their ſchools, yet the people would be diſpoſed to give the compellation through courteſy, and on the preſumption that it had been conferred, wherever they ſaw or ſuppoſed diſtinguiſhed abilities in teaching; and this probably was the reaſon why it was given to John the Baptiſt. (John, iii. 26.) Moreover, in the Jewiſh ſtate, a divine commiſſion was conceived to confer all ſorts of dignities and honours, in an eminent manner, and thus ſuperſeded all ordinary rules and human deſtinations. Accordingly, ſome of thoſe who gave the title of *rabbi* to our Saviour, were willing, either ſincerely or pretendedly, thus to account for their doing ſo. Thus Nicodemus aſſigns the reaſon why he ſaluted him *rabbi* (John, iii. 1. &c.), although he knew that he had not been educated in human literature, and had not received from man any literary honours. Upon the whole we may remark, that the term διδασκαλος may be fitly expreſſed, either by the Engliſh term *doctor*, or by the Syriac *rabbi*, which is now ſo much naturalized among us, that its meaning, as a Jewiſh title of literary honour, can hardly be miſtaken. It muſt alſo be allowed, that the rabbi among the Jews of our Saviour's age, was a title in the higheſt degree reſpectful; and on that account it was interdicted by their maſter, even to the apoſtles themſelves. Campbell's Seventh Preliminary Diſſertation.

The modern rabbins are entitled to a conſiderable reſpect among the Jews: they have the firſt places in the ſynagogues; they determine all matters and controverſies of religion, and very frequently pronounce upon civil affairs. They have even a power to excommunicate the diſobedient.

They retain a vaſt number of ſuperſtitious traditions, from the writings of their predeceſſors; which they obſerve as ſcrupulouſly as they do the law of Moſes.

The ancient rabbins were infinite dealers in allegories. Their writings are almoſt wholly allegorical, particularly their comments and interpretations of the ſcripture.

They had a great number of rules, and forms of interpreting and quoting, which ſome modern writers ſuppoſe to have been followed by the apoſtles, in their interpretation and quotation of the prophecies of the Old Teſtament, in the New. See QUOTATION.

RABBINICAL *Character*. See HEBREW.

RABBINICAL *Hebrew*. See HEBREW.

RABBINIST, a follower of the doctrine of the rabbins; a term uſed in contradiſtinction to Caraite.

Father Simon contends for *Rabbaniſt*, or *Rabbanite*, inſtead of *Rabbiniſt:* in effect, the former readings are apparently preferable to the latter; the word being derived from the Hebrew *Rabbanim*, which is the name of the ſect, and which the Jews uſe to diſtinguiſh their doctors from thoſe of the Caraite Jews.

Rabbiniſt, then, ſignifies a Jewiſh doctor who adheres to the traditions of his fathers; not ſimply a rabbin or doctor; for the Caraites, who oppoſe thoſe traditions, have their rabbins as well as the other Jews.

RABBIT, CUNICULUS, in *Zoology*, a well-known animal of the hare kind, or the lepus cuniculus of Linnæus, with a ſhort tail and naked ears. In the wild ſtate the colour of the fur is brown; but in a tame ſtate it varies to a black,

pied,

pied, and quite white; the eyes are of a fine red. In their wild ſtate they inhabit the temperate and hot parts of Europe, and the hotteſt parts of Aſia and Africa. See LEPUS *Cuniculus*.

The female, or doe rabbit, goes with young thirty days, and then ſhe kindles; and if ſhe take not buck preſently ſhe loſes her month, or at leaſt a fortnight, and often kills her young and eats them.

In England they begin to breed at a year old, but in ſome places much ſooner; and they continue breeding very faſt from the time when they begin, four, five, ſix, or ſeven times a year being common with them. They have uſually from four to eight in a litter, and hence it is that a ſmall number at firſt will ſoon ſtock a whole warren, if left to breed a little while undiſturbed. The does cannot ſuckle their young till they have been at buck again; this therefore is to be done preſently, elſe there is a fortnight loſt of the time for the next brood, and the preſent brood alſo probably loſt. When the buck goes to the doe, he always firſt beats and ſtamps very hard with his feet, and when he has copulated with her, he falls backwards, and lies, as it were, in a trance; in this ſtate it is eaſy to take him, but he ſoon recovers from it.

The buck-rabbits, like our boar-cats, will kill the young ones, if they can get at them; and the does in the warrens prevent this, by covering their ſtocks, or neſts, with gravel or earth, which they cloſe ſo artificially up with the hinder part of their bodies, that it is hard to find them out. They never ſuckle the young ones at any other time than early in the morning, and late at night; and always, for eight or ten days, cloſe up the hole at the mouth of the neſt, in this careful manner, when they go out. After this they begin to leave a ſmall opening, which they increaſe by degrees, till at length, when they are about three weeks old, the mouth of the hole is left wholly open, that they may go out; for they are at that time grown big enough to take care of themſelves, and to feed on graſs.

People who keep rabbits tame for profit, breed them in hutches; but theſe muſt be kept very neat and clean, elſe they will be always ſubject to diſeaſes. Care muſt be taken alſo to keep the bucks and does apart till the latter have juſt kindled; then they are to be turned to the bucks again, and to remain with them till they ſhun and run from them.

The general direction for the chooſing of tame rabbits is, to pick the largeſt and faireſt; but the breeder ſhould remember, that the ſkins of the ſilver-haired ones ſell better than any other. The food of the tame rabbits may be colewort and cabbage-leaves, carrots, parſneps, apple-rinds, green corn, and vetches, in the time of the year; alſo vine-leaves, graſs, fruits, oats, and oatmeal, milk-thiſtles, ſow-thiſtles, and the like: but with theſe moiſt foods they muſt always have a proportionable quantity of the dry foods, as hay, bread, oats, bran, and the like, otherwiſe they will grow pot-bellied, and die. Bran and grains mixed together have been alſo found to be very good food. In winter they will eat hay, oats, and chaff; and theſe may be given three times a day: but when they eat green things, it muſt be obſerved, that they are not to drink at all, for it would throw them into a dropſy. At all other times, a very little drink ſerves their turn, but that muſt always be freſh. When any green herbs or graſs are cut for their food, care muſt be taken that there is no hemlock among it; for though they will eat this greedily among other things, when offered to them, yet it is ſudden poiſon to them.

Rabbits are ſubject to two principal infirmities. Firſt, the rot, which is cauſed by the giving them too large a quantity of greens, or from the giving them freſh gathered, with the dew or rain hanging in drops upon them. It is exceſs of moiſture that always cauſes this diſeaſe; the greens, therefore, are always to be given dry, and a ſufficient quantity of hay, or other dry food, intermixed with them, to take up the abundant moiſture of their juices. On this account, the very beſt food that can be given them is the ſhorteſt and ſweeteſt hay that can be got, of which one load will ſerve two hundred couples a year; and out of this ſtock of two hundred, two hundred may be eat in the family, two hundred ſold to the markets, and a ſufficient number kept in caſe of accidents.

The other general diſeaſe of theſe creatures is a ſort of madneſs: this may be known by their wallowing and tumbling about with their heels upwards, and hopping in an odd manner into their boxes. This diſtemper is ſuppoſed to be owing to the rankneſs of their feeding; and the general cure is the keeping them low, and giving them the prickly herb, called *tare-thiſtle*, to eat.

The general computation of males and females is, that one buck rabbit will ſerve for nine does; ſome allow ten to one buck: but thoſe who go beyond this always ſuffer for it in their breed.

The wild rabbits are to be taken either by ſmall cur dogs, or by ſpaniels bred up to the ſport; and the places of hunting thoſe who ſtraggle from their burrows is under cloſe hedges or buſhes, or among corn-fields and freſh paſtures. The owners uſe to courſe them with ſmall grey-hounds; and though they are ſeldom killed this way, yet they are driven back to their burrows, and are prevented from being a prey to others. The common method of taking them is by nets, called purſe-nets, and ferrets. The ferret is ſent into the hole to force them out, and the purſe-net being ſpread over the hole, takes them as they come out. The ferret's mouth muſt be muffled, and then the rabbit gets no harm. For the more certain taking of them, it may not be improper to pitch up a hay-net or two, at a ſmall diſtance from the burrows that are intended to be hunted: thus very few of the number that are attempted will eſcape. The method by the dog, called the lurcher and tumbler, is alſo a very good one.

Some, who have no ferrets, ſmoak the rabbits out of their holes with burning brimſtone and orpiment. This certainly brings them out into the nets, but then it is a very troubleſome and offenſive method, and is very detrimental to the place, as no rabbit will for a long time afterwards come near the burrows, which have been fumed with theſe ſtinking ingredients.

The teſticle of a rabbit is a very good object for examining the ſtructure of this part of generation in animals. The teſticles of various animals are very variouſly compoſed, but all, in general, of veſſels variouſly rolled and folded together; and even the human teſticles are of the ſame ſort, being compoſed ſolely of rolls of veſſels, without any intermediate ſubſtance, only conſiſting of veſſels and their liquors. Phil. Tranſ. N° 52.

The ſkins of rabbits are a great article of commerce, numbers being exported to China: the fur is of great uſe in the hat-manufactory.

RABBIT, in *Agriculture*, is ſometimes employed as farming ſtock. It is ſufficiently evident, however, that this is a deſcription of farming ſtock that can only be attended to with advantage under particular favourable circumſtances of ſoil and ſituation.

Situations proper for Rabbits.—The practice of forming rabbit warrens, can only be beneficially introduced where the lands are not capable of affording crops of tolerable grain or graſs. The great uncertainty of this ſort of huſbandry

huſbandry renders it much more advantageous for the farmer to depend upon ſuch crops, than on it. In hilly tracts of land, where the plough cannot be introduced, and where the ſoil is of ſuch a light ſandy porous nature, as to afford little or no graſs for the paſturage of ſheep, or in rocky ſituations, this ſyſtem of management may take place with profit to the farmer.

And it has been obſerved by the author of the Rural Economy of Norfolk, that this ſort of animal is there confined to the heathlets, and the barren hills upon the coaſt. A level country is unfit for rabbit-warrens, but convenient for the plough; on the contrary, rabbits delight in the ſides of ſandy hills; which, where turn-wriſt ploughs are not in uſe, are extremely inconvenient for tillage; and, when cultivated, are generally unproductive. For the rabbit, on level ground, finds it difficult to make its burrow; the excavated mould is all to be dragged upward to the ſurface; hence a piece of ground altogether level, can ſeldom be ſtocked ſucceſsfully with rabbits; unleſs it be firſt laid up by art, at a great expence, into inequalities. While, on the contrary, againſt the ſide of a ſteep hill, the rabbit has no difficulty to encounter; the declivity affords him a ready vent for his mould; his work is all down hill; and, unleſs the ſoil be too ſtubborn, or too rocky, for the rabbits to work freely among, a broken hilly country may generally be ſtocked with advantage; provided a tolerable market for the carcaſſes can be had within reach. He thinks there are, perhaps, few ſandy or other looſe-ſoiled hills, which would not pay better in rabbit-warrens, than under any other courſe of huſbandry that could be introduced on them. And it is afterwards ſtated, in a minute, that on a conſiderable part of a farm which lies towards the coaſt, being hilly and very badly ſoiled,—more eſpecially the tops and ſides of the hills, which have always been full of rabbits in ſpite of all endeavours to deſtroy them,—the tenants laſt year (1782) applied for leave to convert this part, about ninety acres, into a rabbit-warren. Leave was given, and an allowance made them of half the eſtimated expence of raiſing a ſod-wall fence round theſe ninety acres. He adds, that the fence was nearly finiſhed, and the warren had, that year, turned out beyond expectation; it was valued by one who ought to be the beſt judge of its worth, at forty pounds a year; which is nine ſhillings an acre. And that, as the part of a farm, theſe ninety acres were not worth five ſhillings an acre; at the then preſent price of barley, they were not worth more than four ſhillings an acre. It is, therefore, obſerved, that for ten pounds a real improvement of twenty pounds a-year has been made and ſecured; for the warrener will, through neceſſity, hereafter keep the fence in repair for his own advantage. He remarks, that the fence is made about four feet high, and three feet thick; faced with greenſward; and capped with furze, ſo as to project eight or ten inches over the face. Some of it was done for a ſhilling a rod; but the ſpring putting in, fourteen or fifteen pence a rod of ſeven yards was obliged to be given. And a neighbouring warrener, that winter, gave ninepence for the wall without the capping; which he does not mean to put on till the wall be thoroughly ſettled. This is very judicious; as ſeveral rods of that above-mentioned ſhot down in different places, as is often the caſe in ſuch ſort of work. It is further obſerved, that there are ſeveral patches in the vallies, and ſome on the tops of the hills which have uſually been tilled. Some of theſe were laſt year (1781), and ſome of them ought to be every year, cultivated for the rabbits; thus, when the graſs gets foul or moſſy it ſhould be ploughed up; fallowed, ſowing turnip-ſeed for preſent feed, (they will not let rape get up,) and to prepare the ſoil for barley and graſs-ſeed the enſuing year. Thus a regular ſucceſſion of feedage might be kept up for the uſe of theſe animals. And in the Rural Economy of Yorkſhire it is ſtated, that at Dalby there are two pretty large warrens. At Lockton there is one now (the time of writing) planting. And there are other parts of theſe heights which might be profitably ſtocked with rabbits. In general, however, property is too much intermixed to admit of an improvement, which is ſingularly adapted to the nature of theſe high grounds. And, that in ſituations where the ground, as well as the ſoil, is ſuitable to rabbit-warrens, and where an extent of it, ſufficiently large, can be collected together in one property, there is a very ſtrong reaſon why it may be profitably ſtocked with rabbits. It is added, that one of the warrens of this diſtrict contains eighteen hundred acres of ſurface; moſt of it covered with a black moreland ſoil; part of it a barren gravel; ſome little of it a thin lime-ſtone loam; not worth perhaps, on a par, for the common purpoſes of huſbandry, a ſhilling an acre; nevertheleſs, theſe eighteen hundred acres are let, as a rabbit-warren, for three hundred pounds a-year! He will not pretend to ſay, that this warren is worth three hundred pounds a-year, nor aſſert that it is not worth a ſhilling an acre to a huſbandman. If it be worth two hundred and fifty pounds, as a warren, and ſuppoſing it to be worth even two ſhillings an acre, as a farm, it ſtill is ſufficient evidence of the profitableneſs of rabbit-warrens, in proper ſituations.

And in ſpeaking of the wolds, he obſerves, that the warrens are numerous, and ſome of them very extenſive. Coldham warren is at preſent, he believes, the largeſt upon the wolds; and, probably, the moſt valuable warren in the iſland. The Coldham farm contains about nineteen hundred acres; and, ſpeaking generally, it is all warren; not, however, wholly appropriated to rabbits, a flock of from ſix to eight hundred ſheep being kept within the warren walls; principally, however, on one ſide of the warren, away from the burrowing grounds. And this appears to be a practice peculiar to the wolds of Yorkſhire and Lincolnſhire, whoſe hills likewiſe abound much with rabbit-warrens, and where better ſoil is appropriated to rabbit-warrens, than is perhaps in any other part of the iſland. The Coldham warren, in point of ſoil, is moſt of it worth from ten to twelve ſhillings an acre; ſome of it fifteen or ſixteen ſhillings. But the preſent bleakneſs of the ſituation renders it of little more than half the value. As theſe better parts become moſſy, they are incloſed by a ſod-wall, the ſurface pared and burnt, and the ſoil broken up for arable crops. Having afforded a ſucceſſion of crops of corn, turnips, &c. they are ſown with graſs-ſeeds, and again thrown open to the rabbits and ſheep. In 1783, there were about two hundred acres of this farm under the plough, beſides ſome little ſheep-walk which lay without the warren walls. The warren therefore, at that time, contained from fifteen to ſixteen hundred acres; and, adjoining to Coldham, are two more conſiderable warrens; ſo that there are, perhaps, three or four thouſand acres of tolerably good land, lying together, and appropriated principally to rabbits.

But it is remarked in reſpect to ſoil, that there is a diſadvantage in ſtocking a *rich* ſoil with rabbits; a fluſh of graſs, after a dry ſeaſon, is found to produce a ſcouring; which ſometimes carries off great numbers. With regard to the burrows on the high wolds, they are moſtly on the ſides of hills; at Coldham, principally in one deep valley; whoſe ſides are ſteep; giving the rabbits great freedom in working. The ſoil, in this caſe, is about eight or ten inches deep, under this a chalky rubble, of ſome inches thick, lying on a chalk-ſtone rock. The burrows are in the ſub-ſoil,

between the ſoil and the rock, and chiefly towards the tops of the hills. And thouſands of daws build their neſts in the burrows, to the great annoyance of the rabbits. But at Driffieldgreets, near Driffield, where there are two large warrens, the ſurface is a dead flat; nevertheleſs, the warrens are well ſtocked and productive; a proof that a flat ſurface may, in ſome caſes, be profitably ſtocked with rabbits. The ſoil, in this caſe, is a light ſand or gravelly loam, which is very proper for the purpoſe to which it is applied.

In ſome of the very ſouthern diſtricts, rabbits occupy the different ſandy hillocks, and many of the rocky waſtes; but there is nothing of any great importance in the management of them. Both the grey and black ſorts prevail in ſome inſtances. The writer of the Suſſex Report on Agriculture thinks, that this ſort of ſtock is the nuiſance of a county; it increaſes and flouriſhes in proportion to the ſize of the waſtes, and is, of courſe, productive in this county. From Horſham foreſt, Aſhdown, and other parts, very conſiderable quantities of rabbits are ſent to be diſpoſed of in London.

In ſome of the midland counties they are found to be ſufficiently abundant upon the ſandy parts of waſte lands; in incloſed level land, it is thought that they are no better than vermin, and that ſhould the commons be pretty generally incloſed, they muſt be in a great meaſure exterminated to make way for a better ſort of ſtock; in incloſed land, they can only be kept with propriety, either in ſmall warrens near the houſe, well fenced in, for family conſumption; or on ſandy or rocky precipices, impracticable to the plough, where they ſhould alſo be fenced in. It is well known, that in the neighbourhood of commons abounding with them, great pains and expence are often uſed to fence the incloſed adjoining lands from their depredations. Rabbits are certainly a ſort of ſtock unworthy of being cultivated, or bred in any conſiderable numbers, on incloſed and cultivated land; yet doubtleſs deſerving conſiderable attention on impracticable ſandy or rocky ſteeps, which may at the ſame time be planted; and when properly fenced in, and thus ſtocked, ſuch land ſeems in a ſyſtem of the higheſt improvement of which it is capable.

In Cheſhire many doubts have been entertained as to the advantages of encouraging the breed of rabbits, and many farmers are ſo utterly averſe to them, that they would wiſh the whole race to be entirely exterminated. Where land is incloſed, and applied to arable purpoſes, it ſeems agreed that by the injury they do to the fences, by the interfering with the cultivated land, and by the deſtroying of its produce, they are much more detrimental than profitable. It is, however, thought to be a queſtion for conſideration, whether, if a portion of weak ſand, or dry heath land, was ſet apart for a rabbit-warren, well fenced, and kept diſtinct for this purpoſe; it might not, in ſome ſituations, be more profitably employed in this than in any other manner.

By ſome it is ſuppoſed, that it may be occaſionally neceſſary to reſtrain them, on account of their aſtoniſhing fecundity; but that to attempt to exterminate them, if it were poſſible, could not be politic or adviſeable, as they furniſh food for foxes, which would otherwiſe prey on game and poultry.

This ſort of ſtock is frequently met with in many other diſtricts on tracts and ſpots of ſimilar kinds of barren and uncultivable ſorts of land, and is probably the moſt convenient, appropriate, and beneficial deſcription of any by which they can poſſibly be occupied and managed.

Stocking.—In the ſecond of the above diſtricts, it is ſtated, that in ſtocking a warren, whether the ſurface be flat or hilly, artificial burrows are made, to reconcile the rabbits to the ground, and to preſerve them from vermin, until they have time to make their own burrows. And that in making theſe burrows, an improvement has lately, it is obſerved, been hit upon. They are bored with an auger, of a diameter large enough to make a burrow of a ſufficient width. In a level warren, theſe augers may, from time to time, be found uſeful in forming ſuch holes. They, however, in moſt caſes, are capable of making burrows for themſelves without any difficulty.

But in regard to ſtocking in Lincolnſhire, according to the agricultural ſurvey of that diſtrict, ſome of the warren lands are ſtocked in the proportion of three couple only to the acre; while in others, it is in a conſiderably larger proportion. And one buck or male rabbit is ſaid to be there ſufficient for one hundred does, or females; but this is certainly a much larger proportion of the latter ſort, than is allowed in moſt other diſtricts. On the wold warrens of Yorkſhire, according to Mr. Marſhall, *one* male is conſidered as ſufficient for only *ſix* or *ſeven* females, and the nearer they can be brought to that proportion, the greater the ſtock of young ones that may be expected, it being the nature or economy of the males to deſtroy their young, eſpecially when the proportional number is too great.

Fencing.—The fencing in theſe ſituations is ſod-wall, capped with furze, or of late with ſtiff ſtraw, forming a kind of thatch. And it is ſuppoſed, that reed would be found admirable in this intention. The warrens near Driffield are fenced with paling; an expenſive fence in the outſet, and always under repairs. A brook, though ever ſo deep, is found to be inſufficient as a fence againſt rabbits; one ſide of Driffieldgreets warren is bounded by a brook; but it is nevertheleſs fenced with paling. When the rabbits can evade this, they readily ſwim the brook. The neceſſity of good fences is of courſe ſufficiently evident in this view, as well as that of preſerving them from the deſtruction of vermin, and birds of prey, ſuch as eagles, kites, &c. which are taken in ſteel traps, placed on elevated mounds of earth, where they delight to ſit. It is this kind of fencing and coping, or kidding the top, together with food in winter, nets, traps, and other things for taking them, with charcoal for drying the ſkins, warreners' men for killing and carrying, horſes for carrying them to market, &c. that conſtitute the great expence of this ſort of management.

Different Breeds.—There are many different breeds or varieties of theſe animals, but thoſe that are employed as ſtock for warrens are the common grey and ſilver-grey breeds: the former of which is found to be conſiderably more hardy and much better for the purpoſes of food; but the latter has greatly the advantage in the value of the ſkin. In the above warrens, till lately the common grey rabbit, probably the native wild rabbit of the iſland, was the only ſpecies. At preſent, the ſilver-haired rabbit is ſought after, and has, within the few laſt years, been introduced into moſt warrens. The ſkin of the grey rabbit is cut; that is, the wool is pared off the pelt, as a material of hats; whereas, that of the ſilver-haired rabbit is dreſſed as fur; which, the writer underſtands, goes principally to the Eaſt Indies. The colour is a black ground, thickly interſperſed with ſingle white hairs. The ſkins of this variety ſell for about four ſhillings a dozen more than thoſe of the common ſort; a ſufficient inducement for propagating it in preference to the grey ſort in moſt caſes. If the white ſorts could be introduced they might be ſtill more valuable.

Management, Expences, Profits, &c.—This is a ſort of ſtock that on the whole only requires a ſlight attention; it is, however, neceſſary to ſupply the rabbits with additional food in the winter ſeaſon, when the weather is ſevere, ſuch

ſuch as fine green hay, ſainfoin, clover, turnips, and others of the ſame ſort, which muſt be diſtributed over the warrens. It is ſuppoſed that turnips anſwer the beſt in deep ſnows, as the rabbits can diſcover them by the ſcent. This ſort of food is given in the quantity of two or three large cartfuls to a thouſand couple *per* day, and one load of hay in the ſame time during a ſtorm. It is likewiſe ſometimes the practice to diſtribute billets of new cut aſh-boughs, gorſe or whins, and other ſimilar woods in the warrens, the bark and other parts of which is eaten, by which the proportion of hay is leſſened in a conſiderable degree. In great ſnows, it is neceſſary to clear them away from the ditches or fences, to prevent the rabbits from getting over them.

It may be obſerved, that the rabbit is a ſort of ſtock that begins to breed at an early age, as at eight, ten, or twelve months, going only about thirty days with young, the young being a little more than three weeks old before they appear from the burrows, during which time they are ſuckled twice in the day by the mother. It is therefore evident, that they may breed three or four times in the courſe of the year under good keep, as the does take buck almoſt immediately after producing their young. In warrens that are incloſed, it is however ſaid, that they ſeldom breed more than two or three times in the year. The annual produce *per* acre, is moſtly eſtimated at from three or four, to eight or ten couple, yielding a profit of from eight, ten, or even fifteen ſhillings, where they are conducted under a good ſyſtem of management. And the produce is, as has been ſeen, the largeſt on new lands; however, much of the profit muſt always depend on ſituation, ſo as to be near good markets.

Theſe animals are in what is termed ſeaſon from the end of October to the beginning of January, in which period the beſt ſkins are produced: of courſe a large proportion of them is killed in this ſhort time. The farmer often ſuſtains great loſs in what by the purchaſers are called *half* ſkins, *quarter* ſkins, and *racks*, ſixteen of which are only conſidered as a whole ſkin. The rabbits are diſpoſed of by the hundred, ſix ſcore couple being conſidered as an hundred.

The following ſtatements are given in the Agricultural Survey of Lincolnſhire, on this ſort of management. On the authority of Mr. Chaplin, it is ſtated that on 1000 acres it is fair to kill 2000 couple, which are ſold by the hundred, as above; which have ſold at 10*l.* on an average of ten years; laſt year 13*l.*; killing and looking after, 60*l.* for 1000 acres. And on the warrens between Gayton and Tathwell, ſilver ſkins have been from 15*s.* even to 21*s.* a dozen; but the common grey rabbit is ſo much hardier, that if a warren be ſtocked with both, there will, in a few years, be nothing but greys. It is added, that from Louth to Caſtor, 18 miles, 10 of them are warrens, chiefly ſilvers; rent 2*s.* to 3*s.* an acre. They plough a part every year for corn and turnips; and laying down again with ſeeds, let down the fences for the rabbits to enter. Warrens are reckoned profitable, ſo that ſome fortunes have been made on them. It is further ſtated, that in point of ſkins, thoſe bred about May-day undergo no change from their white colour, but from a white rack become a whole ſkin; bred at Lady-day, become black; in June, white; in July, black; in November, white again: then in full ſeaſon, as the carcaſes are alſo. The ſkins ought to have thoſe colours on the inſide, when flayed, or ſtripped off from the rabbits. The writer further ſtates, that from 250 acres of land, that were ſainfoin worn out, and planted with rabbits, the following was the account many years ago; but all prices, rent, &c. &c. are calculated at the preſent rates; and it is to be noted, that the ground being thus new to rabbits was much more productive than old warren land is found to be, as they breed much better on ſuch new than on old land. Uſed to kill about 2000 couple; ſtock left about 700 couple. Sod banks that coſt, thirty-five years ago, 1*s.* 2*d.* a rood of ſeven yards, would now coſt 2*s.*; furze faggots were 7*s.* a hundred, that is, 5*s.* for the furze, and 2*s.* kidding, now doubled. Banks will laſt about ſeven years, in a middling way; from three to twenty: want facing once in ſeven years, at half the firſt expence; want capping in three years with the furze. Laying on, or capping, 3*d.* a rood now. It was then reckoned that 250 acres would clear 100*l.*, beſides rent, which then was 1*s.* an acre. Fencing annually half a mile 800 yards 133 roods at 1*s.*, 6*l.* 13*s.*; for facing furze, a kidd will do a yard; 2½ miles kidding, at a kidd a yard, 4400 yards and kidds, at 15*s.* now, for 120 or 27*l.* 10*s.*, or *per annum* 9*l.* 3*s.* 4*d.* add 6*l.* 13*s.*, it is 15*l.* 16*s.* 4*d.* *per annum*. A warrener 35*l.*, a cow, fuel, and houſe: in all 40*l.* Extra labour, killing 18*s.* a-week for ſixteen weeks, 14*l.* 8*s.* Alſo for a month 18*s.* a-week, 3*l.* 12*s.*: in all 18*l.* Beſides nets and thread, 12 at 60 yards each; laſt ſix or ſeven years; would coſt 1*l.* 11*s.* 6*d.* Traps 5*s.* a-year. The men who kill will carry. Four horſes for ſix weeks, 1*l.* 4*s.* a-week, 7*l.* 4*s.* Charcoal for drying ſkins, 5*s.* A perſon to order ſkins, that is, clear from fat, and drying, five weeks; a uſeful woman will do it, 1*l.* Winter food (after three days ſnow they muſt be ſerved) cannot be leſs than 10*l.* a year on 250 acres.

Recapitulation.

	Per Acre. £	s.	d.	£	s.	d.
Rent now	0	6	0			
Tithe	0	0	0	87	10	0
Rates	0	1	0			
Fencing	0	1	3	16	16	4
Warrener	0	3	2	40	0	0
Extra labour	0	1	6	19	0	0
Nets, traps, and charcoal	0	0	2	2	1	6
Horſes	0	0	6¼	7	4	0
Winter food	0	0	0	10	0	0
	0	13	7¼			
Poiſon, powder, and ſhot, and ſundries; foxſkins 1*s.* each				2	0	0
				184	11	10

Produce.

2000 couple at 9*d.*	75	0	0
Skins 9*d.* to 1*s.* 3*d.*; average 1*s.*	200	0	0
	275	0	0
Expences	184	11	10
Profit	90	8	2

But it is, notwithſtanding this ſtatement, ſuggeſted, that if he had a warren of his own, he would plough it up for corn, &c.; thinking tillage now more profitable than rabbits. And the author adds, that at Partney fair, meeting with Mr. Grant of Withgul, and diſcourſing with him upon warrens, he informed him that a common ſtock in winter was three couple *per* acre, and the produce five or ſix

couple killed; that killing, carrying, &c. might amount to ſomething more than 1*s.* an acre: the ſort *ſilver ſprig*, which will not do well in other counties, where they have been tried. He has now 1000 acres of warren; and upon 1000 acres the ſtock is 2600 couple, and kill 5000 couple annually. New land is the moſt productive. On ſuch a warren, the rabbits muſt have two loads of hay a day in a ſtorm, or two or three large waggon loads a day of turnips. The warrener has 20*l.* a-year, and two cows; the killers 8*s.* or 9*s.* a-week, and board for ten weeks. Silver ſkins now are 10*s.* a dozen; have been 14*s.* to 15*s.* Fences 60 a-year; no croſs ones; no buildings. The immenſe occupation of Mr. Grant and his ſons, being much the moſt conſiderable in the county, with the circumſtance of making an ample fortune, made him deſirous of ſeeing him. It is added, that 20 years ago, Driby had a warren of 12 or 1300 acres; and the rent of the farm including it, 300*l.* a-year, which rent has been doubled by ploughing. And Mr. Kerſhaw obſerved, that the community received next to nothing from warrens; which is probably the caſe, as has been ſeen above, where the land is capable of being managed under the plough, or the ſyſtem of graſs.

And the calculation of Mr. Parkinſon, of a warren of 700 acres under rabbits, in the ſame diſtrict, ſtands thus: rent 5*s.*; ſtanding ſtock 2000 couple of ſilver hair, valued to the incoming tenant at 2*s.* 6*d.* a couple ten years ago, and demanding a capital of 1400*l.*; and carefully *typed* to catch all extra bucks, ſo as to leave only one-fourth of the total number of bucks.

	£	*s.*	*d.*
Produce 3000 couples for ſale, worth, on an average of ſeven years paſt, 15*l.* a hundred	450	0	0
But as ſome are greys, the price 10*l.*	300	0	0
	750	0	0
Take the average of the two, that is, ſilver hair of the Wolds, and greys of Lincoln Heath, it will be on a medium	375	0	0

Or about 10*s.* 10*d.* an acre. And add to theſe, 350 ſheep, kept by a courſe of tillage; that is, ploughing up 50 acres annually for paring and burning for turnips; then ſpring corn and ſeeds, which ſeeds ſheep-fed one year, and thrown open to the rabbits: the ſheep at 2*d.* *per* week for 25 weeks, will amount to 72*l.* 10*s.* This is inferior to the common produce of ſheep; but the rabbits will demand hay, &c. to the amount of the difference; and alſo a team of horſes muſt be kept for the cultivation of 100 acres of land, and carrying the rabbits to market. Hence,

	£	*s.*	*d.*
The 50 acres of corn will be conſumed by the horſes, and maſter's and warrener's cows, &c.	447	10	0

Expences and Profits of a Rabbit Warren Farm.

Dr.	£	*s.*	*d.*
To rent 700 acres of land, 5*s.* *per* acre	175	0	0
To tithe, one-ninth	19	8	10
To town charges	21	17	4
To maſter and miſtreſs's board and clothing — £ 52 0 0			
To four children, 10*l.* *per* year — 40 0 0			
To four ſervants, 10*l.* ditto, *viz.* three men and one maid — 40 0 0			
To extra labourers, carpenters, and other workmen — 30 0 0			
Total houſekeeping	162	0	0
To Huſbandry.			
A warrener, with houſe, and two cows — 26 0 0			
To three extra labourers, mowing corn and hay, repairing, fencing, aſſiſting in killing rabbits, &c. — 72 0 0			
To blackſmith's bill — 15 0 0			
Carpenter's ditto — 22 0 0			
Extra turnip-hoers and hay-makers in ſummer — 20 0 0			
	155	0	0
	533	6	2

Per Contra Cr.	£	*s.*	*d.*
By ſlaughter of 3000 couple of rabbits, 15*l.*	450	0	0
By 300 fleeces of wool, 4 and 5 to tod, about 65 tod, 20*s.* *per* tod, *viz.* 200 ewes and 100 hogs	65	0	0
Sell about 80 he-hogs, from turnips, 24*s.*	96	0	0
And about 50 drape-ewes, 21*s.*	52	10	0
By 50 acres barley, 3 qrs. *per* acre, and oats — £ 150			
Deduct ſeed and horſe corn — 70			
Remains 80 quarters, at 21*s.*	84	0	0
By 20 beaſts, to ſell about five to graziers, 8*l.* *per* head	40	0	0
By ſwine, poultry, &c.	20	0	0
Profit in breeding foals	20	0	0
Total	827	10	0
Expences	533	6	2
Net gain	294	3	10

It is noticed, that as the family is maintained out of the farm, the intereſt of the capital of about 1400*l.* is not charged, becauſe the intereſt would be only 70*l.* *per* year, when they are maintained out of the farm, with a profit of 294*l.* 3*s.* 10*d.*

It is ſtated by the writer of the above agricultural ſurvey, that the warren of North Ormſby, occupied by the late Mr. Anſell, is ſuppoſed to be one of the beſt managed in the county. The rabbits chiefly conſiſt of ſilver-greys; the land of the yearly value from 2*s.* 6*d.* to 8*s.*, and ſome little of it 10*s.* the ſtatute acre. The occupier was of opinion, that lately his warren lands would have paid him better, had they been applied to the purpoſe of growing corn, and graſs ſeeds for keeping ſheep. The rabbit produce he ſuppoſed to be from 8*s.* to 10*s.*; in ſome particular years they have paid from 15*s.* to 21*s.* an acre; but to obtain any extraordinary profit, very great care muſt, he thinks, be taken in killing the many different kinds of vermin which depredate, and, without the utmoſt vigilance, will

will quite depopulate the warrens. A conſiderable expence alſo attends the neceſſity there is for night-watchers, to protect them from the infinitely worſe vermin, the poachers. With him the ſilver-grey ſkins have been ſold from 8½*d.* to 15*d.* and 16*d.* *per* ſkin: the laſt two years they have only brought from 10*d.* to 11*d.* *per* ſkin; but to obtain even theſe prices, they muſt be what is called full ſeaſoned, whole ſkins, and of the choiceſt colours, with reſpect to which the faſhion varies very greatly. The carcaſes, of late years, have not averaged net into pocket more than 4*d.* *per* couple, after the expence of drying them, and by means of light diligence carts, having them carried to markets 30, and ſometimes more than 60, miles to obtain even that ſum. This inconvenience is occaſioned partly by its being neceſſary to kill eight or ten parts of a year's ſlaughter in ſo ſhort a time, as between the ſecond week in November and Chriſtmas, on account of their ſkins being then only in full prime, and as they are alſo very ſoon ſubject to become putrid, much more ſo than hares; and their being obliged to be packed cloſe together, very greatly increaſes the miſchief.

The eſtimate of the warren on the eſtate at Thoreſway of 1700 acres, as given by the tenant Mr. Holdgate, with the ſilver ſort of rabbits, is this:

	£	s.	d.
Labour, three regular warreners, with extra aſſiſtants at killing	85	0	0
Fences	42	10	0
Winter food	42	10	0
Nets, traps, &c. &c.	14	3	4
Delivery	21	5	0
Rent is ſaid to be 7*s.* an acre	595	0	0
	800	8	4
The capital employed is that ſum with the addition of ſtock paid for; ſuppoſe this as ſtated about three couple an acre at 2*s.* 4*d.*	595	0	0
	1395	8	4
Intereſt on that ſum one year at 5 *per cent.*	69	15	5
	1465	3	9

Annual Account.

	£	s.	d.
Expences as above	800	8	4
Intereſt	69	15	5
	870	3	9
Produce 10,000 couple, at 2*s.* 4*d.*	1166	13	4
Expences	870	3	9
Profit	296	9	7

Or about 22*l.* *per cent.* (the 5 *per cent.* included) on capital employed. This the writer obſerves is very great, reckoned on the capital, but ſmall reckoned by rent, as it amounts to only half a rent. But ſuppoſe the groſs produce of 1500, which he takes to be nearer the fact; then the account will ſtand thus:

	£.	s.	d.
Produce	1500	0	0
Expences	870	3	9
Profit	629	16	3

or 45 *per cent.* on the capital.

But it is ſuppoſed that, in whatever way it is taken, it explains the reaſon of ſo many of theſe nuiſances remaining. The inveſtment of a ſmall capital affords a profit or intereſt that nothing elſe will, and of courſe the proprietor will be ſure never to convert them to better uſe. But, it is aſked, what ſays the public intereſt? Here are only 200*l.* expences to 600*l.* rent, what is the population, the induſtry, the improvement! The landlord gets the loweſt of rents, the tenant makes a good profit, they divide all, and the reſt of the world is little or no better for them.

Rabbit-warrens are met with in moſt other diſtricts of the kingdom, both towards the ſouthern and northern parts of it; but more abundantly in thoſe of the north. In the ſouth they have in moſt places been got quit of from any tolerable ſort of land which is capable of affording any other better kind of uſeful produce, but in ſome parts of the north they ſtill occupy ſpaces of ground which are of a good quality, and which might be converted to better purpoſes with great advantage to the proprietors, as well as farmers. Warrens of this nature, in ſome caſes, in both theſe ſituations, however, ſtill continue to be well ſtocked, and in the latter, are in particular inſtances of pretty conſiderable extents.

In Cheſhire, the principal rabbit-warrens are on Delamere foreſt, though on ſeveral of the heaths and ſand-lands theſe animals are frequently met with, but not in ſuch numbers together as to conſtitute warrens.

In the north riding of Yorkſhire, alſo, a few rabbit-warrens are met with on the detached moors, as well as on the ſkirts of the higher moors; but they are not ſo extenſive as to make them an object of much attention. The kind of rabbits here are moſtly the common grey, with the exception of the ſtock on a warren at Nappa, in Wenſley-dale, of about one hundred and fifty or two hundred acres, which conſiſts of ſilver-greys, and is the only warren which is known, in this diſtrict, to be entirely ſtocked with this ſort: they are ſtated to have been brought ſome years ſince from a warren in the above noticed diſtrict of Lincolnſhire, to which they had been originally introduced from Ireland. The ſkins of this kind of rabbits are ſuppoſed to be worth double thoſe of the grey; they are not uſed for felts, as the laſt, but dreſſed as furs, and ultimately exported in that ſtate for the China market, where they are worn by the principal people; an uſe which has been already noticed and conſidered in regard to the demand which it creates.

But in the northern parts of Lancaſhire, warrens of this kind are more frequent. At Roſſall-hall, in the tract called the Fild, one of great extent has exiſted for a very great length of time; but the preſent proprietor, B. F. Hiſketh, eſq. has, with great propriety, lately reduced it very conſiderably, by taking two large fine farms from it, ſo that it now conſiſts only of about a hundred acres of the moſt ſandy barren part.

This warren formerly ſupplied a great number of rabbits for ſale in the markets and hat manufactories of the neighbourhood, and of courſe became a ſource of profit to the owner, though the management was very imperfect. The farms taken from it will, however, become far more advantageous to him.

The ſtock here was formerly of the grey rabbit kind, and it is ſtill the ſame on the warren which remains, which is however far from being ſufficiently ſtocked.

There was formerly no ſort of green food ever cultivated for this ſort of ſtock; nor has it been yet attempted on the preſent warren, but the proprietor intends to have it done in an effectual manner. Nor have the rabbits ever been fed in the winter ſeaſon with either hay, bark, or any other ſort

of

of food; their being ſo near to the ſea-coaſt perhaps renders it unneceſſary.

The only mode of taking the rabbits here has hitherto been in nets, by what is termed *running* them by means of dogs.

At Heyſham the Rev. Mr. Clarkſon has a tract of coarſe ſtony land above his houſe, of about twenty acres, which has a great number of grey rabbits in it, and is well ſuited for a rabbit-warren, as it is incapable of being converted to any better purpoſe on account of the ſeverity of the weſt winds, and the effects of the ſea-ſpray thrown up by them, as well as its rocky, whiny nature.

The principal rabbit-warrens in this county are, however, thoſe in the ſandy tracts in the ſouth and north ends of the iſle of Walney, and in the neck of land from which it ſeems to have been ſeparated. The rabbit-warren at the north end of this little iſland occupies a conſiderable ſpace of ground of this barren ſandy quality, as well as that at the ſouthern point. The former is ſtocked wholly with rabbits of the grey kind, this ſort being in moſt demand. There is much expence attending theſe warrens in many caſes.

The expence of ſtocking in order to keep them up is ſometimes very conſiderable. In this inſtance the farmer has upwards of two miles of dike fence compoſed of ſod and ſtone to keep up and in repair, which coſts from five to ſix ſhillings the rod of ſeven yards. The expence of a man conſtantly to look after the rabbits, and keep the dike fences in proper order and repair. That of the purchaſe of the traps or types, which coſt 3*l.* a-piece, and eighteen are required; but they laſt long, and coſt little in repairs.

The providing net and dogs, which is annually about 10*l.*

The charge of taking the rabbits to Ulverſton, twice in the week, during ten weeks, which is 5*s.* each time.

The ſale of rabbits is annually from one hundred and fifty couple upwards, at the rate of 2*s.* 6*d.* each couple. They are uſually ſold to Lyons of Preſton, who takes the charge of them after they have been delivered at the above-named place.

Not any ſort of dry or green food is ever given to the rabbits in this warren during the winter ſeaſon; but there is not any ſnow, and very little froſt taking place; in conſequence of the ſituation being ſo ſurrounded by the ſea.

The warren at the ſouth end of the ſame little iſland is of ſimilar extent, and exactly under the ſame ſort of management; but it is ſaid to be earlier, by a month at leaſt, in the breeding of the rabbits, and the quality of their fur; which is ſuppoſed to ariſe from its being more fully expoſed to the influence of the morning ſun, in which the rabbit delights, and by which it is greatly benefited.

The rabbits are here likewiſe aſſerted to ſell for a higher price, as 3*s.* the couple, than in the warren at the north end of it.

The rabbit-warren at Sand Scale is another farm of this ſort in this neighbourhood, under ſimilar regulations, but ſomewhat ſmaller than thoſe in the iſle of Walney; and there is a ſtill ſmaller one attached to a farm at Roanhead, the property of Miles Sandyes, eſq. of Graythwate, which is conducted in much the ſame manner, and with the ſame reſults as in the above caſe.

It may be noticed that this ſort of ſtock is moſtly taken by nets or traps, ſet in the form of a fold between the places where they run, and thoſe where they feed, the rabbits being hunted into them as they return from feeding. But the wold warreners, Mr. Marſhall ſays, have three ways of catching their rabbits: with fold-nets, with ſpring-nets, and with "types;" a ſpecies of trap. The fold-nets are ſet about midnight, between the burrows and the feeding-grounds; the rabbits being driven in with dogs, and kept incloſed in the fold until morning. But the ſpring-net, when uſed, is, he believes, generally laid round a hay-ſtack, or other place, where rabbits collect in numbers. It is added that the trap is a more modern invention. It conſiſts of a large pit or ciſtern, formed within the ground, and covered in with a floor: or with one large falling door, having a ſmall trap-door towards its centre, into which the rabbits are led by a narrow muce. And this trap, on its firſt introduction, was ſet moſtly by a hay-ſtack; hay being, at that time, the chief winter food of rabbits; or on the outſide of the warren wall, where rabbits were obſerved to ſcratch much, in order to make their eſcape. Since the cultivation of turnips, as a winter food for this ſpecies of ſtock, has become a practice, the ſituation of the trap has been changed. Turnips being cultivated in an incloſure within the warren, a trap is placed within the wall of this incloſure. For a night or two, the muce is left open, and the trap kept covered (with a board or triangular rail), in order to give the rabbits the requiſite haunt of the turnips: which having got, the trap is barred, and the required number taken. He adds, that in emptying the ciſtern, the rabbits are ſorted; thoſe which are fat, and in ſeaſon, are ſlaughtered; thoſe which are lean, or out of condition, are turned upon the turnips to improve. And that, at the cloſe of the ſeaſon, the bucks and the does are ſorted, in a ſimilar way; the bucks are ſlaughtered, the does turned looſe to breed. Mr. Marſhall alſo remarks, that great caution is requiſite in the uſe of theſe traps. If too many rabbits be admitted at once, and the ciſtern be kept cloſe covered only for a few hours, ſuffocating and inordinate heat takes place, and the carcaſes, at leaſt, are ſpoiled. Many thouſand carcaſes have been waſted through this means. The traps are therefore watched; and when the required number is caught, the muce is ſtopped, or the trap covered in a proper manner.

And it is obſerved, that ſome notion may be formed of the produce of the wold warrens, from the great numbers which are frequently ſlaughtered at once; five or ſix hundred couple having not unfrequently been ſlaughtered in one night: and, it is ſaid, that when the two Driffield warrens lay together, there was once an inſtance of fifteen hundred couple being killed at one time.

There is often much inconvenience in this ſort of ſtock, from their getting out of their incloſures, and deſtroying the young corn-crops, new ſown graſſes, young turnips, and the quick hedges as well as young plantations of apple-trees that may be in the neighbourhood. This forms a material objection to this ſort of ſtock by the farmer.

Tame Rabbits.—In reſpect to breeding and rearing tame rabbits with the view of profit, thoſe who are engaged in the buſineſs perform it in hutches, which muſt be kept very neat and clean, otherwiſe the rabbits will be ſubject to diſeaſe. Care muſt be taken alſo to keep the buck and does apart, till the latter have juſt kindled, then they are to be turned to the bucks again, and to remain with them till they ſhun and run from them.

And the general direction for the chooſing of tame rabbits, is to pick the largeſt and ſleekeſt: but the breeder ſhould remember, that the ſkins of the ſilver-haired and white ſorts ſell better than any other. The food of the tame rabbits may be colewort and cabbage-leaves, carrots, parſnips, green corn, and vetches in the time of year; alſo parſley, graſs, green leaves, milk, and ſow-thiſtles, and other ſimilar plants, but with theſe moiſt foods they muſt conſtantly have a proportionable quantity of dry food, as hay, bread, oats, bran, and other ſimilar matters, otherwiſe they grow pot-bellied, and die. Bran and grain mixed together have been found

to

to be very good food. In winter they eat hay, oats, and chaff, and theſe may be given them three times a day; but when they eat green things, it muſt be obſerved that they are not to drink at all, as it throws them into a dropſy. At all other times a very little drink ſerves, but it ſhould always be freſh. When any green herbs or graſs are cut for their food, care muſt be taken that there is no hemlock among it, for, though they will eat this greedily among other things, when offered to them, it is a ſudden poiſon to them. In this mode of breeding, one male to eight or ten females is ſufficient.

It is remarked, that the author of the Treatiſe on Agriculture and Gardening, has bred theſe animals with much ſucceſs and ornamental effect in a ſmall artificial warren, in a lawn in the garden, made in the following manner. "Pare off the turf of a circle, about forty feet diameter, and lay it on the outſide; then dig a ditch within this circle, the outſide perpendicular, the inner ſloping, and throw earth ſufficient into the middle to form a little hill, two or three feet higher than the level of the lawn; the reſt muſt be carried away. Then lay down the turf on the hill, and beat it well to ſettle. The ditch at bottom ſhould be about three feet wide, and three and a half deep, with two or three drains at the bottom, covered with an iron grate, or a ſtone with holes, to carry off the haſty rains, in order to keep the rabbits dry. In the outſide bank ſhould be ſix alcoves, the ſides and top ſupported, either by boards or brick-work, to give the rabbits their dry food in; by their different ſituations, ſome will always be dry; ſix boxes, or old tea-cheſts, let into the bank, will do very well. If the ground be very light, the outſide circle ſhould have a wall built round it, or ſome ſtakes driven into the ground, and boards or hurdles nailed to them, within a foot of the bottom, to prevent the bank from falling in. The entrance muſt be either by a board to turn occaſionally acroſs the ditch, or by a ladder. The turf being ſettled, and the graſs beginning to grow, turn in the rabbits, and they will immediately go to work to make themſelves burrows in the ſides, and in the hill. By way of inducing them rather to build in the ſides, to keep the turf the neater, make a ſcore of holes about a foot deep, and they will finiſh them to their own mind; and if there be a brick-wall round it, it ſhould be built on pillars, with an arch from each, to leave a vacancy for a burrow." But there is, he ſays, another way that may be practiſed, which is, "to dig the ditch only about two feet deep, which will yield about earth enough to make the hill; put ſome pales, about a foot high, on the outſide, for that will be a ſufficient height to keep the rabbits in. Feed them as other tame rabbits are fed; and in wet weather ſprinkle ſaw-duſt at the bottom, by which means the quantity of manure will be increaſed; once a week is often enough to take it away: the quantity will be ſurpriſing, nor will the ſmell be in the leaſt offenſive, even though it be quite cloſe to the houſe. In a very large lawn, two or three of theſe hills, with the rabbits feeding on the tops, will not be unpleaſing objects. If the bucks happen to be miſchievous in killing the young ones, they muſt be chained in an alcove; or elſe have their liberty as in a warren. After a great ſnow they will want ſome aſſiſtance early next morning; becauſe the ditch will be nearly filled, and perhaps the alcove, where the hay is, will be blocked up."

He adds, that "it is a great improvement to caſtrate the young bucks, and keep them till they are full grown, before you kill them; the fleſh will be amazingly finer, whiter, and tenderer. But then it will be beſt to take them away, and keep them in another warren, leſt they ſhould be too numerous, and diſturb the breeding does; or elſe have a few hutches in the alcove to fatten them in."

It is ſuggeſted, that "as oil-cakes are found of great uſe in fattening cattle, it is probable they would be uſeful in fattening rabbits: and it is aſſerted, that ſome of the oil mixed with the pollard or buck-wheat, is cheaper than the cakes; but having never made the experiment, he cannot aſcertain its ſuperior advantages."

In this mode, attention ſhould be had to the breeding thoſe ſorts of rabbits whoſe ſkins are in the greateſt eſteem with the furriers and hatters. Theſe ſkins are generally of more value than the fleſh, eſpecially in the winter, againſt which time contrive to have the greateſt quantity of theſe fattened bucks.

Profit.—It is remarked, in reſpect to profit in this way, that where does are kept in hutches, they are ſuppoſed to breed ſix times a-year, and only five young ones are left to each, which is thirty from each doe: but as theſe are in a more natural way, and the young ones difficult to be gotten at, let us ſuppoſe about thirty-ſix to be produced from each doe, reckoning only ſeven-pence for each; there is a guinea profit from each doe; as the additional value of the ſkins in winter, and the dung, will more than pay the expence of food and attendance on them. And it is quite neceſſary that thoſe who keep many rabbits in this way, ſhould cultivate ſome lucern, parſley, and carrots, as no other vegetables are ſuch proper food for them as theſe; they ſhould alſo be fed upon ſome of the beſt upland paſture-hay; for if it be coarſe, ſo far from eating, they will waſte it. Lucern hay is very proper for them in theſe caſes.

In ſome diſtricts very conſiderable profits and advantages are derived from the breeding and keeping of white tame rabbits. The ſkins of this ſort having lately been much employed in trimmings, have ſold at a much higher price than thoſe of the common kinds. Their dung is alſo found of very great utility in the cultivation of large farms.

Diſeaſes.—When kept in this way, rabbits are ſubject to ſeveral diſeaſes, as the *rot*, which is cauſed by the giving them too large a quantity of green food, or the giving it freſh gathered, with the dew or rain hanging in drops upon it, as it is over-moiſture that always cauſes the diſeaſe; the green food ſhould, therefore, always be given dry, and a ſufficient quantity of hay, or other dry food, intermixed with it, to counteract the bad effects of it. And a ſort of *madneſs* often ſeizes them: this may be known by their tumbling about; their heels upwards, and hopping in an odd manner into the boxes. This diſtemper is ſuppoſed to be owing to the rankneſs of their feeding: and the general cure is the keeping them low, and giving them the prickly herb called tare-thiſtle to eat as much as poſſible. They are alſo ſubject to a ſort of ſcabby eruption, which is ſeldom removed. Theſe ſhould, however, be directly ſeparated from the reſt of the ſtock.

It is noticed that the profit in this mode of management cannot, however, be well aſcertained, as much will depend on the care which is taken in the feeding, and other management.

RABBIT-*Warren*, the place where theſe animals breed and rear their young. The land for this purpoſe ſhould be of a light ſandy quality, and it is beſt to have a hilly ſituation, with a ſunny expoſure, being well incloſed by means of ſod-walls, or paling-fences: any ſort of waſte, craggy, or rocky land, on which nothing elſe can be cultivated, anſwers very well for this purpoſe. See RABBIT.

RABBIT-*Warren Farm*, that ſort which is chiefly managed under the rabbit ſyſtem. Theſe ſorts of farms are now much leſs common than formerly, but in ſome inſtances, as has been ſeen, they afford the beſt and moſt advantageous means by which lands can be turned to any account in the way of cultivation. They, however, in moſt caſes require no little capital, exertion, and attention, to manage them in the beſt and moſt profitable methods. See RABBIT.

RABBIT *Manure*, that which is collected from the dung of thoſe animals, and which is ſaid to be very valuable. See MANURE.

It is found beneficial in different modes of application, as by being intimately mixed and blended with the main particles of the ſoil or mould in arable lands, and by being ſown by the hand, only over the ſurface of it, in the way of a top-dreſſing, when they are in a ſtate of crop. When uſed in this laſt manner, it is likewiſe highly advantageous on moſt ſorts of graſs land; and in both theſe caſes of top-dreſſing with it, there is a very quick and powerful ſtate of vegetation produced in the crops, which can hardly be gained in any other way. See QUICK *Manure*, and TOP-*Dreſſing*.

In Oxfordſhire, Mr. Fane has raiſed a ſmall building for keeping rabbits in hutches, for the ſake of the manure; he is ſaid to have ſome hundreds, and to meditate the erection of a ſecond building for keeping double the number; the preſent quantity make a load of manure in the courſe of the week; and as two loads manure an acre, they are the means of fully dreſſing twenty-ſix acres annually: it is not conceived by him that they produce any other profit, nor is it neceſſary; for to be able to ſell ſo much food at home, and pay attendance, the profit of manuring ſuch a breadth of land, it is ſuppoſed, muſt be conſiderable. Three dozen of rabbits in the week are moſtly ſent to the London market during the ſeaſon in which they can be uſed.

This is a ſort of dung or manure, which has yet been but little ſubjected to chemical examination, conſequently its real properties, or conſtituent principles, are very imperfectly known or underſtood; it would appear, however, from the effects which it produces, that it may be employed with the moſt advantage, when laid upon the land, in its more raw, crude, or freſh ſtate, before it has undergone much decompoſition by the proceſs of fermentation or putrefaction. It has, perhaps, never yet been kept dry and reduced into a powdery condition, ſo as to be put in along with the ſeed, in the manner of rape-duſt, though it ſeems probable that it would go farther, and be more beneficial, in ſome caſes, if uſed in this way. See DUNG.

RABCHORCADO, in *Ornithology*, the name of an American bird, deſcribed by Nieremberg with many fabulous circumſtances. All that ſeems certainly known is, that its tail is very remarkably forked.

RABDA, in *Geography*, a town of Arabia, in the province of Yemen; 30 miles N.W. of Sana.

RABDIUM, in *Ancient Geography*, *Tur-Rabdin*, a town of Aſia, upon a mountain, at ſome diſtance from the Tigris, ſouth of Tigranocerta, and eaſt of Niſibis.

RABDOIDES. See RHABDOIDES.

RABDOLOGY. See RHABDOLOGY.

RABDOMANCY. See RHABDOMANCY.

RABEBOIA, a name given by ſome to the roots of the ſiammula major.

RABELAIS, FRANCIS, in *Biography*, was born about the end of the fifteenth century at Chinon, in Touraine. At an early period he entered himſelf among the Cordeliers, and became well ſkilled in the learned languages, and the literature of the age. He acquired a good ſhare of popularity as a preacher; and what he gained by his ſermons, he expended in the purchaſe of a ſmall library. His private life was not ſo exemplary as his public diſcourſes were edifying; and for ſome miſconduct, which cauſed ſcandal in the monaſtery, he was impriſoned in his cloiſter. By his wit and facetiouſneſs he obtained his liberation, with the pope's permiſſion to quit his order, and remove to that of St. Benedict. Not being able, however, to bear any kind of reſtraint, he laid aſide his religious habit, and, in 1530, went to Montpelier to ſtudy medicine. After ſome time he repaired to Lyons, where he printed a collection of pieces of Hippocrates and Galen. Here he likewiſe publiſhed ſeveral other works, among which were ſome of the books of his Hiſtory of Pantagruel, which gave him ſo diſtinguiſhed a place among burleſque writers. In 1535 he went to Paris, and waited on cardinal John du Bellay, to whom he had been known when they reſided in the ſame convent; and he now made himſelf ſo agreeable to his old friend, that he was taken into his houſe in the ſeveral capacities of phyſician, reader, librarian, and ſteward. Du Bellay, in the following year, going out as ambaſſador to the court of Rome, took Rabelais with him, where his wit ſo much intereſted the pope and cardinals, that he very readily obtained a full abſolution for the crime of apoſtacy. In 1537 he took his doctor's degree in phyſic at Montpelier; and returning to Paris ſoon after, his friend the cardinal preſented him with a prebend in the chapter of St. Maur. He was afterwards made the curè of Meudon, which office he held from 1545 to his death, in 1553, being, according to one of his biographers, in the 63d, and according to another, in the 70th year of his age. His Pantagruel, which was finiſhed about the time that he accepted the curè of Meudon, brought upon him the hoſtility of the monks, whom he had ſeverely ſatirized, and who procured its condemnation by the Sorbonne and the parliament; but it cauſed his company to be much ſought after, as the wittieſt writer of his time. The want of decency was eaſily pardoned at that period, and Rabelais had ſome eſtimable qualities, and poſſeſſed extenſive and various erudition, with a ready elocution, and an inexhauſtible ſtore of ludicrous ideas. "The *Pantagruel* and *Gargantua* of Rabelais," ſays a critic, "are to be regarded as comic ſatires, often concealing, under a whimſical extravagance, attacks upon follies which it would not have been ſafe ſeriouſly to expoſe." It is in vain, however, that commentators have attempted to find out the meaning in much that is mere ribaldry and nonſenſe, and even to diſcover real hiſtory veiled in the allegory of burleſque, where the author meant nothing more than to make his reader laugh or wonder. His ſatire, where it is intelligible, is often juſt and ingenious; but the obſcurity of his language, and eccentricity of his conceptions, render the peruſal of his works, to a modern at leaſt, rather a taſk than an amuſement." The moſt complete editions of his works is that publiſhed in Holland, in 5 vols. 8vo., 1715, with notes by Duchat; and that at Amſterdam, in 3 vols. 4to., 1741, with plates by Picart. The letters of Rabelais were publiſhed in an octavo volume, with notes by St. Marthe. The memory of Rabelais is perpetuated in the medical ſchool of Montpelier, where bachelors are inveſted with a ſcarlet robe, ſaid to have been the very robe which that wit himſelf wore.

RABELHORST, in *Geography*, a town of the duchy of Holſtein; 5 miles W.N.W. of Ciſmar.

RABENAU, a town of Saxony, in the margraviate of Meiſſen;

Meiſſen; 8 miles S.S.W. of Dreſden. N. lat. 50° 52′. E. long. 13° 36′.

RABENECK, a town of Bavaria, in the biſhopric of Bamberg; 3 miles S.W. of Weiſchenfeld.

RABENER, Theophilus William, in *Biography*, a celebrated German writer, was the ſon of an advocate at Leipſic, and born at Wachau in 1714. He was educated at home, by tutors employed for the purpoſe; but when he was 14 years of age, he was ſent to the college of Meiſſen, where he had for fellow-ſtudents Grabener, Gærtner, and Gellert, with whom, and particularly with the laſt, he formed a friendſhip which continued through life. In 1735 he went to the univerſity of Leipſic, where he applied himſelf chiefly to the ſtudy of juriſprudence, without entirely neglecting the Muſes. In 1741, profeſſor Schwabe having begun a journal in the German language, entitled "Amuſements of Reaſon and Wit," Rabener became one of his principal coadjutors, and continued to aſſiſt him by his contributions till the year 1744. He is chiefly known as a writer in the firſt volume, by a humorous piece entitled "Proofs of the Neceſſity of employing Rhyme in German Poetry." This periodical work was, for ſome time, carried on with ſpirit and ſucceſs; but at length it became degraded by literary diſputes, which finally put an end to it; and another was eſtabliſhed, under the title of "Contributions of Bremen." The writers engaged in this were all the moſt celebrated perſons who flouriſhed at that period, among whom were Gærtner, Schmidt, and Rabener, to whom were united Gellert, Klopſtock, and others. The Journal of Bremen forms an epoch in the hiſtory of the German literature, as it introduced into the country a better taſte, and tended greatly to improve the language, which, previouſly to this, had been much neglected. Rabener had before this been appointed controller of the taxes in the circle of Leipſic, a place of great labour, and which required an exact knowledge of the laws of the country, and the moſt inflexible integrity. Notwithſtanding, however, the attention which the duties of this office required, he found leiſure to continue his literary purſuits; and towards the end of 1751, compoſed his ſatirical letters, in which he introduces perſons of every ſtate and character, all of whom ſpeak in the language ſuited to their condition. In 1753 he was appointed chief ſecretary to the directors of the taxes at Dreſden; and two years afterwards he publiſhed the fourth and laſt volume of his ſatires, which contains "A burleſque Explanation of the Proverbs of Sancho Panza," the "Firſt of April," and "The Excuſe and Reparation." After this he began to write for the ſtage, and compoſed a comedy in four acts, entitled "The Freethinker," which, with many other papers and letters, were burnt, together with his houſe, during the ſiege of Dreſden, in 1760. He now abandoned his literary labours, but his friends obtained from him a collection of letters, which were afterwards publiſhed by Weiſs. Theſe were never intended for the public, but they are written with ſo much truth and ſincerity, and exhibit a more correct picture of the author than any pen could have drawn. His health began to decline ſoon after his loſs in 1760, and in 1767 he experienced a paralytic ſtroke, which was repeated in 1769; but he lingered out till March 1771, when he died. "He was," ſays his biographer, "among the ſmall number of thoſe privileged men, whom nature has endowed with every quality neceſſary to their ſtate. He thought and ſpoke in a manner peculiar to himſelf: his pleaſantries flowed as from an abundant ſource; he never ſought for them; and they appeared ſo natural, pleaſant, and lively, that it was impoſſible not to be ſtruck by them. But he diſplayed his wit only among his friends: he never laviſhed it on the rich and great; on the contrary, he concealed it, when invited merely for the purpoſe of being heard. He always ſpoke the truth, without regard to perſons or rank." Rabener, ſays he, was the favourite author of Germany, who wrote poetically in proſe, whoſe ſatirical, ſportive genius poſſeſſed ſalt without gall. Rabener's works are generally known throughout Europe, having been tranſlated into the French, Engliſh, Dutch, and Swediſh languages. Gen. Biog.

RABENSPURG, in *Geography*, a town of Auſtria; 8 miles N.E. of Liſterdorff.

RABENSTAIN, a town of Auſtria, on the river Bielach; 8 miles S. of St. Polten.

RABENSTEIN, a town of Bohemia, in the circle of Leitmeritz; 40 miles E. of Prague. N. lat. 50°. E. long. 13° 26′.—Alſo, a town of the duchy of Stiria; 11 miles N.N.W. of Gratz.—Alſo, a town of Bavaria, in the biſhopric of Bamberg; 2 miles S. of Weiſchenfeld.

RABIA Prior, in *Chronology*, is the name of the third month of the Arabic year, conſiſting of thirty days; and *Rabia poſterior* is the name of the fourth month, conſiſting of twenty-nine days.

RABICH, a name given by Leo Africanus to a tree or ſhrub growing very plentifully in many parts of Africa, the fruit of which is much eſteemed by the natives. He ſays that the tree rabich is prickly, and that the fruit is round, and like a cherry, but ſmaller, and of the taſte of the jujube.

RABIEL, a name given by ſome authors to dragon's blood.

RABIES, in *Medicine*, that peculiar ſtate of the nervous ſyſtem, which is produced by the bite of a rabid animal, and which is commonly, but improperly, called *madneſs*. As the dog is the principal ſource of this diſeaſe, the word rabies is commonly united with the epithet *canina*. See Hydrophobia.

RABINAL, in *Geography*, a town of Mexico, in the province of Vera Paz; 40 miles S.S.W. of Vera Paz.

RABINET, a name formerly given to a ſmall piece of ordnance, between a falconet and a baſe. Its dimenſions, &c. ſee under Cannon.

RABIRA, a word uſed by ſome of the chemical writers to expreſs tin.

RABISHI, in *Geography*, a river of the iſland of St. Vincent, forming a bay on the eaſtern coaſt, near the ſouthern extremity, where it runs into the ſea. N. lat. 13° 5′. W. long. 61° 11′.

RABLAY, a town of France, in the department of the Mayne and Loire; 9 miles N. of Villiers.

RABLES, *Iſles aux*, a cluſter of ſmall iſlands at the entrance of lake Superior, in Upper Canada, and at the eaſt end of it, caſt of White Fiſh iſland, and pretty cloſe to the main land.

RABNABAD, a town of Hindooſtan, in Bengal, at the mouth of the Ganges; 90 miles S.S.E. of Mahmudpour.—Alſo, a ſmall iſland on the coaſt of Bengal, at the mouth of the Ganges. N. lat. 22°. E. long. 90° 30′.—Alſo, one of the mouths of the Ganges, which opens into the bay of Bengal. N. lat. 22°. E. long. 90° 26′.

RABNITZ, a river of Hungary, which runs into the Danube, a little below Raab.

RABOGH, a town of Arabia, in the province of Yemen, near the coaſt of the Red ſea, where the Arabs live in huts; 105 miles S.W. of Medina.

RABOLANE, in *Ornithology*, a name given by many to the lagopus, a bird found on the ſnowy mountains, and called by ſome the white partridge.

RABRI, a name given by ſome authors to bole armenic.

RABUEL, Claude, in *Biography*, a French Jeſuit and able mathematician, was born at Pont-de-Vele, in the county of Breſſe, in the year 1668. About the age of 18 he was entered into the ſociety of Jeſus, and principally diſtinguiſhed himſelf by his proficiency in mathematical learning, of which he became the profeſſor in Trinity college at Lyons, performing its duties with great reputation and ſucceſs. He died in 1728, in the 60th year of his age. His chief work was "A Commentary on the Geometry of Deſcartes," which was publiſhed after his death in 1730, under the care of father l'Eſpinaſſe. This was the firſt illuſtration of the whole of that work, which had been given to the public. The labours of Fermat, De Witt, and others, extended only to particular parts of it. Rabuel left behind him other works on algebra, the conic ſections, and the geometrical loci of the differential calculus, and of the integral calculus; and he was one of the few inſtances of perſons who, with a paſſion for the mathematics, had a fine taſte for polite literature.

RABUTAH, in *Geography*, a town of Africa, in the kingdom of Sennaar; 35 miles S.S.W. of Sennaar.

RABUTIN, Francis de, in *Biography*, who flouriſhed in the ſixteenth century, was of an ancient and noble family in Burgundy, and ſerved in the army with the duke de Nevers, under Henry II. and Charles IX., with a high reputation for valour and fidelity. He was living in 1581, but nothing is known of him beyond that period. He was author of "Commentaires de dernières Guerres du Roi Henri II. et de l'Empereur Charles Quint," firſt printed in 1555; a continuation was printed afterwards, in 1558; and the whole work together in 11 books, in 1574. It contains a hiſtory of the wars in the Low Countries, from 1550 to 1558, and is ſaid to be written in a ſimple ſtyle, with a great appearance of vivacity.

Rabutin, Roger de, count of Buſſi, a very diſtinguiſhed character in the reign of Lewis XIV., was born at Epiry, in the Nivernois, in 1618. He entered very young into the army, in his father's (Leonor Baron of Buſſi) regiment, of which he became colonel. After ſerving in a number of battles and ſieges, he roſe to the rank of meſtre-de-camp of the light horſe, and lieutenant-general of the Nevernois. He looked for ſtill higher honours, and being diſappointed, engaged in lampoons upon perſons about the court, which drew upon him the king's diſpleaſure; and in 1665, in which year he was admitted a member of the French academy, a manuſcript hiſtory of the amours of two court ladies, of which he was the writer, being handed about, under the title of "Hiſtoire Amoureuſe des Gaules," a complaint was laid before his majeſty, in conſequence of which he was ſent to the Baſtille. Impriſonment had nearly proved fatal to him, and he was liberated, but was obliged to reſign the office which he held under government. After this he was exiled to his country-ſeat, where he remained 17 years, during which he did not ceaſe to importune the king to be allowed to return, by letters conceived in terms of abject humility and baſe adulation. In 1682 he was allowed to return to court, but finding himſelf generally neglected, he retired of his own accord to his eſtates. He died at Autun in 1693, at the age of 75. He was author of ſeveral works, among which were "Diſcours a ſes Enfans, ſur le bon Uſage des Adverſités;" "Memoires," publiſhed firſt at Paris in two, and afterwards at Amſterdam in three volumes, 4to.; "Lettres," 7 vols. 12mo.; and "Hiſtoire Abregée de Louis le Grand." His ſon the abbè de Buſſi became biſhop of Luçon in 1723, and was a learned and ingenious member of the French academy. The ſiſter of the biſhop, a nun, publiſhed an abridgment of the life of Madame de Chantal, and of the life of St. Francis de Sales.

RABY, in *Geography*, a ſmall townſhip of America, in New Hampſhire, in Hillſborough county; about 65 miles W. by. S. of Portſmouth; incorporated in 1790. Its name has been ſince changed.—Alſo, a town of Bohemia, in the circle of Prachatitz, containing a citadel, at the ſiege of which, Ziſca, general of the Huſſites, loſt his only remaining eye; 4 miles S. of Horazdiowitz.—Alſo, a town of Sweden, in Sudermanland; 7 miles N. of Nykoping.

RACA, or Racha, a Syriac term, found in the Goſpel of St. Matthew, chap. v. 22. and preſerved in moſt tranſlations.

Father Simon obſerves, that the Greek tranſlator of St. Matthew's Goſpel retained the Syriac raca, which he found in the original, becauſe it was very common among the Jews. And St. Jerom, Luther, the Engliſh tranſlators, thoſe of Geneva, Louvain, Port-royal, &c. ſtill preſerve it in their reſpective languages.

F. Bouhours chooſes rather to expreſs the ſenſe of it in a ſort of paraphraſe, thus: he that ſays to his brother, *homme de peu de ſens*, *man of little underſtanding*, ſhall deſerve to be condemned by the tribunal of the council, &c.

Moſt tranſlators, except the Engliſh, and F. Simon, for raca write racha; but the former orthography ſeems the beſt founded; all the Latin copies having raca, and all the Greek ones ῥακα, or, with Heſychius, ῥακκα, which is the ſame; all, we mean, but St. Irenæus, and Beza's copy, now at Cambridge, which have ῥαχα. In effect, the origin of the word ſhews it ſhould be raca; as coming from the Syriac רקא, *raca*, of the Hebrew *rek*, רק, *empty*, *ſhallow*.

RACAISBONE, in *Geography*, a town of Hindooſtan, in Aurungabad; 30 miles S. of Aurungabad.

RACAM, a town of New Mexico, in the province of Hiaqui; 60 miles S.W. of Riochico.

RACAN, Honorat de Bueil, *Marquis of*, in *Biography*, a French poet, was born in 1589, of a noble family, in Touraine. When very young, he had a place in the king's bed-chamber, under the duke of Bellegarde. From Malherbe, who was at that time domeſticated with the duke, he acquired a fondneſs for poetry, and obtained inſtructions in the art of verſifying. He at firſt bore arms, as a profeſſion; but after a time he devoted himſelf to a life of leiſure. He was one of the earlieſt members of the French academy, and though almoſt wholly without the advantages of education, he obtained reputation as a writer. His moſt popular work was entitled "Bergeries." He compoſed in various ſtyles, and wrote tranſlations of Pſalms, and many ſacred odes taken from the Pſalms, and other ſcriptural poems. In proſe he publiſhed "The Life of Malherbe;" "A Diſcourſe pronounced before the Academy;" and ſome "Letters." He died in 1670, at the age of 81. Of his works a new edition was given at Paris, in 1724, in 2 vols. 12mo.

RACCA, Racah, *Rika*, or *Racka-Rica*, in *Geography*, a town of the Perſian empire, in the province of Diarbekir, and paſhalic of Orfu, the capital of the diſtrict named Diar Modzar. It is ſituated on the eaſtern bank of the river Euphrates, at the mouth of a ſmall river named Beles, (the ancient Billicha,) and was founded, according to Pliny, by Alexander the Great. It was firſt called Nicephorium, and afterwards Callinicum and Leontopolis, from Seleucus Callinicus and the Greek emperor Leo. It was the favourite reſidence of Haroun al Raſchid, the

ruins

ruins of whofe palace, it is faid, are ſtill viſible. The poſition of Racca, in the parallel of 36° N., was aſcertained by the celebrated oriental aſtronomer Mahomed Ben Jaber, ſurnamed Al Batani, who paſſed many years of his life at this place. The town and adjoining country are inhabited by different tribes of wandering Arabs. N. lat. 36° 1′. E. long. 38° 50′.

RACCAN, a river on the north coaſt of Sumatra, which runs into the ſea, N. lat. 2° 30′. E. long. 100° 15′.

RACCANATTO, a river of Naples, which runs into the gulf of Tarento, N. lat. 39° 47′. E. long. 16° 42′.

RACCOON, in *Zoology*. See RACKOON.

RACCOON, in *Geography*, an iſland in the Atlantic, near the coaſt of South Carolina, nine miles long and one wide. N. lat. 33° 3′. W. long. 79° 22′.

RACCOON *Creek*, a river of Pennſylvania, which runs into the Ohio, N. lat. 40° 38′. W. long. 80° 25′.

RACCOON *Iſland*, a ſmall iſland in Oſſabaw ſound, belonging to the ſtate of Georgia. N. lat. 31° 47′. W. long. 81° 12′.

RACCOON *Key*, a ſmall iſland or rock in the gulf of Mexico, near the ſouth coaſt of Weſt Florida. N. lat. 29° 46′. W. long. 89° 21′.

RACCOON *Keys*, a cluſter of ſmall iſlands near the coaſt of South Carolina. N. lat. 24° 8′. W. long. 79° 15′.

RACCOURCY, in *Heraldry*, ſignifies the ſame as *coupé*, that is, *cut off*, or *ſhortened;* and denotes a croſs, or other ordinary, when it does not extend to the edges of the eſcutcheon, as they always do when abſolutely named, without ſuch diſtinction.

RACE, in general, ſignifies running with others, in order to obtain a prize, either on foot, or by riding on horſeback, in chariots, &c.

Racing was one of the exerciſes among the ancient Grecian games, which was performed in a courſe, containing one hundred and twenty-five paces; and thoſe who contended in theſe foot-races were frequently clothed in armour. For a particular account of theſe races, ſee STADIUM.

There were properly but two kinds of horſe-races at Olympia, namely, the *chariot-race*, introduced into thoſe games in the 25th olympiad (for an account of which ſee CHARIOT), and the race of riding-horſes, which was not admitted till the 33d. Although chariots were in uſe before riding-horſes, as we may conclude from the teſtimony of Homer, among all whoſe heroes, Greek and Trojan, no one makes his appearance on horſeback, except Diomedes and Ulyſſes mounted upon the horſes of Rheſus (Il. x.), it is nevertheleſs plain, from this inſtance, that neither the heroes nor the horſes were utter ſtrangers to the art of riding; and it is alſo evident, from another paſſage in the 15th Iliad, that horſemanſhip was carried even to ſome degree of perfection, at leaſt in the time of that poet, who lived but in the next generation after the ſiege of Troy, according to ſir Iſaac Newton. This paſſage, extracted from Pope's Homer (Il. xv. v. 822.) is as follows:

> "So when a horſeman from the wat'ry mead
> (Skill'd in the manage of the bounding ſteed)
> Drives four fair courſers, practis'd to obey,
> To ſome great city, thro' the public way:
> Safe in his art, as ſide by ſide they run,
> He ſhifts his ſeat, and vaults from one to one:
> And now to this, and now to that he flies:
> Admiring numbers follow with their eyes."

Some authors (ſee Rollin's Anc. Hiſt. tom. v. p. 72. ed. Amſt.) have introduced an exerciſe like this into the Olympic games, though Mr. Weſt profeſſes himſelf diſſatisfied with the authority upon which they depend: and ſays that in the books which he has conſulted, he can find no mention of any other race of riding-horſes, beſides thoſe of the *Celes* and the *Calpé*. As to that particular branch of horſemanſhip, above deſcribed, Euſtathius, in his comment upon Homer, tells us, that in the old ſcholia it is written, that Demetrius ſays he had ſeen a man, vaulting in the manner deſcribed by the poet, from the back of one horſe to another, holding the bridles at the ſame time, and keeping the horſes to their ſpeed, without any interruption or incumbrance. This aſſertion implies that ſuch a ſight was very uncommon, and conſequently that no ſuch exerciſe could ever have been admitted into any of the games of Greece. The word Κελητιζειν, uſed by the poet in the beginning of this ſimile, ſays Mr. Weſt, may poſſibly have induced ſome people to imagine, that the riders of the horſes called Κελητες, *celetes*, were accuſtomed to leap from one horſe to another, as if that word was a term of the manege, of which the verſes that follow were merely an explanation. It is certain, however, from a paſſage in the Odyſſey (E. v. 371.) that by Ἵππος Κέλης, Homer meant to ſignify no more than a riding-horſe, and conſequently that by the word Κελητιζειν, which is derived from Κελης, no more is to be underſtood in this place than ſimply to ride. This interpretation of Κελης, *celes*, may be farther confirmed by the authorities of Pindar and Pauſanias, and particularly by a ſtory related by the laſt mentioned author (lib. vi. c. 13.) of a mare, named Aura, belonging to one Phidolas, a Corinthian. This mare, ſays the hiſtorian, having accidentally thrown her rider ſoon after ſhe had ſtarted from the barrier, continued the race of her own accord, and turned round the pillar as if the rider had been ſtill upon her back; upon hearing the trumpet, ſhe mended her pace, till coming in before her antagoniſts, ſhe ſtopped ſhort over-againſt the judges of the games, as conſcious of having gained the victory. The victory was accordingly adjudged to her maſter Phidolas, who, by erecting in return a ſtatue to her honour, intimated to whom the merit of that victory was due. In this ſtory, there is no mention of any other horſe or mare, that ſhared the victory with Aura, and conſequently that, in the race called *Celes*, each competitor made uſe of but one ſingle horſe. Moreover, the victorious Aura was of the feminine gender, and hence we may infer, that in all the races, as well of riding horſes as of chariots, mares or horſes were indifferently uſed; excepting in the race named *Calpé*, in which mares only were employed. And further it appears, that though the rider was thrown off in the very beginning of the race, yet the crown was awarded to Phidolas, the maſter of Aura; to whom certainly no leſs was due, than if his mare had conquered under the conduct and diſcretion of her rider. It appears alſo, by the circumſtance of Aura's mending her pace upon hearing the trumpet, that the trumpet either did not ſound during the whole race, but at the laſt round only, or that it ſounded differently in different periods of the courſe. There was, however, a meaning in the ſound of the trumpet, which Aura, probably an old ſtager, underſtood.

The race of full-aged riding-horſes was inſtituted in the 33d olympiad, and that of the Πωλος Κελης, or under-aged riding-horſes, in the 131ſt. It is a well-known fact that chariots were uſed in war above 1000 years before cavalry was introduced among the ancients. They ſeem to have had a terrible notion of being mounted upon the back of a horſe, and have accordingly made monſters of thoſe whom they firſt beheld in that attitude, to which they were not very ſpeedily reconciled. Their amazement gradually diminiſhed: and their intercourſe with other nations not only

rendered riding-horſes familiar to them, but convinced them likewiſe of the advantages accruing from the uſe of cavalry. Hence it came to paſs, that an order of equites, or horſemen, was inſtituted in moſt of their commonwealths; to whom, as in Athens, was allotted the ſecond rank in the ſtate. Upon the ſame principle, perhaps, the Ἵππος Κελης, or riding-horſe, was admitted into the Olympic hippodrome, and held in ſuch eſtimation, that although the race of riding-horſes was neither ſo magnificent nor ſo expenſive, and conſequently not ſo royal, as the chariot-race, yet we find, among the competitors in this exerciſe, the names of Philip, king of Macedon, and Hiero, king of Syracuſe. To the latter is inſcribed the firſt Olympic ode of Pindar, in which honourable mention is made of the horſe Pherenicus, whoſe fleetneſs gained for his maſter the Olympic crown. The race of the Calpé was performed by mares. (See CALPÉ.) The length of this race, and alſo that of the Celes, are not aſcertained; but it is reaſonable to ſuppoſe, that the latter, diſtinguiſhed, as we have already obſerved, into two claſſes, one of full-aged, and the other of under-aged horſes, conſiſted of the ſame number of rounds as thoſe of the chariots, diſtinguiſhed in like manner into two claſſes. Mr. Weſt has not been able to determine the different ages that ranked the horſes in one or the other claſs; nor whether the weight of the riders, or the ſizes of the horſes, were taken into conſideration. Theſe points ſeem to have been left to the diſcretion of the Hellanodicks, who were appointed to examine the young horſes that were entered to run for any of the equeſtrian crowns (Pauſ. l. iv. c. 24.), and who were ſworn before the ſtatue of Jupiter Horcius, to give a true and impartial judgment upon the matters left to their examination, without taking any reward; and not to diſcover the reaſons which diſpoſed them to reject ſome, and admit others. Weſt's Diſſertation on the Olympic Games. Sect. 14. See HIPPODROME.

RACE, in *Genealogy*, a lineage, or extraction, continued from father to ſon.

The word is French, formed from the Latin *radix*, *root*; as intimating the root of the genealogical tree.

In ſeveral orders of knighthood, as in that of Malta, &c. the candidates muſt prove a nobility of four races or deſcents.

In ſome republics the magiſtrates are to prove themſelves of plebeian race, to be qualified.

The French reckon their kings by races; as, the firſt race, the ſecond race, the third race. We alſo ſay the race of the Ottomans, the Arſacidæ, the Ptolemies, &c.

RACE, in *Natural Hiſtory*. See CIBDELOPLACIA.

RACE, the mark made on timber, &c. by a tool called a racing-knife.

RACE, *Cape*, in *Geography*, a cape on the S.E. coaſt of Newfoundland. N. lat. 46° 40′. W. long. 53° 3′ 30″.

RACE *Point*, a cape on the coaſt of America, W. of cape Cod. N. lat. 42° 4′. W. long. 78° 12′.

RACEME, in *Gardening*, the long mode of cluſter-flowering and fruiting which takes place in ſome ſorts of plants and fruit-trees, as in the grape vine, and the different kinds of currants. See RACEMUS.

RACEMIFEROUS, in *Botany*, denotes bearing in cluſters.

RACEMUS, in *Botany* and *Vegetable Phyſiology*, a cluſter, is a mode of inflorescence, in which ſeveral flowers, each ſupported on its own proper ſtalk, are connected by one common ſtalk, either ſimple or compound. A bunch of Currants is a ſimple *racemus*; the inflorescence of the Woody Nightſhade, *Solanum Dulcamara*, is a compound one. In the American plant called *Actæa racemoſa*, the cluſters are ſimple, but aggregate. A *racemus* differs from a *ſpica*, or ſpike, in having a partial ſtalk, as above deſcribed, to each flower; it is moreover generally underſtood to be drooping or pendulous, and to have the flowers expand all nearly at one time. On the contrary, a ſpike is moſt frequently erect; the flowers open in very gradual ſucceſſion, inſomuch that the lowermoſt may have partly perfected their ſeeds, before the uppermoſt expand; and eſpecially, they are individually ſeſſile, at leaſt at the time of their expanſion. To theſe characters may be added, that a ſpike is crowded or denſe; a cluſter lax or ſcattered. It muſt be allowed that botaniſts, even of the firſt rank, are incorrect in the application of theſe terms. The male inflorescence of *Quercus*, the Oak genus, becauſe drooping and looſely diſpoſed, with all the flowers in perfection nearly at the ſame time, is termed a *racemus*; though it poſſeſſes the moſt eſſential character of a *ſpica*, ſeſſile flowers. On the other hand, *Veronica ſpicata*, having a denſe upright ſeries of flowers, expanding gradually, is ſaid to be ſpiked, though each ſeparate flower has a partial ſtalk. A little latitude muſt neceſſarily be allowed, though it is very deſirable that botaniſts ſhould be more exact in the uſe of theſe and other terms, than they ſometimes are. See SPICA and INFLORESCENCE.

RACER, in *Gardening*, a name applied to a ſort of ſward-cutter, or cutting implement, uſed in racing out or cutting through the ſurface of graſs ſward, and dividing it into proper widths, lengths, and thickneſs, for turf intended to be cut up for laying in pleaſure-grounds, or other places, and always neceſſary preparatory to the work of flaying or cutting up the turf with the turfing-iron. It is alſo uſeful for cutting and ſtraightening the edges of graſs verges in ſuch grounds, as well as for many other purpoſes.

It is a tool which is very ſimple in its conſtruction, merely conſiſting of a ſtrong wooden handle, about four feet long, having the cutter fixed at the lower end, in the form of a half moon, with the edge downward, to cut into the ſward; the handle ſhould be about an inch and a half thick, growing gradually thicker towards the lower end.

In uſing the tool, it is puſhed forward ſo as to cut or race out the ſward in an expeditious manner. And in cutting turfs with it, it is neceſſary firſt to mark out on the ſward the width of the turf intended, which ſhould generally be a foot wide, and a yard long, and about an inch or inch and a half deep; then ſtrain a line tight, firſt lengthways, ſtriking the racer into the ſward cloſe to the line, running it along expeditiouſly, ſo as to cut its way, and divide the ſward to a proper depth, afterwards placing a line a foot farther, and racing it out as before, and ſo on, to as many widths as may be wanted; and then, with the line placed croſs-ways, to race out the ſward accordingly in yard lengths. The ſward being thus raced out, the turf-cutter with the turfing-iron ſhould proceed to cut them up and flay them off from the ground. This ſmall implement is likewiſe very convenient for many other little purpoſes about pleaſure grounds and gardens, as thoſe of cutting the edges of the verges which are laid with turf, and ſtraightening the edges of the borders in different parts. See TURF.

RACHA. See RACA.

RACHIA, in *Geography*, a town of Bohemia, in the circle of Leitmeritz; 8 miles E. of Leitmeritz.

RACHELSDORF, a town of Bavaria, in the biſhopric of Bamberg; 15 miles N. of Bamberg.

RACHETUM, from the Fr. *racheter*, *redimere*, the compenſation or redemption of a thief.

RACHIA, in *Geography*, a town of Iſtria; 7 miles N.E. of Pedena.

RACHIALGIA, in *Medicine*, a term given by Aſtruc, and adopted by the noſologiſts, to denote certain colicky pains in the bowels, which were ſuppoſed to originate from the nerves of the ſpine, and eſpecially the colic from the poiſon of lead, or Colica *Pictonum*; which ſee. The word is from ῥαχις, *the ſpine*, and ἀλγη, *pain*. See Sauvages Noſol. Meth. claſs vii. gen. 29.

RACHIS, or rather *Rhachis*, in *Botany*, from ῥαχις, *the back-bone*, is the common ſtalk, or receptacle, of the florets, in the ſpikelets of graſſes; or of the ſpikelets themſelves in *Lolium*, *Triticum*, *Secale*, *Hordeum*, *Rottböllia*, &c. The ſame term is applied to the rib, or leaf-ſtalk, of ferns, which is often winged or bordered. The *Rachis* in both theſe inſtances is frequently jointed; by which in the former, the ripe ſeeds of ſuch graſſes, wrapped up in their huſks, are the more readily diſperſed. The part in queſtion being in ſome caſes ſmooth, in others variouſly hairy or bearded, affords excellent ſpecific diſtinctions; witneſs the genus *Avena*.

RACHISAGRA, a term uſed by ſome phyſicians for the gout in the ſpine of the back.

RACHITIS, in *Medicine*, from ῥαχις, *the ſpine*, (becauſe the ſpinal marrow was ſuppoſed to be the ſeat of the diſeaſe,) a malady corruptly termed in Engliſh the *Rickets*: which ſee.

RACH-KOKE, in *Geography*, one of the Kuriſkoi or Kurilly iſlands in the Eaſtern or Pacific ocean: diſtant from Muſſyr, another of the ſaid iſlands, about 120 verſts. Its length is about 20 verſts, and its breadth the ſame, and it preſents the appearance of a ſolitary mountain riſing upwards from the ſea. It was formerly covered with verdure, with ſhelves of rocks, where ſea-fowl in great number made their neſts: but theſe rocky ſhelves have been demoliſhed by the eruption of ſubterraneous fires, which ſplit the ſummit of the mountain, throwing up vaſt quantities of ſtones and aſhes; and ſince that time, the iſland has always continued burning. At this eruption thoſe places on the ſhore where formerly they had thirteen fathom water, were filled up with rubbiſh and aſhes into ſhoals and banks.

RACHLIN, in *Ancient Geography*, the *Ricina* of Ptolemy, near the N.E. coaſt of Ireland, memorable as the retreat of Robert I. of Scotland.

RACHOL, in *Geography*, a town of Hindooſtan, in Soonda; 16 miles S.S.E. of Goa.

RACHORE, a diſtrict or province of Hindooſtan, in Golconda, bounded on the N. by the Kiſtnah, on the E. by Canoul, on the S. by Adoni, and on the W. by Sanore.—Alſo, a town of Hindooſtan, and capital of the above-mentioned province, on the S. ſide of the Kiſtnah, and not far above the conflux of the Toombuddra with it, and below that of the Beemah; belonging to the Nizam. It is four days' journey from Adoni, reckoning a day's journey at 22 Britiſh miles in road diſtance, and 17 or 18 geographical miles; 91 miles S.W. of Hydrabad. N. lat. 16° 24′. E. long. 78° 2′.

RACHOSIS, from ῥαχος, *lacero*, a diſeaſe, in which the ſcrotum is relaxed and excoriated.

RACHOUR, in *Geography*, a town of Hindooſtan, in the circar of Gurry Mundella; 20 miles S.S.W. of Gurrah.

RACHOURE, a town of Hindooſtan, in Myſore; 20 miles S. of Gurramconda.

RACHOW, a town of Poland; 36 miles S.S.W. of Lublin.

RACINE, John, in *Biography*, an eminent French poet, was born in 1639. He was educated at the convent of Port-Royal, near Paris; after this he went through a courſe of philoſophy at the college of Harcourt, and then made his appearance before the public in an ode on the king's marriage. This effort was, through the intereſt of Colbert, rewarded with a preſent and a ſmall penſion. Elated with the ſucceſs that crowned his firſt effort, he determined to follow poetry as a profeſſion; and, rejecting the offer of an uncle, a prior, who offered to reſign his benefice to him, provided he would enter into holy orders, he fixed his reſidence at Paris. In 1664 he brought upon the ſtage his firſt tragedy, entitled "La Thebaide ou les Frères ennemis." It was written in the manner of Corneille, which he ſoon after quitted for one of his own; a judicious change, ſays a critic, ſince the characteriſtics of theſe two maſters of the French drama were extremely different. He next publiſhed his "Alexandre," which was followed by his "Andromaque." About this time he was preſented to the priory of Epinay, but not being in orders, he was, after a law-ſuit, obliged to quit. His "Andromaque," which eſtabliſhed his character as a tragedian, was ſoon followed by the comedy "Les Plaideurs," which, though it obtained for him the praiſe of Moliere, and was well received at court, was his only attempt in that walk. Between the years 1670 and 1678, he publiſhed his "Britannicus," "Berenice," "Bajazet," "Mithridate," "Ephigene," and "Phædre." His popularity and well-earned reputation excited a ſtrong party againſt him: the chagrin which he underwent from the artifices of his enemies, and the over-ſenſibility to criticiſm, which led him to confeſs, in the confidence of friendſhip, that the worſt critique made upon his works cauſed him more uneaſineſs than the greateſt plaudits had given him pleaſure, inſpired him with the reſolution of renouncing poetry and turning Carthuſian. He was, however, perſuaded to change his plan, and to marry: he accordingly formed an alliance with the daughter of a gentleman in the treaſury of Amiens, by whom he had ſeveral children. At the ſame time he ceaſed to write for the ſtage, and thereby reconciled himſelf with his old friends of the Port-Royal. Racine now became a courtier, and obtained the ſituation of gentleman in ordinary to the king, to whom he made himſelf very uſeful. He was alſo appointed to the office of hiſtoriographer-royal, in conjunction with his friend Boileau, which they made a complete ſinecure. He was prevailed upon by madame Maintenon to write a dramatic piece on a ſcriptural ſubject, for the ladies of her foundation of St. Cyr, and his "Eſther" was performed by them in 1689, with great applauſe, in the preſence of the whole court. He followed it with "Athalie," acted by the ſame ladies in 1691. Madame Maintenon, deeply affected with the miſeries of the people in the latter years of Lewis's reign, engaged Racine to draw up a memoir on the ſubject. This he did in ſo free a manner, as to give great offence to the king, who happened to obtain a ſight of it from a lady to whom it had been lent. Racine was excluded from the court, a circumſtance that ſo preyed upon his mind, that he fell into a ſtate of melancholy, of which he died in 1699, at the age of 60. For a character of this writer we ſhall be indebted chiefly to the General Biography. He was polite in his manners, with the affected ſoftneſs of a courtier, which was, however, a maſk to his actual diſpoſition, for, in reality, he had much gall and ſpleen in his character. Religion, however, corrected, in a good meaſure, theſe defects, and in all the relations of domeſtic life he was exemplary. As a dramatic writer he is ſuppoſed to have ranked with Corneille, though in many points he even ſurpaſſed him. His characteriſtics are tender-

neſs,

neſs, elegance, correctneſs, good taſte, refined ſentiments, and the art of verſifying in a ſupreme degree, ſo that his countrymen find a charm in his lines, which diſtinguiſhes them from other French poetry. The criticiſms of Boileau contributed much to his excellence in this particular, and he is ſaid to have taught him, as a great ſecret, to write the ſecond line of a couplet firſt. With reſpect to the proper dramatic merit, Racine muſt be judged by thoſe who are formed to the French ſchool, and are not readily wearied with long ſpeeches, rather deſcriptive of feeling than expreſſing it, and all refinements of the tender paſſion, often applied to characters, to which it is hiſtorically unſuitable. Many parts of his beſt pieces, however, prove that his mind was well furniſhed with elevated and dignified ſentiments, which he probably derived from an aſſiduous ſtudy of the ancients. Beſides his dramatic works, Racine was author of "Cantiques," replete with the unction of tender devotion; "L'Hiſtoire de Port-Royal;" "Idylle ſur la Paix;" "Epigrams;" Letters;" and ſome "Opuſcules." He was member of the French academy from 1673, and as director of that inſtitution he pronounced the eulogy of Corneille. The beſt edition of his works is in ſeven vols. 8vo. 1768.

Racine, Louis, ſon of the preceding, alſo a diſtinguiſhed poet, was born at Paris in 1692. He was, however, not more diſtinguiſhed for his poetry than for his piety, and adopted the eccleſiaſtical habit. In a ſtate of retirement, in 1720, he publiſhed his poem "On Grace." The chancellor d'Augeſſeau, during his own exile at Freſnes, brought Racine again into the world, and cardinal Fleury afterwards gave him a place in the finances. He married, and lived very happily in his family, till the loſs of an only ſon threw him into a deep melancholy. His religious ſentiments took full poſſeſſion of his ſoul, the fervour of which may be eſtimated by the line from Tibullus which he inſcribed on the crucifix which ever accompanied him:

"Te ſpectem ſuprema mihi cum venerit hora,
Te teneam moriens deficiente manu."

He died in 1763, at the age of 71. His poetical writings are "Poems on Religion and Grace;" "Odes," of which the diction is ſplendid, and the ſentiments elevated; "Epiſtles," and a "Tranſlation of Milton's Paradiſe Loſt." In proſe he wrote "Reflexions ſur la Poeſie;" "Memoires ſur la Vie de Jean Racine;" "Remarques ſur les Tragedies de J. Racine:" beſides theſe he contributed ſeveral diſſertations to the Memoires of the Academy of Inſcriptions, of which he was a member. His works were collected and publiſhed in 6 vols. 12mo.

Racine, Bonaventure, a learned French prieſt and eccleſiaſtical hiſtorian, was born at Chauny, in the dioceſe of Noyon, in the year 1708. He received an excellent education at the Mazarin college at Paris, where he not only ſtudied the ancient languages, but entered pretty fully into the different branches of philoſophy, divinity, and the ſtudies connected with eccleſiaſtical hiſtory. At the age of twenty-one he was entruſted by the archbiſhop of Alby, as a fit perſon, to re-eſtabliſh the college of Rabaſtens, a town in his dioceſe. To this deſign he devoted his talents with unwearied zeal and aſſiduity, and was abundantly compenſated by the ſucceſs which attended his labours. The inſtitution was, in a ſhort time, crowded with ſtudents, who imbibed from his lectures a taſte for ſcience and literature. Thus uſefully engaged, he became an object of the jealouſy of the witty Jeſuits, who cauſed him to be baniſhed from Rabaſtens. He retired to Montpelier, where M. Colbert engaged him to undertake the direction of the college of Lunel: from this place he was alſo driven by the ſame perſecutors, and he found it neceſſary to withdraw ſecretly to Paris, where he was invited to undertake the education of certain young perſons at the college of Harcourt, in connection with ſome other eccleſiaſtics. Here his old enemies the Jeſuits purſued him, and an order was obtained from cardinal Fleury, in 1734, to deprive him of his office of tutor. In the following year M. de Caylus, biſhop of Auxerre, nominated him to a canonry in his cathedral, and ordained him prieſt; but his new dignity produced no alteration in his manner of living, nor in the diſtribution of his time, which was almoſt wholly ſpent in devotion and ſtudy. From this time he ſet about preparing to publiſh the collections that he had made in eccleſiaſtical hiſtory, and in 1748 he ſent into the world the firſt volumes of an "Abridgment of Univerſal Hiſtory, containing the principal Events in every Century, with Reflections," in 12mo. Theſe were followed by others, to the number of thirteen, the laſt making its appearance in the year 1754. This work, written in a neat, perſpicuous, and ſimple ſtyle, was well received, and became extremely popular. The labour which it coſt him his weak conſtitution was unable to ſuſtain; he ſunk under his exertions in the 47th year of his age. He was characteriſed by the excellence of his manners and the amiableneſs of his temper, and he had an ardent zeal for what he regarded as truth, which approached to enthuſiaſm. Two other volumes have been added ſince his death to the Hiſtory, but they are the work of an inferior hand, and unworthy of being placed in conjunction with thoſe of Racine. Moreri.

RACING, the riding of heats for a plate or other premium. Horſes for this uſe ſhould be as light as poſſible, large, long, and well-ſhaped, nervous, of great mettle, and good wind, with ſmall legs, and neat ſmall-ſhaped feet.

The firſt thing to be conſidered in this ſort of gaming is the choice of a rider; for it is not only neceſſary that he ſhould be very expert and able, but he muſt alſo be very honeſt.

He muſt have a very cloſe ſeat, his knees being turned cloſe to the ſaddle ſkirts, and held firmly there, and the toes turned inwards, ſo that the ſpurs may be turned outward to the horſe's belly; his left hand governing the horſe's mouth, and his right the whip. During the whole time of the race, he muſt take care to ſit firm in the ſaddle, without waving or ſtanding up in the ſtirrups. Some jockies fancy this is a becoming ſeat, but it is certain, that all motions of this kind do really incommode the horſe. In ſpurring the horſe, it is not to be done by ſticking the calves of the legs cloſe to the horſe's ſides, as if it were intended to preſs the wind out of his body; but, on the contrary, the toes are to be turned a little outwards, that the heels being brought in, the ſpurs may juſt be brought to touch the ſides. A ſharp touch of this kind will be of more ſervice toward the quickening of a horſe's pace, and will ſooner draw blood than one of the common coarſe kicks. The expert jockey will never ſpur his horſe until there is great occaſion, and then he will avoid ſtriking him under the fore-bowels between the ſhoulders and the girt; this is the tendereſt part of a horſe, and a touch there is to be reſerved for the greateſt extremity.

As to whipping the horſe, it ought always to be done over the ſhoulder, on the near ſide, except in very hard running, and on the point of victory; then the horſe is to be ſtruck on the flank with a ſtrong jerk; for the ſkin is the moſt tender of all there, and moſt ſenſible of the laſh.

When a horſe is whipped and ſpurred, and is at the top of his ſpeed; if he claps his ears in his pole, or whiſks his tail, it is a proof that the jockey heats him hard, and then he ought to give him as much comfort as he can, by ſaw-

ing

ing the ſnaffle backwards and forwards in his mouth, and by that means forcing him to open his mouth, which will give him wind, and be of great ſervice. If there be any high wind ſtirring in the time of riding, the artful jockey will let his adverſary lead, holding hard behind him, till he ſees an opportunity of giving a looſe; yet in this caſe, he muſt keep ſo cloſe behind, that the other horſe may keep the wind from him; and that he, ſitting low, may at once ſhelter himſelf under him, and aſſiſt the ſtrength of the horſe. If the wind happen to be in their back, a juſt contrary method is to be taken with it; the expert jockey is to keep directly behind the adverſary that he may have all the advantage of the wind to blow his horſe along, as it were, and at the ſame time intercept it in regard to his adverſary.

When running on level carpet-ground, the jockey is to bear his horſe as much as the adverſary will give him leave, becauſe the horſe is naturally more inclined to ſpend himſelf on this ground: on the contrary, on deep earths he may have more liberty, as he will there ſpare himſelf.

In riding up hill the horſe is always to be favoured, by bearing him hard, for fear of running him out of wind; but in running down hill, if the horſe's feet and ſhoulders will bear it, and the rider dares venture his neck, he may have a full looſe. If the horſe have the heels of the reſt, the jockey muſt always ſpare him a little, that he may have a reſerve of ſtrength, to make a puſh at the laſt poſt.

A great deal depends on the jockey's knowing the nature of the horſe that is to run againſt him; for by managing accordingly, great advantages are to be obtained: thus, if the oppoſite horſe is of a hot and fiery diſpoſition, the jockey is either to run juſt behind him, or cheek by joul with him, making a noiſe with the whip, and by that means forcing him on faſter than his rider would have him, and conſequently ſpending him ſo much the ſooner; or elſe keep juſt before him, in ſuch a ſlow gallop, that he may either over-reach, or by treading on the heels of the fore horſe, endanger tumbling over.

Whatever be the ground that the adverſary's horſe runs worſt on, the cunning jockey is to ride the moſt violently over; that by this means it will often happen, that in following he either ſtumbles or claps on the back ſinews. The ſeveral corrections of the hand, the whip, and the ſpur, are alſo to be obſerved in the adverſary, and in what manner he makes uſe of them: and when it is perceived, by any of the ſymptoms, of holding down the ears, or whiſking the tail, or ſtretching out the noſe like a pig, that the horſe is almoſt blown, the buſineſs is to keep him on to this ſpeed, and he will be ſoon thrown out, or diſtanced. If the horſe of the opponent looks dull, it is a ſign his ſtrength fails him; and if his flanks beat much, it is a ſign that his wind begins to fail him, and his ſtrength will ſoon do ſo too.

After every heat for a plate, there muſt be dry ſtraw, and dry cloths, both linen and woollen, ready to rub him down all over, after taking off the ſweat with what is called a ſweat-knife; that is, a piece of an old ſword-blade, or ſome ſuch thing. Some adviſe the ſteeping of the cloths in urine and ſaltpetre the day before, and letting them be dried in the ſun for this occaſion. After the horſe has been well rubbed with theſe, he ſhould be chaſed all over, with cloths wetted in common water, till the time of ſtarting again. When it is certainly known that the horſe is good at the bottom, and will ſtick at the mark, he ſhould be rid every heat to the beſt of his performance; and the jockey is, as much as poſſible, to avoid riding at any particular horſe, or ſtaying for any, but to ride out the whole heat with the beſt ſpeed he can. If, on the contrary, he has a fiery horſe to ride, and one that is hard to manage, hard-mouthed, and difficult to be held, he is to be ſtarted behind the reſt of the horſes with all imaginable coolneſs and gentleneſs; and when he begins to ride at ſome command, then the jockey is to put up to the other horſes; and if they ride at their eaſe, and are hard held, they are to be drawn on faſter; and if it be perceived that their wind begins to rake hot, and they want a ſob, the buſineſs is to keep them up to that ſpeed; and when they are all come within three quarters of a mile of the poſt, then is the time to puſh for it, and uſe the utmoſt ſpeed in the creature's power.

When the race is over, the horſe is immediately to be clothed up, and rode home; and immediately on his coming into the ſtable, the following drink is to be given him. Beat up the yolks of three eggs, and put them into a pint and a half of new milk made warm; let there be added to this three pennyworth of ſaffron, and three ſpoonfuls of ſallad-oil, and let the whole be given with a horn. After this he is to be rubbed well down, and the ſaddle-place rubbed over with warm ſack, and the places where the ſpurs have touched, with a mixture of urine and ſalt, and afterwards with a mixture of powder of jet and Venice turpentine; after this he ſhould have a feed of rye-bread, then a good maſh, and at ſome time after theſe as much hay and oats as he will eat. His legs, after this, ſhould be bathed ſome time with a mixture of urine and ſaltpetre.

For the preparation of the horſe before running, &c. ſee PLATE.

We ſhall here obſerve, that horſe-races were a ſpecies of amuſement known in England in very early times. Fitz-Stephen, who wrote in the days of Henry II. records the great delight which the citizens of London took in the diverſion. Races appear likewiſe to have been in vogue in the reign of queen Elizabeth, and to have been carried to ſuch exceſs as to have injured the fortunes of the nobility. Lord Herbert of Cherbury (ſee his Life by Mr. Walpole, p. 51.) enumerates theſe among the ſports which he thought unworthy of a man of honour. "The exerciſe," ſays he, "I do not approve of is running of horſes, there being much cheating in that kind; neither do I ſee why a brave man ſhould delight in a creature whoſe chief uſe is to help him to run away." Jarvis Markham, who wrote on the management of horſes in 1599, mentions running horſes; but at this time there were only private matches made between gentlemen, who were their own jockies, and rode their own horſes. However, in the following reign of James I., public races were eſtabliſhed; and Garterly, in Yorkſhire, Croydon, near London, and ſometimes Theobald's, near Enfield-chace, where the king reſided, were the courſes in which they were performed. The horſes at this time were prepared for running by the diſcipline of food, phyſic, airing, and ſweats and clothing, which compoſe the preſent ſyſtem. The weight alſo which each horſe was to carry was rigidly adjuſted; the uſual weight of the riders being ſtated at ten ſtones, who were put into ſcales, and weighed before they ſtarted. Moſt of the celebrated races in the kingdom were called bell-courſes, the prize and reward of the conquering horſes being a bell. To this purpoſe, Camden ſays, that in 1607 there were races near York, and the prize was a little golden bell. Upon this Berenger offers a conjecture, whether the phraſe of *bearing the bell*, which implies being comparatively the beſt or moſt excellent, and correſponds with the expreſſion of bearing the palm among the ancients, as a reward decreed to the ſwifteſt horſe in a race, is not more aptly deduced from this

cuſtom,

cuſtom, than from the method of tying a bell round the neck of the ſheep, which leads the flock, and is, therefore, counted the beſt.

About the latter end of the reign of Charles I. it was cuſtomary to have races performed in Hyde Park. See the Comedy of the Merry Beggars, or Jovial Crew, written in 1641, in Dodſley's Collection of Old Plays.

Racing was much encouraged by Charles II. after his reſtoration: he gave public rewards and prizes, and appointed races for his own amuſement at Datchet Mead, when he reſided at Windſor. But the moſt diſtinguiſhed ſpot for theſe exerciſes was Newmarket, which was at firſt frequented for the purpoſe of hunting, and ſeems not to have been deſtined to be a horſe-courſe till ſome time before the troubles of the reign of Charles I., when races were diſcontinued; but they were revived ſoon after the Reſtoration. The king attended in perſon, and eſtabliſhed a houſe for his accommodation, and kept and entered horſes in his own name. Inſtead of bells, a ſilver bowl or cup, of the value of a hundred guineas, was allotted for a prize; and upon this royal gift the exploits of the ſucceſsful horſe, and his pedigree, were generally engraved. The ſum of a hundred guineas is now given in lieu of the ſilver bowl.

When William III. was advanced to the throne, he not only added to the plates given to different places in the kingdom, but founded an academy for riding. Queen Anne continued the bounty of her predeceſſors, with the addition of ſeveral plates. George I., towards the end of his reign, diſcontinued the plates, and gave the ſum of a hundred guineas in their room.

In the thirteenth year of George II. an act was paſſed for the ſuppreſſion of races by poneys, and other ſmall and weak horſes, by which all matches for any prize under the value of 50*l.* are prohibited, under a penalty of 200*l.*, to be paid by the owner of each horſe running, and 100*l.* by ſuch as advertiſe the plate; and by which each horſe entered to run, if five years old, is obliged to carry ten ſtone; if ſix, eleven; and if ſeven, twelve. It is alſo ordained, that no perſon ſhall run any horſe at a courſe, unleſs it be his own, nor enter more than one horſe for the ſame plate, upon pain of forfeiting the horſes: and alſo every horſe-race muſt be begun and ended in the ſame day. Horſes may run for the value of 50*l.* with any weight, and at any place. 13 Geo. II. cap. 19. 18 Geo. II. cap. 34. Pennant's Brit. Zool. vol. i. p. 6, &c. Berenger's Hiſt. and Art of Horſemanſhip, vol. i. p. 185, &c.

We ſhall here add, that at Newmarket there are two courſes, the long and the round: the firſt is exactly four miles, and about three hundred and eighty yards, *i. e.* ſeven thouſand four hundred and twenty yards. The ſecond is ſix thouſand ſix hundred and forty yards. Childers, the ſwifteſt horſe ever known, has run the firſt courſe in ſeven minutes and a half, and the ſecond in ſix minutes forty ſeconds; which is at the rate of more than forty-nine feet in a ſecond. But all other horſes take up at leaſt ſeven minutes and fifty ſeconds in completing the firſt and longeſt courſe, and ſeven minutes only in the ſhorteſt, which is at the rate of more than forty-ſeven feet in a ſecond, and it is commonly ſuppoſed that theſe courſers cover, at every bound, a ſpace of ground in length about twenty-four Engliſh feet.

RACITZA, in *Geography*, a town of Bukovina; 7 miles N. of Czernaucii.

RACK, a ſmall iſland near the coaſt of Virginia. N. lat. 37° 19′. W. long. 75° 51′.

Rack, *Lower* and *Upper*, two ſmall iſlands near the coaſt of Virginia; the former in N. lat. 37° 20′. W. long. 75° 50′, and the latter in N. lat. 37° 26′. W. long. 75° 45′.

Rack, an engine of torture furniſhed with cords, &c. for extorting confeſſion from criminals.

The duke of Exeter, conſtable of the Tower under Henry VI., with the duke of Suffolk, and others, having a deſign to introduce the civil law into England; for a beginning, the *rack*, or *brake*, allowed in many caſes by the civil law, was firſt brought to the Tower, where it is ſtill preſerved; in thoſe days the rack was called the duke of Exeter's daughter. 3 Inſt. 35.

It was occaſionally uſed as an engine of ſtate, not of law, more than once in the reign of queen Elizabeth. (Barr. 92. 496.) But when, upon the aſſaſſination of Villiers, duke of Buckingham, by Felton, it was propoſed in the privy-council to put the aſſaſſin to the rack, in order to diſcover his accomplices; the judges being conſulted, declared unanimouſly, to their own honour, and the honour of the Engliſh law, that no ſuch proceeding was allowable by the laws of England. The uncertainty of this puniſhment, as a teſt and criterion of truth, was long ago very elegantly pointed out by Tully (pro Sulla, 28.); though he lived in a ſtate in which it was uſual to torture ſlaves, in order to furniſh evidence. "Tamen," ſays he, "illa tormenta gubernat dolor, moderatur natura cujuſque tum animi tum corporis, regit quæſitor, flectit libido, corrumpit ſpes, infirmat metus; ut in tot rerum anguſtiis nihil veritati loci relinquatur."

The marquis Beccaria (ch. 16.), in an exquiſite piece of raillery, has propoſed this problem, with a gravity and preciſion that are truly mathematical: "the force of the muſcles, and the ſenſibility of the nerves of an innocent perſon being given, it is required to find the degree of pain neceſſary to make him confeſs himſelf guilty of a given crime."

Rack, in the *Manege*, a pace in which a horſe neither trots nor ambles, but ſhuffles, as it were, between both.

The racking pace is much the ſame as the *amble* (which ſee); only that it is a ſwifter time, and a ſhorter tread.

Rack is alſo a wooden frame, made to hold hay or fodder for cattle. There has lately been much improvement made in the forming of all ſorts of racks, both for the ſtable, cattle-ſheds, and field. See Cattle-*ſheds*, Stable, and Sheep-*houſe*.

Rack, in *Rigging*, a ſhort thin plank, with holes made through it, containing a number of belaying-pins, uſed inſtead of cleats; it is ſeized to the ſhrouds, and nailed over the bowſprit or windlaſs.—Alſo, a long ſhell, containing a number of ſheaves, formerly fixed over the bowſprit to lead in the running rigging. At preſent, wooden ſaddles, with holes in them, are nailed on the bowſprit for this purpoſe. being more out of the way, and leſs liable to be out of order, See Shot-*rack*, and Shroud-*rack*.

To Rack *Wines*, &c. is to draw them from off their lees, after their having ſtood long enough to clear and ſettle. Hence,

Rack-*Vintage*, is frequently uſed for the ſecond voyage our wine-merchants uſed to make into France for racked wines; whence they uſed to return about the end of December.

Rack-*Holders*, ſuch tenants as hold their lands under ſuch leaſes.

Rack-*Leaſes*, are ſuch ſorts of leaſes as are granted for one or more lives, at the full rack rents, as in Cornwall, and ſome other counties. See Leases *of Land*.

Rack-*Rent*, is the full yearly value of land let by leaſe, payable by tenant for life or years, &c. See Rent.

Rack-

RACK, *Sheep*, a ſort of long narrow crib, fixed upon wheels, for containing hay for ſheep, having a lid or covering on the top. It is very uſeful in bad weather, in the winter ſeaſon, as preventing the hay from being waſted, and admitting the ſheep to feed conveniently.

RACKAMA, in *Geography*, a lake of Syria, ſouth of Hella and the ancient Babylon, is about 30 miles long, and flows into the Euphrates.

RACKEBY, a town of Sweden, in Weſt Gothland; 40 miles N.E. of Uddevalla.

RACKET, a kind of bat for ſtriking the ball at tennis; conſiſting uſually of a lattice, or net-work, of cat-gut, ſtrained very tight over a circle of wood, with a handle or ſhaft of a moderate length.

The word is formed from the French *raquette*, which Menage derives from the Latin *retetta*, a diminutive of *rete*, *net*; whence alſo *reticum*, and *reticulum*.

Paſquier obſerves, that anciently they uſed no rackets at tennis, but played with the palm of the hand: and hence he conjectures it is that the French call tennis play, *jeu de paume*. He adds, that rackets were not introduced till a little before his time.

RACKET is alſo a machine which the ſavages of Canada bind to their feet, to enable them to walk more commodiouſly over the ſnow; made much in the manner of a tennis-racket.

Its figure is a lozenge, of which the two obtuſe angles are rounded off. It is bound about with very fine thongs of leather, and the meſhes of it are much ſmaller and cloſer than thoſe of our rackets.

In the middle is fitted a kind of ſhoe, lined with wool, or hair; to be tied on to the ankle: by which means the feet are prevented from ſinking in the ſnow. Rackets oblige the perſon to take very long ſteps, and, as we ſay, to walk a great pace, to keep them from knocking againſt each other.

RACKET, in *Geography*, a river of New York, which runs into the St. Lawrence, N. lat. 45° 13′. W. long. 74° 42′.

RACKIBIRN, the name of a ſmall iſland on the N.W. coaſt of Ireland, ſituated near Tiellen head, in the county of Donegal. N. lat. 54° 39′. W. long. 8° 44′.

RACKING, in *Sea Language*, denotes the faſtening of two oppoſite parts of a tackle together, ſo as that any weighty body ſuſpended by it ſhall not fall down, although the rope, which forms the tackle, ſhould be looſened by accident or neglect. This expedient is chiefly practiſed when the boats are hung up to the ſhip's ſide in the night, in an open road or bay, leſt the rope of the tackle ſhould be untied by the inattention of ſome of the crew, by which accident the boat might be conſiderably damaged, and probably loſt or daſhed to pieces. Falconer.

RACKING *Fruit Liquor*, the operations of fining and drawing it off. See CYDER.

RACKLIA, in *Geography*, a ſmall rocky iſland in the Grecian Archipelago, inhabited by two or three poor monks, who take care of a few ſheep and goats. N. lat. 36° 53′. E. long. 25° 38′.

RACKNITZ, a town of the duchy of Carinthia; 3 miles S. of Saxenburg.

RACKOON, or RACCOON, the *urſus lotor* of Linnæus, in *Zoology*, the name by which we commonly know an American animal, called *coati* by the Braſilians. It is ſomething ſmaller than the beaver, and is of the ſhape of the beaver in the body, and its legs are as ſhort as in that creature. The face, cheeks, and chin are white; the upper part of the body is covered with hair, long, ſoft, and thick; black at the ends, whitiſh in the middle, and aſh-coloured at the root. Sometimes from this mixture of colour the back appears plainly grey; and Marcgrave mentions another ſpecies, which is of a deep yellow or ochre colour.

The head is very like that of the fox in ſhape; but that the ears are ſhorter, roundiſh, and naked, and it has from the forehead to the noſe a duſky line. The eyes are large, and ſurrounded with two broad patches of black; the noſe is black and ſharp-pointed; its tail is very buſhy, and annulated with black. Its feet are each divided into five ſlender toes; by the help of which it climbs trees as expertly as a monkey, and uſes the fore-feet as hands, to reach up its food to its mouth. It is a very cleanly animal; and if there be water near, it always waſhes its food, be it what it will, before it eats it. It feeds on vegetables, but is alſo very fond of eggs, and will even ſeize birds if it can catch them. It is alſo very fond of ſweet things and ſtrong liquors, and will get exceſſively drunk: at low-water it feeds much on oyſters, watching their opening, and with its paw ſnatching out the fiſh, and is ſometimes caught in the ſhell. It is very common in the warm and temperate parts of America, in the mountains of Jamaica, and in the iſles of Maria in the South ſea, and is a creature eaſily tamed. It is hunted for its ſkin; the fur, next to that of the beaver, being excellent for making hats. Ray and Pennant.

RACLER, Fr., to ſcrape, to raſp, or file a hard body. It is ſaid, in deriſion of a bad performer on the violin, or any other inſtrument played with a bow, that he ſcrapes or raſps the ſtrings; becauſe, in fact, he draws a harſh and diſagreeable tone from his inſtrument, which reſembles that produced by ſcraping or filing a hard body. Even good players on the violin ſometimes ſcrape a little in the *forte* parts of their performance. Suppl. to Encycl., 1ſt edit.

RACLERGUNGE, in *Geography*, a town of Bengal; 50 miles N.W. of Burdwan.

RACONIGI, a town of France, in the department of the Stura, containing four gates, with as many fauxbourgs, well peopled. The king of Sardinia had a palace here. The police is conducted by fifteen counſellors, from whom two ſyndics are choſen every four months, who act as bailiffs or mayors of the town. It has two pariſhes, and ſeveral religious houſes. The inhabitants are induſtrious, and much employed in making gauzes and ſilk ſtuffs; 6 miles N. of Savigliano.

RACOPILUM, in *Botany*, from ῥακος, *a rent in a garment*, or *a wrinkle*, and πιλος, *a hat* or *cap*, the name of one of Paliſſot de Beauvois's genera of moſſes, whoſe veil is torn at the ſide. It ought to be written *Rhacopilum*.

RACOUBEA, a name of Aublet's, of which we find no explanation. See HOMALIUM.

RACOW, *Catechiſm of*, in *Eccleſiaſtical Hiſtory*, a ſyſtem of theology compiled by the moſt eminent Socinian doctors, and firſt publiſhed at Racow, or Rakow, in Poland, in the year 1609, with a dedication to our king James I. This catechiſm, or a tranſlation of it, was committed to the flames in England, in the year 1653, by order of parliament. A new edition of it, corrected and enlarged, was publiſhed at Stauropolis, in 1684. The Socinians conſider this catechiſm as the great ſtandard of Socinianiſm, and an accurate ſummary of the doctrine of that ſect. However, Moſheim obſerves, that it is, in reality, no more than a collection of the popular tenets of the Socinians, and by no means a juſt repreſentation of the ſecret opinions and ſentiments of their doctors. Hence he ſays it never obtained among them the authority of a public confeſſion or rule of faith; and hence the doctors of that ſect were authoriſed to correct and con-

tradict it, and to ſubſtitute another form of doctrine in its place. But to this account it has been replied, that it would have been inconſiſtent with the liberty, for which they argue in the preface to this catechiſm, to have limited their religious inquiries to this ſtandard; and by treating it as a rule of faith, they would have violated their expreſs declarations, that they dictated to no one, and aſſumed no authority. Moſh. Eccl. Hiſt. See RAKOW.

RACSON-COMPON, in *Geography*, a mountain of Thibet. N. lat. 31° 50'. E. long. 86° 14'.

RADA, a town of Sweden, in Warmeland; 33 miles N. of Carlſtadt. - Alſo, a town of Sweden, in Warmeland; 35 miles S.E. of Carlſtadt.—Alſo, a town of Sweden, in Weſt Gothland; 5 miles W. of Gothenburg.—Alſo, a river of Weſtphalia, which runs into the Ocker, 5 miles N.E. of Goſlar.

RADANAGUR, a town of Hindooſtan, in Bahar; 32 miles E. of Ramgur.

RADANI, a town of Sweden, in Weſt Gothland; 16 miles N. of Uddevalla.

RADAR, a town of Perſia, in the province of Chorafan; 48 miles N. of Meſchid.

RADASALMI, a town of Sweden, in the province of Savolax; 20 miles N.N.W. of Nyſlot.

RADAVITZA, a town of Pruſſia, in the palatinate of Culm; 22 miles E.S.E. of Culm.

RADAUN, a town of Auſtria; 6 miles W.S.W. of Vienna.

RADAUTZ, or RADENTZ, a town of Bukovina; 22 miles W.S.W. of Saczava.

RADAWAIR, a town of Hindooſtan, in Candeiſh; 14 miles S.W. of Burhanpour.

RADBUZA, a river of Bohemia, that riſes in the S.W. part of the circle of Pilſen, and runs into the Miza, near the town of Pilſen.

RADCLIFFE, JOHN, in *Biography*, an eminent and eccentric phyſician, was born at Wakefield, in Yorkſhire, where his father poſſeſſed a moderate eſtate, in the year 1650. He received the rudiments of his claſſical education at a ſchool in that town; and at the age of 15, was ſent to complete his ſtudies at Univerſity college, in Oxford. He took his bachelor's degree in arts in 1669, and removed to Lincoln college, where he was elected to a fellowſhip. Having determined upon the profeſſion of phyſic, he went through the courſes of botany, chemiſtry, and anatomy, and was diſtinguiſhed by the rapidity of his attainments in all theſe purſuits. Nevertheleſs he did not apply with zeal or induſtry to the ſtudies of the cloſet, and recommended himſelf rather by his vivacity, acuteneſs, and wit, than by any extraordinary acquiſitions in any department of knowledge. In the proſecution of his medical inquiries, he contented himſelf with looking into the works of Dr. Willis, who was at that time practiſing in London with much reputation. He was poſſeſſed, indeed, of very few books; inſomuch that when Dr. Bathurſt, head of Trinity college, aſked him once with ſurpriſe where his ſtudy was? he pointed to a few vials, a ſkeleton, and a herbal, and ſaid, "Sir, this is Radcliffe's library." He took the degree of maſter of arts in 1672, and in 1675 he proceeded bachelor of medicine, and immediately began to practiſe in Oxford. He profeſſed to pay very little regard to the rules which were generally followed, but cenſured them on many occaſions with great freedom and acrimony; a conduct which did not fail to draw upon him the enmity of all the old practitioners. Nevertheleſs his reputation and his practice rapidly increaſed; and before he had been two years in the world, he was very generally conſulted, even by thoſe of the higheſt rank. About this time, in conſequence of ſome witticiſms, which he had launched with his accuſtomed freedom againſt Dr. Marſhall, rector of Lincoln college, the latter unkindly oppoſed his application for a diſpenſation for taking holy orders, which the ſtatutes required, if he retained his fellowſhip, and ſhewed other tokens of incivility; which induced Radcliffe to reſign his fellowſhip, quit the college, and take lodgings in the town. He continued to practiſe at Oxford, increaſing alike in wealth and reputation, until 1684, having taken the degree of doctor in 1682; and he then determined to remove to London, and ſettled himſelf in Bow-ſtreet, Covent Garden.

His ſucceſs in the metropolis was unuſually rapid; and doubtleſs his wit and pleaſantry, which rendered him a moſt entertaining companion, contributed ſcarcely leſs than his reputed ſkill in his profeſſion to forward his progreſs. In leſs than a year he was in full practice; and in the ſecond year, he was appointed phyſician to the princeſs Anne of Denmark. In 1688, when prince George of Denmark joined the prince of Orange, and the princeſs retired to Nottingham, in a ſtate of pregnancy, he was preſſed by biſhop Compton to attend her, in quality of his office; but he excuſed himſelf on account of the multiplicity of his patients. After the revolution, he was conſulted by king William and the nobility about his court; an honour which he muſt have owed entirely to his high reputation, for he never ſhewed any inclination to be a courtier. By his rough independence of ſpirit and freedom of language, indeed, he ultimately loſt all favour at court. In 1699, when king William returned from Holland in a ſtate of ſevere indiſpoſition, he ſent for Radcliffe, and ſhewing him his ſwollen ankles, while the reſt of his body was emaciated, ſaid, "What think you of theſe?"—"Why truly," replied the phyſician, "I would not have your majeſty's two legs for your three kingdoms." This freedom was never forgiven by the king, and no interceſſions could ever recover his favour towards Radcliffe. In 1694, when queen Mary caught the ſmall-pox, and died, Radcliffe was accuſed, biſhop Burnet ſays, of negligence and unſkilfulneſs. He ſoon afterwards loſt the favour of princeſs Anne, by neglecting to obey her call from his too great attachment to the bottle, and another phyſician was appointed in his place. When queen Anne came to the throne, the earl of Godolphin exerted all his endeavours to reinſtate him in his former poſt of chief phyſician; but ſhe refuſed, alleging that Radcliffe would ſend her word again, "that her ailments were nothing but the vapours." Nevertheleſs he is ſaid to have been conſulted in all caſes of emergency, in a private way. In 1703 Dr. Radcliffe had an alarming and dangerous attack of pleuriſy, which he neglected, and increaſed in the outſet by drinking a bottle of wine: he had, however, 100 ounces of blood taken from him by Mr. Bernard, the ſerjeant ſurgeon; and the next day, in ſpite of all intreaties, was carried to Kenſington. His eſcape was almoſt miraculous. The queen aſked Mr. Bernard how he did? and when he told her that he was ungovernable, and would obſerve no rules, ſhe anſwered, that then nobody had reaſon to take any thing ill from him, ſince it was plain he uſed other people no worſe than he uſed himſelf. During this illneſs he made a will, by which he diſpoſed of the greater part of his property for charitable purpoſes, appropriating particularly ſeveral thouſand pounds for the relief of ſick ſeamen ſet on ſhore. He recovered, however, and continued in full occupation in his profeſſion, increaſing in wealth and inſolence to the end of his days, and waging a perpetual war with his brethren; who, in their turn, repreſented him as an active, ingenious, adventuring empiric, whom conſtant

practice

practice had brought at length to ſome ſkill in his profeſſion. His caprice in the performance of his profeſſional duties appears to have been unbounded; and many anecdotes are related of his refuſal to attend on perſons of diſtinction, if he happened to be engaged in pleaſant company, or had any perſonal pique againſt the individuals, or if he conceived himſelf in any way affronted. Thus he ſet off ſuddenly for Bath in 1704, while attending the lady of ſir John Trevor, becauſe that gentleman ſent to Oxford for Dr. Breach to conſult with him; which he had done as a compliment to Radcliffe, rather than join any of the London phyſicians with him. When Mr. Harley was ſtabbed by Guiſcard, Swift complains, that by the caprice of Radcliffe, who would allow none but his own ſurgeon to be admitted, "he had not been well looked after;" and adds in another place, "Mr. Harley has had an ill ſurgeon, by the caprice of that puppy Dr. Radcliffe, which kept him back ſo long." On the other hand, he attended the lady of ſir John Holt in a bad illneſs, with unuſual diligence, out of pique to the huſband, who was not ſuppoſed to be over fond of her. In the laſt illneſs of queen Anne, he was ſent for to his country-houſe at Carſhalton about noon, by order, as one account affirms, of the privy council; but he returned an anſwer, that "he had taken phyſic, and could not come." It has been ſtated, however, on the other hand, that he was only ſent for on this occaſion by lady Marſham, without any order from the queen or the council; which is countenanced by the following circumſtances. On the 5th of Auguſt, four days after the queen's death, a friend of the doctor's moved in the houſe of commons, that he might be ſummoned to attend in his place, (Dr. Radcliffe had been elected a member for Buckingham in 1713,) in order to be cenſured for not attending on her majeſty. A letter is preſerved, ſaid to have been written by the doctor to one of his friends, on this occaſion, in which he ſays, "I know the nature of attending crowned heads in their laſt moments too well, to be fond of waiting upon them, without being ſent for by a proper authority. You have heard of pardons being ſigned for phyſicians before a ſovereign's demiſe; however, ill as I was, I would have went to the queen in a horſe-litter, had either her majeſty, or thoſe in the commiſſion next to her, commanded me to do ſo." Whatever was the true ſtate of the caſe, it is certain that Dr. Radcliffe became ſo much the object of popular reſentment, that he was apprehenſive of being aſſaſſinated, as appears from a letter addreſſed by him to Dr. Mead, which is extant. "Nor ſhall I be at any time from home," he ſays, "becauſe I have received ſeveral letters, which threaten me with being pulled to pieces, if ever I come to London." He ſurvived the queen but three months, and died at Carſhalton, on the 1ſt of November 1714, at the age of 64. It was believed, that the dread which he had of the populace, and the want of company in his retirement, which he did not dare to leave, contributed to accelerate his death. He was carried to Oxford, and buried in St. Mary's church in that city.

It does not appear that Dr. Radcliffe ever attempted to write, and probably he would not have ſucceeded as an author. He was believed, indeed, to have been very little converſant with books; which made Dr. Garth humorouſly ſay, that "for Radcliffe to inſtitute a library, was as if an eunuch ſhould found a ſeraglio." He was often the ſubject of the attacks of ridicule from poets and wits, and even was not ſpared on the ſtage; having been ſeverely ſatirized in a piece acted in 1704, ſoon after a legal diſpute with an apothecary, which was attended by the ladies of the court, and in which the paſſages affronting the doctor were much applauded. Swift, in Martinus Scriblerus, and Steele in the Tatler, levelled their ridicule at the doctor; and the following ſevere portrait of him was drawn by Dr. Mandeville, in his Eſſay on Charity Schools. "That a man with ſmall ſkill in phyſic, and hardly any learning, ſhould by vile arts get into practice, and lay up great wealth, is no mighty wonder; but that he ſhould ſo deeply work himſelf into the good opinion of the world as to gain the general eſteem of a nation, and eſtabliſh a reputation beyond all his contemporaries, with no other qualities but a perfect knowledge of mankind, and a capacity of making the moſt of it, is ſomething extraordinary. If a man arrived to ſuch a height of glory, ſhould be almoſt diſtracted with pride, ſometimes give his attendance on a ſervant, or any mean perſon, for nothing, and at the ſame time neglect a nobleman that gives exorbitant fees; at other times, refuſe to leave his bottle for his buſineſs, without any regard to the quality of the perſons that ſent for him, or the danger they are in:—if he ſhould be ſurly and moroſe, affect to be a humouriſt, treat his patients like dogs, though people of diſtinction, and value no man but what would deify him, and never call in queſtion the certainty of his oracles:—if he ſhould inſult all the world, affront the firſt nobility, and extend his inſolence even to the royal family:—if, to maintain as well as to increaſe the fame of his ſufficiency, he ſhould ſcorn to conſult with his betters on what emergency ſoever, look down with contempt on the moſt deſerving of his profeſſion, and never confer with any other phyſician but what will pay homage to his ſuperior genius, creep to his humour, and never approach him but with all the ſlaviſh obſequiouſneſs a court flatterer can treat a prince with:—if a man in his life-time ſhould diſcover, on the one hand, ſuch manifeſt ſymptoms of ſuperlative pride, and an inſatiable greedineſs after wealth at the ſame time; and on the other, no regard to religion, or affection to his kindred, no compaſſion to the poor, and hardly any humanity to his fellow-creatures:—if he gave no proofs that he loved his country, had a public ſpirit, or was a lover of arts, of books, or of literature:—what muſt we judge of his motive, the principle he acted from, when after his death we find that he has left a trifle among his relations, who ſtood in need of it, and an immenſe treaſure to an univerſity that did not want it."

Whatever may be the motives of the endowers of ſplendid inſtitutions for the public uſe, the nation is at all events benefited for ages, by ſuch noble eſtabliſhments as the library and infirmary which he founded at Oxford, and which bear his name. He alſo endowed two travelling fellowſhips, with an annual income of 300*l.* attached to each. He had previouſly cauſed the beautiful eaſt window, over the altar, in Univerſity college, to be put up at his own expence; and likewiſe given the money, which was paid for the erection of the maſter's lodge there, making one ſide of the eaſtern quadrangle. He was certainly avaricious to the extent almoſt of ſpunging, and never could be induced to pay bills without much following and importunity. A piece of waggery would ſometimes conquer this diſpoſition. A pavior, after long and fruitleſs attempts, once caught him juſt getting out of his chariot, at his own door, in Bloomſbury ſquare, and ſet upon him. "Why, you raſcal," ſaid the doctor, "do you pretend to be paid for ſuch a piece of work? Why, you have ſpoiled my pavement, and then covered it over with earth to hide your bad work."—"Doctor," ſaid the pavior, "mine is not the only bad work the earth hides."—"You dog you," ſaid the doctor, "are you a wit? You muſt be poor; come in:" and he paid him. He told Dr. Mead, that the great ſecret by which he might make his fortune was to "uſe all mankind ill." Dr. Mead, however, adopted the

contrary axiom, and ſucceeded even beyond his adviſer. Notwithſtanding that Radcliffe ſeems to have literally practiſed this principle, in his dealings both with his patients and his brethren; and notwithſtanding the ſevere accuſations of ignorance and empiriciſm, which were every where levelled againſt him; the univerſal reputation, which he acquired and maintained, ſeems to ſanction the teſtimony of Dr. Mead, that "he was deſervedly at the head of his profeſſion, on account of his great medical penetration and experience." See Atterbury's Epiſtolary Correſpondence. The Richardſoniana. Pope's Works, vol. vii. Swift's Works, vol. xix. Hutchinſon's Biographia Medica.

RADDELE, in *Geography*, a town of Ceylon, on the eaſt coaſt; 5 miles N.E. of Trincoli.

RADDINSDORP, a town of the duchy of Holſtein; 6 miles E.S.E. of Eutyn.

RADDLE, in *Agriculture*, a red ochre of iron, which, according to Dr. Darwin, has been found uſeful as a manure in the northern parts of Staffordſhire. Its properties have not, however, been yet chemically examined as they relate to manure. See REDDLE.

RADEBURG, in *Geography*, a town of Saxony, in the margraviate of Meiſſen; 10 miles N.E. of Dreſden. N. lat. 51° 8′. E. long. 13° 53′.

RADECHAU, a town of Bohemia, in the circle of Konigingratz; 9 miles S.E. of Trautenau.

RADEGATZ, a town of Germany, in the principality of Anhalt-Deſſau; 13 miles S.S.W. of Deſſau.

RADEGURRY, a town of Hindooſtan, in Canara; 24 miles S.S.E. of Mangalore.

RADENTHAL, a town of the duchy of Carinthia; 13 miles E. of Saxenburg.

RADERAN, a town of Bohemia, in the circle of Kaurzim; 3 miles N.E. of Kaurzim.

RADERMACHIA, in *Botany*, a name originally given to the Bread-fruit, (ſee ARTOCARPUS,) by Thunberg, in honour of one of his great patrons, Joachim Cornelius Matthew Radermacher, a member of the Dutch council, and Preſident of the Society of Sciences, at Batavia. The author, in his Nova Genera, p. 25, repreſents this gentleman as a moſt diſtinguiſhed Mæcenas, and encourager of Natural Hiſtory. Nevertheleſs, the above name has, by common conſent, given way to the expreſſive one of Forſter, *Artocarpus*, which is preciſely ſynonimous with Bread-fruit.

RADERSBERG, in *Geography*, a town of Germany, in the principality of Culmbach; 7 miles E. of Bayreuth.

RADES, a town of Tunis, on the N.E. coaſt; 5 miles S.E. of Tunis.

RADESCHE, or RATSCHACH, a town of Lower Carniola, on the Save; 10 miles N.W. of Gurckfeld.

RADHA, in *Mythology*, is the name of the conſort of the Hindoo deity Kriſhna. As Kriſhna was an avatara, or incarnation of Viſhnu, ſo Radha is underſtood to be ſimilarly an avatara of Viſhnu's conſort Lakſhmi; thus incarnated to accompany her lord in this, his moſt ſplendid terreſtrial manifeſtation. Under the articles KRISHNA and LAKSHMI ſome notice will be found on the ſubject of this. Radha is ſeen very frequently pourtrayed and alluded to in the paintings and writings of India: Kriſhna is, indeed, ſeldom ſeen without her. She is repreſented of perfect beauty, and is warmly celebrated in the amatory poetics of Hindooſtan. In the elegant work of Jayadeva, entitled Gita Govinda, a paſtoral drama exhibiting the loves of Kriſhna and Radha, the lovely nymph is thus deſcribed after a quarrel with her frolickſome and fickle lord, in the morning after the night of reconciliation, when affliction ceaſed, and ecſtacy crowned the recollection of paſt ſorrows. "In the morning ſhe aroſe, diſarrayed, and her eyes betrayed a night without ſlumber, when the yellow-robed god, who gazed on her with tranſport, thus, in his heavenly mind, meditated on her charms: 'Though her locks be diffuſed at random; though the luſtre of her lips be faded; though her garland and zone be fallen from their enchanting ſtations; and though ſhe hides their places with her hands, looking towards me with baſhful ſilence; yet, even thus diſarrayed, ſhe fills me with ecſtatic delight.' But Radha, preparing to array herſelf before the company of nymphs could ſee her confuſion, ſpake thus with exultation to her obſequious lover.

'Place, O ſon of Yadu! with fingers cooler than ſandal wood, place a circlet of muſk on this breaſt, which reſembles a vaſe of conſecrated water, crowned with freſh leaves, and fixed near a vernal bower to propitiate the god of love. Place, my darling! the gloſſy powder, which would make the blackeſt bee envious, on this eye, whoſe glances are keener than arrows darted by the huſband of Reti. (See RETI.) Fix, O accompliſhed youth! the two gems, which form part of love's chain, in theſe ears, whence the antelopes of thine eyes may run downwards and ſport at pleaſure. Place now a freſh circlet of muſk, black as the lunar ſpots, on the moon of my forehead; and mix gay flowers on my treſſes with peacock's feathers, in graceful order, that they may wave like the banners of Kama. Now replace, O tender hearted! the looſe ornaments of my veſture; and refix the golden bells of my girdle on their deſtined ſtation, which reſembles thoſe hills where the god with five ſhafts, who deſtroyed Sambara, keeps his elephant ready for battle.' While ſhe ſpake, the heart of Yadava triumphed; and obeying her ſportive beheſts, he placed muſky ſpots on her boſom and forehead; dyed her temples with radiant hues: embelliſhed her eyes with additional blackneſs; decked her braided hair, and her neck, with freſh garlands; and tied on her wriſts the looſened bracelets, on her ankles the beamy rings, and round her waiſt the zone of bells, that founded with raviſhing melody."

But we muſt recollect, ſays the author of the Hindu Pantheon, whence this article is chiefly taken, that the ſeemingly amorous conflicts of theſe ardent lovers are mere myſtical deſcriptions of "the reciprocal attraction between the divine goodneſs and the human ſoul." This is the emblematical theology that Pythagoras admired and adopted; that the Sufi poets, Hafez, Sadi, and many others among the Perſians, and Solomon alſo, in his fine Song, ſo beautifully inculcates. Like the enthuſiaſts of other days, and in a manner not eaſily comprehended by the unenlightened, nor believed by them to be permanently chaſte, however innocent its commencement, "they profeſs eager deſire, but without carnal affection; and circulate the cup, but no material goblet: in their ſect, all things are ſpiritual, all is myſtery within myſtery." See ſir W. Jones's admirable Eſſay on the Myſtical Poetry of the Perſians and Hindoos, in the third volume of the Aſiatic Reſearches, in which a tranſlation of the Gita Govinda of Jayadeva is introduced. Under the article JAYADEVA of this work is a brief notice of his poem; and under MAHESA is an extract from it, deſcriptive of the perſons and loves of this intereſting couple. (See alſo PRABHA.) The reader deſirous of ſeeing what has been ſaid and believed on the curious ſubject of myſtical or emblematical theology, may conſult our articles under MYSTERY, MYSTICS, and thoſe thence referred to.

Returning to Radha, we have to obſerve that among the ſect of Gokalaſtha (ſee SECTS *of Hindoos*) ſhe is deemed a perſonification of religion, and ſometimes called *Rukmeni*.

(See that article.) There is a ſect ſaid to worſhip her excluſively, and called Radha-ballabhi: they conſider her as the Sakti, or active power of Viſhnu or Kriſhna. (See SAKTI.) The followers of this ſect have aſcribed to them the ſingular practice of making their own wives perſonate Radha, and of preſenting to or through them the oblations propitiating the goddeſs, or Lakſhmi, of whom, as before ſaid, ſhe is an incarnation. There is no end to the whimſicalities in the modes of human worſhip, to give them no harſher name, wherever, to uſe an oriental expreſſion, we ſuffer our necks to ſlip out of the collar of reaſon. Thus in India, as hath been the caſe in other countries, there is, with ſeveral ſects, a *right-handed* and a *left-handed* mode of worſhip; one meaning a decent, the other an indecent mode. Thoſe among the ſect in queſtion, who follow the left-handed path, require their wives to be naked, when attending them at their devotional abominations. She is ſometimes called Radhika, and Kriſhna, Radhikeſwara, or lord of Radhika; and ſometimes the name of Kantamati is given both to her and Rukmeni. See RUKMENI and YONI.

In Radha may be recognized the Grecian Juno, and of courſe in her huſband Kriſhna, or Viſhnu, the amorous Jove of that imitative race. On this point we ſhall quote a paragraph from the Edinburgh Review, N° xxxiv.

"We tranſlate a paſſage from the Purana, entitled Brahma Vaivartica, to demonſtrate the identity of character aſcribed to Jupiter and Viſhnu; only premiſing, that in conformity to the peculiar tenets of its author, Viſhnu is here ſtiled Kriſhna, and his goddeſs, Rādhā. Gangā (the Ganges) was originally a nymph of wonderful beauty, who inhabited Paradiſe. She became enamoured of Kriſhna, and, concealing her face with her robe, ſtood immoveable in his preſence, her eyes fixed on his radiant countenance. The jealouſy of Rādhā (Juno) was excited. Followed by her innumerable attendants, ſhe repaired to the preſence of the god, and ſeated herſelf on her throne of gems. The timid Gangā trembled at her aſpect, and diſſolved with terror. The goddeſs ſpeaks: "Who is this nymph, lord of the univerſe, who, with half concealed viſage, and eyes ſparkling deſire, thus gazes on thy ſacred perſon? This is not the firſt time the ſkies have witneſſed the infidelity of their lord. When I detected thee dallying in a grove of ſandal with Viraja, the figure of a quadruped concealed thy ſhame, and ſhe was changed into a river. Still purſued by thee ſhe became the mother of the mighty ocean. The ſame foreſt was the ſcene of thy amours with the nymph Sobhā, (beauty). Again thou aſſumedſt the form of an animal; whilſt her ſpirit fled to the moon, and thou divideſt her body amongſt gems, flowers, and black-eyed damſels. The woods of Vrindavan afforded thee a retreat with the ſhepherdeſs Prabha (luſtre.) On my arrival, her ſpirit tranſmigrated to the ſolar orb; of her body thou madeſt a diſtribution: the god of fire obtained a part; and ſome, as gold, give brightneſs to the crowns of the kings of the earth. When I found thee, unexpectedly, on a bed of vernal buds, reclined in company with the fair Xamā (patience), alarmed at my voice, thou gatheredſt as they lay diſperſed, thy yellow robes, thy lyre, thy necklace of flowers, and thy creſt of gems. Thee I forgave when thou beſtowedſt a portion of her body on the pious anchoret, a portion on the ſick, and a portion on the ſtudious."

Such of our readers as have obtained a ſhare in the latter portion, may, in the endeavour to expound this ſolar allegory, be repaid perhaps for their pains; in peruſing the Gita Govinda and the article in which it is compriſed, above referred to, they aſſuredly will.

RADHIKA, a name of *Radha*, conſort of the Hindoo deity *Kriſhna*, as ſufficiently noticed under thoſe articles.

RADHOST, in *Geography*, a mountain of Moravia, in the circle of Prerau; 12 miles E. of Meſeritch.

RADHUA, a mountain of Arabia; 30 miles W. of Medina.

RADIÆUS, in *Anatomy*, an epithet applied to parts about the radius, and equivalent to *radialis*; which ſee.

RADIAL CURVES. See CURVES.

RADIALIS, in *Anatomy*, a name given to parts in the fore-arm, ſituated near the radius. The adjective *radial* is alſo employed to denote the edge, ſurface, or aſpect of any part, which is towards the radius; and in this way, with the term *ulnar*, affords the means of deſcribing the organs much more accurately and intelligibly, than the indefinite expreſſions of *outer* and *inner*, which vary conſtantly in the changing attitudes of the limb.

RADIALIS *Arteria*, is the artery of the wriſt, in which the pulſe is commonly felt. See ARTERY.

RADIALIS *Carpi Extenſor, Longior & Brevior*. See CARPI.

RADIALIS *Carpi Flexor*. See CARPI.

RADIALIS *Externus, Longior & Brevior*, ſynonyms of the extenſores carpi radiales, longior & brevior. See CARPI.

RADIALIS *Internus*, a ſynonym of the flexor carpi radialis. See CARPI.

RADIALIS *Nervus*. The large nerve which goes behind the humerus, between two heads of the triceps, is called radial by ſome anatomiſts: others give this name to the nerve which lies parallel to and over the brachial artery. The firſt of theſe is called alſo the muſcular ſpiral nerve, the ſecond the median. See NERVE.

RADIALIS *Vena*, the vein correſponding to the radial artery. See VEIN.

RADIANT HEAT. See HEAT.

RADIANT *Point*, or *Radiating Point*, is any point of a viſible object, whence rays proceed.

Every radiant point diffuſes innumerable rays all round; but only thoſe radiants are viſible, from which right lines may be drawn to the pupil; becauſe the rays are all right lines.

All the rays proceeding from the ſame radiant continually diverge; the cryſtalline collects or reunites them again.

RADIATED, in *Botany*, an epithet applied to round flat flowers, conſiſting of a diſk, and a ſingle row of longiſh pointed leaves, ranged all around it in manner of rays, or ſpokes.

Radiated flowers are properly ſuch as have ſeveral ſemi-florets ſet round a diſk, ſo as to reſemble a radiant ſtar: ſuch are daiſies, chamomile-flowers, ſun-flowers, &c. Theſe are ſometimes alſo called *radiated diſcous flowers*.

A radiated flower has two parts; its middle part, which is called the diſk, and which is wholly made up of floſcules; and the other part, which is called the circle or border, which is wholly made up of ſemi-floſcules, or elſe of plain flat leaves; but that is leſs common. The floſcules and ſemi-floſcules both uſually adhere to the embryos, and to the thalamus of the flower, being contained in one general cup. Theſe embryos finally ripen into ſeeds; ſometimes furniſhed with down, ſometimes with foliaceous heads, and ſometimes without either, and ſometimes marginated. Of theſe ſeeds ſome are wrapped round with a kind of caſe or capſule, others are ſeparated from one another by ſmall perpendicular leaves.

RADIATED *Leaf*. See LEAF.

The word is alſo uſed in ſpeaking of medals, and in heraldry,

heraldry, where the ancient crowns are called radiated crowns, coronæ radiatæ. See CROWN.

RADIATION, in *Phyſics*, the action of a body diffuſing rays of light as from a centre.

Every viſible body is a radiating body; it being only by means of its rays that it affects the eye.

The ſurface of a radiating body may be conceived as conſiſting of radiant points.

RADIATION, *Place of*. See PLACE.

RADIATION, or *Irradiation*, is alſo uſed by ſome authors to expreſs the manner of the motion of the animal ſpirits; on a ſuppoſition that they are diffuſed from the brain towards all parts of the body, through the little canals of the nerves, as light is from a lucid body. But in lieu of a radiation, the moderns rather incline to the opinion of the circulation of the ſpirits.

RADICAL, RADICALIS, in *Phyſic*, &c. ſomething ſerving as a baſis or foundation; or which, like a *root*, is the ſource or principle whence any thing ariſes.

The ſchools talk much of a radical moiſture inherent in the ſeeds of all animals, which nouriſhes and preſerves the vital heat or flame, as oil does a lamp; and which, when exhauſted, life is extinguiſhed.

Dr. Quincy obſerves, that this radical moiſture is a mere chimera; unleſs we thereby mean the maſs of blood, which is the promptuary whence all the other juices and humours are derived; and which, while it circulates, ſuſtains life, &c.

In grammar, we uſe the term, radical words, for roots and primitives; in oppoſition to compounds and derivatives. In the Hebrew language, the letters of the alphabet are divided into *radical* and *ſervile*. The firſt conſtitute primitive or original words, which, by a ſignificant metaphor, are called roots, שרשים. All the 22 letters of the alphabet may be radicals; *i. e.* primitive words may conſiſt of any of theſe letters; but the following 11 letters properly claim this title, becauſe they can never be *ſerviles; viz.* נ, ד, ן, ח, ש, ם, ע, פ, צ, ק, ר. Of whatever letters any word conſiſts, it muſt at leaſt contain one of a radical character. (See ROOT.) For an account of the ſervile letters, ſee SERVILE.

RADICAL *Numbers*, *Numeri Radicales*, in the Italian muſic, are 2, 3, 4, 5, 6, 7, 8, 9, and ſometimes 10, which are often met with in muſical compoſitions, to denote the accords of the thorough baſſes: 2 ſtands for the ſecond and its duplicates; 3 for the third; 4 for the fourth, &c.

RADICAL *Leaf*, among *Botaniſts*. See LEAF.

RADICAL *Sign*, in *Algebra*, the ſign or character of the root of a quantity.

$\surd$ is the character of radicality, and expreſſes the ſquare root;

$\sqrt[3]{}$ the cube root, &c.

RADICANS, in *Botany*, rooting, a term applied to a ſtem which throws out fibres as it extends itſelf, whether thoſe fibres be true radicles, by which the plant imbibes nouriſhment, and is generally increaſed; or whether they ſerve only for the ſupport of the ſtem againſt walls, rocks, or neighbouring trees. Of the firſt kind, the Strawberry affords a familiar example; of the latter, the Ivy, the Virginian Creeper (*Hedera*, or rather *Vitis*, *quinquefolia*), and the *Bignonia radicans*, are inſtances.

RADICATION, the action by which plants take root, or ſhoot out roots.

The French Royal Academy of Sciences have made a great number of curious obſervations on the germination and radication of plants.

RADICLE, in *Agriculture*, that part of the ſeeds of plants which, upon vegetating, becomes their naſcent roots. It is, in fact, the main organ or medium of nutrition, and the means by which food is imbibed or drank up from the ſurrounding ſoil or earth. The radicles, together with the leaves, therefore, conſtitute the *abſorbent* organ of plants. See RADICULA, and ROOT.

RADICOFANI, in *Geography*, a town of Etruria, near which are two caſtles, one built by Didier, laſt king of the Lombards, and the other by Coſmo I.; 55 miles S. of Florence.

RADICONDOLI, a town of Etruria; 24 miles N.E. of Florence.

RADICULA, in *Botany* and *Vegetable Phyſiology*, the radicle, or fibre of the root. (See ROOT.) This term is uſed by Dillenius, in his Nova Genera, 121. t. 6, as a generic name, for a ſet of plants referred by Linnæus to SISYMBRIUM. See that article.

RADII *Pronator Quadratus*, in *Anatomy*, a muſcle of the fore-arm. See PRONATOR.

RADII *Pronator Teres*. See PRONATOR.

RADII *Supinator Brevis*, } muſcles of the fore-arm. See
RADII *Supinator Longus*, } SUPINATOR.

RADII *Pinnarum*, in *Ichthyology*, the little ſlender bones ſupporting the membrane, forming the fins in fiſhes, and called by Artedi oſſicula radiata pinnarum, from their running from the baſe to the ſummit in the form of rays. See FIN, and *Anatomy of* FISH.

RADIMPOUR, in *Geography*. See RADUNPOUR.

RADIOLA, in *Botany*, ſo called by Dillenius, becauſe the cells of the ripe capſule ſpread like the rays of a little wheel. The plant having been referred by Linnæus to the genus *Linum*, the above became its ſpecific name; but it is now reſtored to the rank of a genus by the late profeſſor Gmelin of Gottingen, as well as by the author of Flora Britannica.—Dill. Nov. Gen. 126. t. 7. Gmel. Syſt. Nat. Linn. v. 2. 289. Sm. Fl. Brit. 201. Prod. Fl. Græc. Sibth. v. 1. 110. Ait. Hort. Kew. v. 1. 282.—Claſs and order, *Tetrandria Tetragynia*. Nat. Ord. *Gruinales*, Linn. *Caryophyllaceæ*, Juſſ.

Gen. Ch. *Cal.* Perianth inferior, of one leaf, cut about half down into four equal, permanent, wedge-ſhaped ſegments, each of which is three-cleft. *Cor.* Petals four, obovate, about the length of the calyx, alternate, with its principal ſegments. *Stam.* Filaments four, awl-ſhaped, erect, the length of the calyx; anthers roundiſh, of two lobes. *Piſt.* Germen ſuperior, roundiſh, with four grooves; ſtyles four, terminal, very ſhort; ſtigmas capitate. *Peric.* Capſule roundiſh, bluntly five-ſided, of eight cells and eight valves. *Seeds* ſolitary, elliptical, compreſſed, very ſmooth.

Eſſ. Ch. Calyx in many ſegments. Petals four. Capſule ſuperior, with eight valves and eight cells. Seeds ſolitary.

1. R. *millegrana*. Thyme-leaved Flax-ſeed. Engl. Bot. t. 893. (R. vulgaris ſerpyllifolia; Dill. in Raii Syn. 345. t. 15. f. 3. Jacob. Faverſh. 92. Linum Radiola; Linn. Sp. Pl. 402. Fl. Dan. t. 178. Linocarpum Serpylli folio, multicaule et multiflorum; Mich. Gen. 23. t. 21. Millegrana minima; Raii Syn. ed. 2. 207. Ger. Em. 569. Chamælinum vulgare; Vaill. Pariſ. t. 4. f. 6.)—Native of ſandy ground, overflowed by clean freſh water, throughout Europe, flowering in July and Auguſt; but not a very general Engliſh plant. The *root* is annual, ſmall, and fibrous. *Stem* an inch or two high, repeatedly forked, corymboſe, ſpreading, leafy, round, nearly ſmooth, many-flowered, often reddiſh. *Leaves* oppoſite, ſeſſile, ovate, entire, ſmooth, ſcarcely a quarter of an inch long. *Flowers* ſmall, white, on ſhort, ſimple, ſolitary ſtalks from the forks of the ſtem.—Gmelin has erred conſiderably in

the generic character and name, as well as in his reference to Linnæus. The *calyx* is many-cleft, not compoſed of four diſtinct leaves; the plant has hardly any thing of the aſpect of a *Linum*, and therefore cannot properly be called *linoides*; neither has it been publiſhed as a genus, under the name of *Radiola*, by Linnæus, as Gmelin's reference to the 12th edition of Syſt. Nat. indicates.

RADIOMETER, a name which ſome writers give to the *radius aſtronomicus*, or Jacob's ſtaff. See FORE-STAFF.

RADISH, in *Botany*. (See RAPHANUS.) The radiſh is much grown, according to the author of the Agricultural Survey of the County of Kent, on the beſt rich loamy ſoils of the Iſle of Thanet, and in Eaſt Kent, for the ſupply of the London ſeedſmen. The ſorts uſually cultivated for this uſe are, the early ſhort top, the ſalmon, and the turnip-rooted radiſh.

The land for the growth of this ſort of crop ſhould be in a fine ſtate of preparation, by being ploughed to a great depth in the early part of the winter, and broken well down by harrowing, ſo as to render it perfectly clean from weeds, being previouſly filled with well reduced manure. The ground being brought into this fine condition, the ſeed is ſown on furrows about ten inches apart, in a dry time in the month of March, about two or three gallons *per* acre. And as ſoon as the plants appear, every other row is cut up with a horſe-hoe, leaving the rows twenty inches apart. When the plants get two or three rough leaves, they are hoed out in rows, and are then kept clean by repeated horſe and hand-hoeing, when neceſſary, leaving the plants at about eighteen inches diſtance. It is added, in the above Report, that the crop is ſeldom fit to reap till October, and ſometimes is out in the fields till Chriſtmas, without receiving injury from wet weather; it being neceſſary that it ſhould have much rain to rot the pods, that it may thraſh well. In reſpect to the produce, it is from eight to twenty-four buſhels *per* acre: and it is ſold to the London ſeedſmen, who ſend it to all parts of the kingdom for retailing to the gardeners.

It is probable that this ſort of crop might be grown in many other diſtricts near the metropolis, or other large towns, with equal ſucceſs, where the ſoil is of a rich loamy nature, as it is very eaſy in its culture, and requires but little labour or trouble. As it is neceſſary for it to remain out ſuch a length of time, however, it will be proper, eſpecially in wet ſeaſons, to keep the ſtems from falling too much upon the ground, as they and the ſeed may be injured by being too much in contact with it. If kept up in this way, the ſtalks, ſeed-huſks, and other offal parts, may alſo form a good cut food for ſome ſorts of live-ſtock, as is the caſe with ſome other ſimilar ſorts of crops.

RADISH, *Horſe*. See COCHLEARIA *Armoracia*.

RADIUS, in *Anatomy*, that bone of the fore-arm which extends from the humerus to the wriſt, in the line carried from the external condyle of the former bone to the thumb. See EXTREMITIES.

RADIUS, *Diſlocations and Fractures of*. See FRACTURE and LUXATION.

RADIUS, in *Botany* and *Vegetable Phyſiology*, means the aggregate marginal florets, of compound flowers, each generally of an oblong form, and all ſpreading from the centre, or diſk, like rays. Such are the white florets of the Daiſy, and blue, purple or red ones, for the moſt part, of the *After*. The uſual ſhape of the limb or border of ſuch florets is ligulate; either linear, or elliptical; rarely, as in *Achillea*, ſhort and roundiſh; the extremity having three or five teeth. In ſome compound flowers the *radius* conſiſts of tubular florets, as in *Centaurea*; and thoſe are neuter, deſtitute of organs of fructification. The ligulate radiant florets above-mentioned are either female, producing perfect ſeed; or they are abortive, with more or leſs imperfect traces of a piſtil. Many of them have no ſigns of a ſtyle or ſtigma, but none is without ſo much of a germen, as ſerves for the baſis, that ſupports the petal itſelf.

A radius is occaſionally aſſumed by ſome flowers, naturally deſtitute of one, as in the genus *Bidens*, each ſpecies of which, by ſuch an acquiſition, becomes a *Coreopſis*, and changes its order in the *Syngeneſia*, from *Polygamia æqualis*, to *P. ſuperflua*. This change is an approach towards a double flower, in that claſs; being a transformation of a certain number of the perfect, or united, florets into female ones. If ſuch a transformation be total, and all the tubular florets become ligulate, the whole flower is double, and unproductive of ſeed, like the double Chamomile.

RADIUS, *Ray*, in *Geometry*, the ſemidiameter of a circle; or a right line drawn from the centre to the circumference.

The word is derived from the Greek ῥάβδος, *rod*. Fleta uſes the word radius, for a furrow.

The radius is alſo called, eſpecially in trigonometry, *ſinus totus*; the whole ſine.

It is implied in the definition of a circle, and it is apparent from its conſtruction, that all the radii of the ſame circle are equal.

RADIUS, in the *Higher Geometry*, *Radius of the evolute*, *Radius curvedinis*, or *Radius oſculi*, called alſo the radius of concavity and the radius of curvature, is a right line repreſenting a thread, by whoſe evolution from off the curve on which it was wound, the curve is formed: or it is the radius of a circle that has the ſame curvature in a given point of a curve with that of the curve in that point. See CURVATURE and EVOLUTE, under which articles the method of finding this radius may be ſeen.

RADIUS *Aſtronomicus*, an inſtrument uſually called Jacob's ſtaff, the croſs-ſtaff, or fore-ſtaff.

RADIUS, in *Optics*. See RAY.

RADIUS, in *Mechanics*, is applied to the ſpokes of a wheel; becauſe iſſuing like rays from its centre.

RADIUS *Vector*, is alſo uſed for a right line drawn from the centre of force in any curve in which a body is ſuppoſed to move by a centripetal force, to that point of the curve where the body is ſuppoſed to be. See CENTRAL *Force*.

RADIUS, among the Romans, a name given to the iron rod with which the boys rolled the trochus.

RADIUS *Articulatus*, in *Natural Hiſtory*, a name given by Mellius, Gmelin, and ſome other authors, to a kind of figured foſſils, of which there are a great many very different ſpecies, ſome of which have been deſcribed by authors among the belemnitæ, under the names of alveoli belemnitarum. Mr. Gmelin, who has taken great pains to inform himſelf, as well of the nature and figure of theſe ſtones, from the ſubjects themſelves, as of their hiſtory, and the various accounts of them from other authors, obſerves, that the place where they are moſt frequent is Sweden, and that there they are no where ſo common as in the iſle of Oeland. Volkman figures ſome alſo which he found in Sileſia, and Helwing others which he collected in Pruſſia: he alſo found great numbers of them himſelf in Ruſſia.

They are uſually immerſed in lime-ſtone, and though at firſt ſight they may all appear alike, yet, on a careful examination, they will be found to differ very greatly. The moſt obvious general diſtinction, eſtabliſhed by Gmelin, is that ſome of them are ſtraight, and others crooked. The ſtraight ones may be divided into two genera. The firſt of theſe comprehend, according to this gentleman, two ſpecks; the firſt ſmooth, and with a converging alveolus.

The

The regular and nice configuration of theſe bodies ſhews very plainly that they cannot be of mineral origin; but the ſeveral patellæ of which each is compoſed, the ſiphunculus of communication, obvious in ſeveral, and the ſhelly matter yet found remaining on many, prove them to have been once ſhell-fiſh of the univalve or tubular concamerated kind; the deſcription of which, ſo far as it can be gathered from theſe remains, muſt have been this. The ſhell muſt have been either cylindric or conic in figure, of a ſmooth ſurface, and divided into ſeveral chambers or cells; but this ſo that the ſepta which form the concamerations are not continued and whole, but in ſome part of the periphery are cut in, in the ſhape of a creſcent. Through theſe creſcents, which, ſtanding all together, make a continued canal, there has paſſed another ſhelly body of a cylindric or conic figure, alſo divided into concamerations, and that in ſuch a manner, that the ſepta which form the cells are pierced with a ſmall aperture on one ſide, which grows gradually ſmaller as the ſhell extends in length; and finally, through theſe apertures, in the concamerations, there paſſes another ſhell pointed at the end, and, like the reſt, divided into its concamerations, and pierces along its middle with a ſiphunculus. Mem. Acad. Petrop. vol. iii. p. 263.

This ſhell is, therefore, a compages of three ſhelly bodies, encloſed one within another; and, it muſt be ſuppoſed, in order to carry an analogy with other ſhell-fiſh, theſe three ſhelly bodies have communication with one another, by means of certain ſlips or perforations. The communication of theſe, one with another, ſeems all evident, from their being all found in their foſſile ſtate, filled with the ſame ſtony matter; this has, doubtleſs, been all received in at the ſiphunculus of the inner ſhell, and thence has been thrown into the ſecond, and from this into the third ſhell, ſo as to fill up all the concamerations of the outer, as well as of the inner parts. This muſt have been the caſe with theſe; and the ſeveral various ſpecies that are at this day found foſſile, muſt have owed their origin to as many different ſpecies of the ſhells. The crooked and twiſted, or wreathed kinds, which have the ſiphunculus uſually placed near the ſide, greatly approach in their ſtructure to ſome of the cornu ammonis.

RADIX, in *Botany* and *Vegetable Phyſiology*. See ROOT.

RADIX is uſed among ſome anatomiſts for the ſole of the foot.

RADIX *Carlo Sancto*; this root is found in temperate ſoils, in Mechoacan, a province of America. Its bark is eaſily ſeparated from it, is of an aromatic ſmell, and of a bitter and ſomewhat acrid taſte. The root itſelf conſiſts of very ſlender fibrils, which are eaſily ſeparated from each other. The bark is accounted ſudorific, and corroborates the ſtomach and gums: if chewed, it procures an agreeable breath. It is good for ſcurvies, catarrhs, epilepſies, haſtening deliveries, and removing hernias, and the ſmall-pox, if taken either in powder or in the form of a decoction. The Spaniards have called it by the name of St. Charles, on account of its uncommon virtues.

RADIX *Entrochorum*, the root of the entrochi, a name given by ſome authors to a foſſile ſubſtance, uſually found among the entrochi, and ſeeming to have been the baſis from which they have grown. It is plainly a part of the ſtella marina arboreſcens petrified, as thoſe ſtones alſo are. This foſſile is rarely found whole, but the fragments of it are very common. When entire, it is about the ſize of a walnut; the top of it being flat, and in ſome degree reſembling the end of an entrochus, with a central hollow, but not having the leaſt appearance of the rays of thoſe ſtones. Theſe foſſils, though not properly judged of as to their origin, have yet been deſcribed by a great number of authors. Agricola, in particular, compares the form of them to a wheel. The body of this kind well reſembles indeed the nave of a wheel, the ſhape of it being conical toward one end, till you come to the top, and then a little flattened, with a hole in it. There is alſo a like hole in the oppoſite broad end of the ſame foſſil, ſeeming fit for an axle to paſs through; and there are five hollow ſtilts, or feet, iſſuing ſideways, at equal diſtances from the broad bottom, and equally carried on in the ſame direction, ſo as not amiſs to repreſent the ſpokes. At the end of each of theſe rays or ſpokes, there is a hollow, of the ſame nature with thoſe in the middle of the common entrochi, but this is cut acroſs, by a ſeam, or ſtreak of the ſame ſtone, which paſſes directly over its centre, and covers about a third part of it; this goes no farther than the mouth of the hole, but it cuts it into two, and ſhews it in the form of two eyes. Theſe radii or ſpokes are very ſeldom found ſo perfect as here deſcribed. Liſter mentions them as being formed like creſcents at the end, which may very eaſily happen from the breaking off a part of the terminating portion. Phil. Tranſ. N° 129.

RADIX *Alba*, a word uſed by Dioſcordes, to expreſs the root of the dracunculus.

RADIX, among *Grammarians*. See RADICAL, and ROOT.

RADIX, in *Mathematics*, the ſame as root; but uſed in a different ſenſe by different authors: we ſay the *root* of an equation, but the *radix* of a ſyſtem of logarithms, the *radix* of a ſeries, the *radix* of notation, &c. meaning in all theſe caſes the fundamental quantity on which the ſyſtem is conſtructed, or that whence it has been derived, or that by means of which all other things of a like kind are compared.

RADIX *of a Syſtem of Logarithms*, is that number which involved to the power denoted by the logarithm, is equal to that number. Thus, under the article LOGARITHMS it is ſhewn, that if $r^x = a$, then x is the logarithm of a, and r is called the radix of the ſyſtem. This radix in the common or Briggs's logarithms, is 10, and in the Neperian or hyperbolic logarithms, it is 2.71828128, &c. and generally the radix of any ſyſtem of logarithms, is that number whoſe logarithm in that ſyſtem is unity.

RADIX *of a Syſtem of Notation*, is that number which indicates the local value of the figures, and is in all ſyſtems repreſented by a unit and cipher (10), which is *ten* in the common ſyſtem, *two* in the binary ſyſtem, *three* in the ternary, *twelve* in the duodenary, and ſo on. See NOTATION.

RADIX *of a Series* is uſed, by ſome authors, as a term of compariſon between any finite function, and its expanſion or developement: thus, the radix

of $1 - r + r^2 - r^3 + r^4$ &c. is $\frac{1}{1+r}$

of $1 - \frac{1}{2} + \frac{1}{4} - \frac{1}{8} + \frac{1}{16}$ &c. is $\frac{1}{1+\frac{1}{2}}$

of $1 - 1 + 1 - 1 + 1$ &c. is $\frac{1}{1+1}$

of $1 - 2 + 4 - 8 + 16$ &c. is $\frac{1}{1+2}$

of $\frac{1}{2} - \frac{1}{4} + \frac{1}{8} - \frac{1}{16} + \frac{1}{32}$ &c. is $\frac{1}{2+1}$

of $1 + x + x^2 + x^3 + x^4$ &c. is $\frac{1}{1+x}$

of

of $1 + 2x + 3x^2 + 4x^3 + 5x^4$ &c. is $\frac{1}{(1-x)^2}$

of $1 + \frac{x^2}{2} + \frac{3x^4}{8} + \frac{5x^6}{16} +$ &c. $\sqrt{\frac{1}{1-x^2}}$

See Dr. Hutton's Tracts, vol. i. p. 9. See alſo our article SERIES.

RAD-KNIGHTS. See REDMANS.

RADL, in *Geography*, a mountain of Stiria; eight miles S.S.W. of Landſperg.

RADLER SEE, a lake of Carinthia; ſix miles N. of Saxenburg.

RADLSTEIN, a town of the duchy of Carnolia; ſix miles W. of Landſtraſs.

RADLSTHAL, a town of Auſtria; nine miles E. of Krottau.

RADMANS. See REDMANS.

RADMANSO, in *Geography*, a ſmall iſland in the Baltic, near the coaſt of Sweden. N. lat. 59° 45'. E. long. 18° 44'.

RADNAGUR, a town of Bengal; 32 miles S. of Burdwan.

RADNITZ, a town of Bohemia, in the circle of Pilſen; 10 miles N.E. of Pilſen.

RADNOR, NEW, or *Maes-Yfed*, a borough and market-town in the cwmwd of Swydd Wynogion, Cantref y Clawdd, (now called the liberties of the town of New Radnor,) county of Radnor, South Wales, is ſituated near the river Somergill, at the diſtance of ſeven miles N.W. from Kington, and 156 miles W.N.W. from London. In remote times, this town was a place of great importance, as appears from its having given name to the county, but it has now dwindled into comparative poverty and inſignificance. Caradog informs us, that about the year 990, Meredydd ab Owain deſtroyed Radnor, in a ferocious conteſt with his nephew, who had been aſſiſting the Engliſh to ravage South Wales. It recovered, however, from this diſaſter, and continued to flouriſh till the union of Wales with England, when it began to decline, in conſequence of its ceaſing to be fortified and garriſoned as a frontier town. Before that period, it was ſurrounded by a lofty wall, and a deep moat, ſome remains of which are diſtinctly viſible on the weſt and ſouth ſides. The walls, when ſtanding, are traditionally ſaid to have been of great height. The area incloſed by them was an oblong ſquare, containing about twenty-ſix acres of ground, laid out into three longitudinal ſtreets, which were interſected by five tranſverſe ones. Of theſe at preſent ſeveral have no buildings; and others are only foot paths. But though thus decayed, Radnor ſtill preſerves its privileges as a borough. The corporation conſiſts of a bailiff, twenty-five capital burgeſſes, two aldermen, a recorder, a coroner, a town-clerk, and other inferior officers. The bailiff and aldermen are choſen annually from among the capital burgeſſes, and are juſtices of the peace. The bailiff of the preceding year is alſo a juſtice of the peace; and there are beſides three additional perſons nominated out of the capital burgeſſes, who are inveſted with ſimilar authority. The diſtrict over which they preſide, and ſuperſede the juriſdiction of the county magiſtrates, is conſiderable; comprehending a circle round the town nearly ten miles in diameter. The bailiff's courts and the petty ſeſſions are regularly held every Monday, when the bailiff, aldermen, and town-clerk attend to tranſact buſineſs relating to the borough, and have power to determine all ſuits for ſums under forty ſhillings. The quarter-ſeſſions for the borough are held on the Mondays after the county quarter-ſeſſions at Preſteigne; and the ſheriff's county courts for the recovery of ſmall debts, are holden every alternate month here, and at the town laſt mentioned. The repreſentative for the borough is choſen by the burgeſſes of New Radnor, in conjunction with thoſe of the boroughs of Knighton, Rhaiadar, Cefn Llys, and Cnwclas; the bailiff being the returning officer. As nothing but the circumſtance of receiving parochial relief diſqualifies any perſon from becoming a burgeſs, the number of voters is conſiderable; thoſe of New Radnor are ſuppoſed to exceed 300, and the whole number, including thoſe of the contributary boroughs, is eſtimated to be about 1300. To be a capital burgeſs of New Radnor, however, actual reſidence within the juriſdiction is eſſential, which is not the caſe as to the contributary boroughs: and if a capital burgeſs becomes non-reſident he loſes his privileges as ſuch. A benefit ſociety, eſtabliſhed here in 1778, at preſent conſiſts of above 100 members, who hold their annual meetings on the 6th of January.

Weekly markets were formerly held here on Tueſdays, but theſe are, at preſent, only nominal, notwithſtanding ſome late attempts to reſtore them. There are ſtill, however, five annual fairs, and there is alſo an annual wake on the third Sunday in the month of Auguſt. The pariſh of Radnor is divided into three portions, of which the town of New Radnor is the principal, containing, according to the parliamentary returns of 1811, 75 houſes, and 380 inhabitants. The public buildings here are the town-hall, the priſon, and the church. The laſt conſiſts of a nave, ſouth aiſle, and chancel, with a tower at the weſt end.

Radnor caſtle ſtood on an eminence commanding the town. Of this once majeſtic pile, a few fragments of walls only remain, but the entrenchments are ſtill entire; the outer ward, called Baili-Glas, or the Green Court-Yard, is yet diſtinct from the inner one, or keep, and is nearly in its original form. In 1773, on digging within the area of this caſtle, ſix or ſeven ſmall "Gothic arches of good maſonry were diſcovered," beſides a variety of ancient inſtruments. The foreſt of Radnor extends ſeveral miles to the north of the town, covering the ſlope of a lofty eminence, from the ſummit of which are very extenſive proſpects. The principal ſeats in the vicinity are Downton-hall, the ſeat of Percival Lewis, eſq. and Harpton-court, a ſeat belonging to Thomas Frankland Lewis, eſq. Both theſe manſions are ſurrounded by beautiful ſcenery, and are highly ornamental to this diſtrict. About two miles weſtward from the town is a celebrated water-fall, called Water-break-its-neck, ſeventy feet in perpendicular height; but it is extremely defective in water, except during the time of floods, when the effect produced is truly grand. At the weſtern extremity of the pariſh is an intrenched dyke, which formerly extended acroſs the whole vale of Radnor. War-cloſe, a field to the eaſtward of the town, is traditionally ſaid to have been the ſcene of ſome military conteſt, but no particulars reſpecting it are preſerved.

Old Radnor, or *Pen-y-Craig*, is a ſmall village, ſituated about three miles to the ſouth of New Radnor. Camden ſuppoſes it to have been the Magnos of Antoninus, which was garriſoned by the Phacienſian regiment in the reign of Theodoſius the younger; and there ſeems every reaſon to believe that it was a place of note in the Romo-Britiſh period. The Roman road paſſed cloſe to the baſe of the hill upon which the village ſtands. The church here is a venerable old edifice of ſtone, with a maſſive ſquare tower at one end. A curious ſcreen, richly carved in wood, extends acroſs the nave and ſide aiſles. Here are various monuments to the memory of members of the Lewis family of Harpton. Carliſle's Topographical Dictionary of Wales, 4to. 1813. Lipſcomb's Tour through Wales.

RADNOR, a ſmall pleaſant town of America, in Delaware county, Pennſylvania. The place was originally called "Amſtel" by the Dutch, who began to build here. The number of inhabitants is 925.

RADNOR, a town of South Carolina; 10 miles S.W. of Edmondſbury.

RADNORSHIRE, an inland county of South Wales, is bounded on the north by the counties of Montgomery and Salop, on the eaſt by the county of Hereford, and on the ſouth and weſt by the counties of Brecknock and Cardigan. According to Mr. Clark, it contains 510 ſquare miles, or 346,000 acres, and is politically divided into ſix hundreds, and fifty pariſhes; ſome of which are within the dioceſe of Hereford, and the remainder within that of St. David's. The parliamentary returns of 1811, ſtate the number of its houſes at 4194, and of its inhabitants at 20,900. It ſends two members to parliament; one for the county, and one for the borough of New Radnor, with its contributary boroughs. The face of the country is extremely mountainous and bleak in every part of it, but it is interſected by ſeveral vallies, which are watered by the Wye, the Teme, the Lugg, the Ithan, the Eddow, and their reſpective ſubſidiary ſtreams. Theſe vallies afford a conſiderable extent both of meadow and arable land; eſpecially the Vale of Wye-Side, and the Vale of Radnor, ſome portions of which are very fertile, and have a good ſoil and a congenial climature. In the other parts of the county, however, a barren ſoil, and a chilly atmoſphere, are the predominant characteriſtics. Nearly two-thirds of its whole extent being either in a ſtate of commonage, or lying wholly waſte, agriculture has hitherto made little comparative progreſs here. Cattle and ſheep conſequently conſtitute the chief produce of the county. The number of the latter is indeed very great. Hence Radnorſhire is famed for its ſupply of wool; but notwithſtanding this circumſtance, ſingular to ſay, the manufacture of woollen goods is totally diſregarded. The raw material is ſold to the manufacturers of the north, by whom the inhabitants of this county are in return furniſhed with cloth.

Radnorſhire contains three market-towns; Preſteigne, Rhaiadar, and New-Radnor. The market at the laſt, however, is only nominal. The county courts are held at Preſteigne, which is now the moſt important and flouriſhing town in the county. (See PRESTEIGNE.) The chief remain of antiquity within its limits is Offa's Dyke, which commencing at the river Wye, near Hay, ſkirts the counties of Radnor and Hereford, and paſſes into Montgomeryſhire at Pwll-y-Pyod, a hamlet on the road between Biſhop's-caſtle and Newtown. The only religious houſe in the county was the abbey of Cwm Hir, founded in 1143, for monks of the Ciſtertian order, by Cadwathelan-ap-Madoc, which, at the diſſolution, was valued at 28*l.* 17*s.* 4*d. per annum*. Of this monaſtery a conſiderable part of the buildings is yet ſtanding, though in a very ruinous and dilapidated condition. Leland, in his Itinerary, (vol. v. p. 13.) ſpeaks of its church as the longeſt in Wales, and informs us, that it was "ſpoiled and defaced by Owen Glendowr." The principal caſtles in Radnorſhire were thoſe of Colewine, Tynbont, Aberhedow or Aber-Edwy, Ewenlles, Radnor, Rhaiadar, and Pain's-caſtle. Several antiquaries, among whom are Camden, Gale, and Ward, place the Roman ſtation Magnos, or Magna, at Old Radnor, as is mentioned above; but Baxter contends that it ſhould be fixed at Ledbury, in Herefordſhire, and Harris at Gaer, near Brecknock. In this county, particularly on the ſummit of Gwaſtedin hill, are ſeveral of thoſe collections of ſtones called in South Wales *karneu*, in North Wales, *karnedheu*, in Scotland, *cairns*, and in Ireland, *duns*.

Radnor was erected into an earldom by Charles II., in the perſon of John Robarts, lord Robarts of Truro, but that title became extinct in 1757. It was revived, however, in 1765, in the perſon of William Bouverie, baron Longford, and viſcount Folkſtone, whoſe ſon Jacob, now earl of Radnor, enjoys his privileges. General View of the Agriculture of the County of Radnor, by John Clark, 4to. Skrine's Tours in Wales. Camden's Britannia. Pennant's Tour in Wales, 8vo.

RADNOTH, a town of Tranſylvania, on the river Maros; 23 miles W. of Scherburg.

RADOE, a ſmall iſland in the North ſea, near the coaſt of Norway. N. lat. 60° 35'.

RADOFFIN, a town of Moravia, in the circle of Iglau; 21 miles E. of Iglau.

RADOLFZELL, or RATOLFZELL, or *Zell*, a town of Germany, in Auſtrian Swabia; ſituated on the Unterſee, or lake of Lille; 10 miles N.W. of Conſtance.

RADOM, a town of Poland, in the palatinate of Sandomirz; 50 miles N.N.W. of Sandomirz.

RADOMISCHL, a town of Bohemia, in the circle of Prachatitz; four miles N. of Strakonitz.

RADOMISL, a town of Poland, in the palatinate o. Lublin; 45 miles S. of Lublin.—Alſo, a town of Poland, in the palatinate of Kiev; 56 miles N.W. of Kiev.

RADOMSK, or RADOMISKI, a town of Poland, in the palatinate of Siradia; 32 miles S.E. of Siradia.

RADONITZ, a town of Bohemia, in the circle of Saatz; 13 miles W.S.W. of Saatz.

RADOSCHITSCH, a town of Poland, in the palatinate of Sandomirz; 20 miles N.E. of Malogocz.

RADOSKU, a town of Pruſſia, in the palatinate of Culm; 10 miles W. of Lautenburg.

RADSTADT, a town of the archbiſhopric of Salzburg; 36 miles S.S.E. of Salzburg.

RADT *vor dem Walde*, a town of the duchy of Berg, where Roman Catholics, Lutherans, and Calviniſts, have, each of them, a church; 25 miles E. of Daſſeldorp.

RADULA. See RASPATORY.

RADUNPOUR, or RADIMPOUR, in *Geography*, a town of Hindooſtan, in the country of Agimere, on the river Puddar, or Butlaſs; 171 miles N. of Surat. N. lat. 23° 58'. E. long. 71° 48'.

RADZANOW, a town of the duchy of Warſaw; 30 miles N.E. of Ploczko.

RADZIECZOW, a town of Poland, in the palatinate of Belcz; 24 miles W. of Belcz.

RADZIEJOW, or RODSCHOWA, a town of Poland, in the palatinate of Brzeſtye; 25 miles W. of Brzeſtye.

RADZIVILOW, a town of Lithuania; 50 miles E.N.E. of Minſk.

RADZYMIN, a town of the duchy of Warſaw; 12 miles N. of Warſaw.

RAEMSDONCK, or RAMSDONCK, a ſmall but ſtrong place of Brabant; three miles E. of Gertrudenberg.

RAEPOUR, a town of Hindooſtan, in the circar of Gohud, on the Jumnah; 38 miles E.N.E. of Lahaar.

RAERDORP, a town of Holland; five miles N.E. of Amſterdam.

RÆTVIK, a calcareous mountain of Sweden, the height of which is eſtimated by Bergman at 6000 feet above the ſea, obſerving alſo, as a ſingularity, that upon this mountain, and that of Rodaberg, are found vaſt blocks of reddiſh felſpar, mingled with quartz and brown mica.

RAFAEL, CAPE, a cape on the E. coaſt of the iſland of Hiſpaniola. N. lat. 19° 2'. E. long. 69° 46'.

RAFAEL, *St.*, a town of South America, in the province of

of Caraccas; 40 miles S. of Caraccas.—Alſo, a town of South America, in the province of Moxes; 210 miles E. of Santa Cruz de la Sierra la Nueva.—Alſo, a town of New Navarre; 105 miles S.W. of Caſa Grande.

RAFAH, a town of Egypt; 57 miles N.E. of Catieh.

RAFALSO, a ſmall iſland in the gulf of Finland. N. lat. 60° 20'. E. long. 26° 12'.

RAFFAELLE DA URBINO, in *Biography*. See RAPHAEL.

RAFFLING, a ſort of game with three dice, in which he who throws the greateſt pair, or pair royal, in three caſts, wins the prize or ſtake.

The word probably comes from the baſe Latin, *rieflare, to rifle, plunder, take all away*.

The raffle is properly the doublet or triplet: a raffle of aces, or duces, carries it againſt mere points.

RAFFLING is alſo uſed when a company of perſons club to the purchaſe of a commodity, or make ſmall depoſits, amounting in the whole to its full value; and he that throws the higheſt on three dice, or who has the higheſt number by means of balls thrown on a bagatelle or porto-bello table, takes it.

RAFICA, in *Geography*, a town of Aſiatic Turkey, in the government of Diarbekir; three miles S. of Raca.

RAFLUNDA, a town of Sweden, in the province of Skone; 17 miles S. of Chriſtianſtadt.

RAFNIA, in *Botany*, a genus of plants, ſeparated from the Linnæan *Crotalaria* and *Liparia*, augmented with ſeveral new ſpecies from the Cape, and named by its author, profeſſor Thunberg, in the ſecond part of the preface to his Prodromus Plantarum Capenſium. De Theis is completely in the dark as to the perſon commemorated in this name, who can be no other than Mr. C. G. Rafn of Copenhagen, author of a Flora of Denmark and Holſtein, in the Daniſh language, publiſhed in the years 1796 and 1800, in octavo, making two volumes, which include the firſt ten claſſes of the Linnæan ſyſtem. We know not whether any more has appeared. The ſame botaniſt has written a work on the phyſiology of plants; and ſeveral papers for the Academy of Sciences at Copenhagen. See Sims and Konig's Ann. of Bot. v. 1. 6.—Thunb. Prodr. 123. præf. n. 48. Willd. Sp. Pl. v. 3. 949. Ait. Hort. Kew. v. 4. 261.—Claſs and order, *Diadelphia Decandria*. Nat. Ord. *Papilionaceæ*, Linn. *Leguminoſæ*, Juſſ.

Gen. Ch. *Cal.* Perianth inferior, of one leaf, bell-ſhaped, five-cleft, ringent; the upper lip in two broadiſh diſtant ſegments; lower divaricated, in three acute ones, the middle one ſmalleſt. *Cor.* Papilionaceous. Standard large, heart-ſhaped, acute, ſpreading, depreſſed at the ſides. Wings ovate, about half as long as the ſtandard. Keel acute, the length of the wings. *Stam.* Filaments ten, all united into a linear tube, ſplit along the baſe; five of them rather the ſhorteſt; anthers ſimple. *Piſt.* Germen ſtalked, linear; ſtyle ſimple, bent upwards at nearly a right angle; ſtigma obtuſe. *Peric.* Legume ſtalked, oblong-lanceolate, compreſſed, of one cell and two valves. *Seeds* ſeveral, ſtalked, roundiſh-kidney-ſhaped.

Eſſ. Ch. Stamens all united. Calyx ringent; upper lip divided; lower divaricated, in three ſegments, the middle one ſmalleſt. Legume ſtalked, lanceolate, compreſſed.

Obſ. The firſt ſpecies in Willdenow, *perfoliata*, *Crotalaria perfoliata* of Linnæus, figured in Smith's Inſects of Georgia, v. 2. t. 67, is *Baptiſia perfoliata* of Brown, in Ait. Hort. Kew. v. 3. 5, a genus adopted from Ventenat, and belonging to the *Decandria Monogynia*.

1. R. *amplexicaulis*. Orbicular Rafnia. Thunb. Prodr. 123. Willd. n. 2. (Crotalaria amplexicaulis; Linn. Sp. Pl. 1003. Geniſta perfoliata, orbiculatis foliis; Seb. Theſaur. v. 1. t. 24. f. 5. *Linn.*)—Leaves reticulated, orbicular, claſping the ſtem, alternate; the floral ones oppoſite, coloured.—Native of the Cape of Good Hope. A ſmooth, handſome, branched *ſhrub*, clothed with entire *leaves*, from one to two inches acroſs, finely reticulated with innumerable veins; the upper ones, which accompany the *flowers*, ſmaller, and pale yelloviſh. *Flowers* ſolitary, nearly ſeſſile, yellow, ſmaller than the floral leaves.

2. R. *elliptica*. Elliptical Rafnia. Thunb. ibid. Willd. n. 3, excluding the reference to Andrews.—Leaves ſlightly veined, elliptic-ovate, acute, alternate; the floral ones oppoſite, not longer than the flowers.—Native of the Cape. Confounded by Linnæus with the foregoing, from which it differs in having much ſmaller *leaves*, ſeſſile, not claſping the ſtem, quite deſtitute of reticulated veins. *Flowers* of a deeper yellow, as long as the floral leaves.

3. R. *cuneifolia*. Wedge-leaved Rafnia. Thunb. ib. Willd. n. 4. (Spartium ovatum; Berg. Cap. 197.)—Leaves obovate, ſomewhat wedge-ſhaped. Branches angular. Flowers racemoſe, terminal.—From the ſame country. *Stem* arboreſcent. *Branches* rather angular, ſtriated, ſmooth. *Leaves* numerous, alternate, ovate, pointed, ſucculent, ſmooth, above an inch long; contracted at the baſe, and tapering down into broad *footſtalks*. *Flowers* purpliſh-yellow, in terminal, corymboſe cluſters. *Bergius*.

4. R. *triflora*. Three-flowered Rafnia. Thunb. ib. Willd. n. 5. Ait. n. 1. Venten. Malmaiſ. t. 48. (Crotalaria triflora; Linn. Sp. Pl. 1004. Curt. Mag. t. 482. Borbonia cordata; Andr. Repoſ. t. 31, excluding the ſynonym.)—Leaves ovate, ſmooth. Branches angular. Stalks ſingle-flowered, three together.—Native of the Cape, where it was gathered by Sparrmann and Thunberg, and from whence its ſeeds were ſent to Kew garden, in 1786, by Mr. Francis Maſſon. The plant is biennial, requiring to be ſheltered in winter, and flowering in June and July. *Stem* branched, about a yard high, moſt leafy in the upper part, ſmooth, and of a glaucous green, as well as the *leaves*, which are numerous, alternate, almoſt ſeſſile, more or leſs ovate, but varying in ſize and breadth. *Flowers* abundant at the ſummits of the branches, large, yellow, axillary, ſtalked, three together, the floral leaves ſmaller than the reſt, and often tinged with purple.

5. R. *oppoſita*. Oppoſite-leaved Rafnia. Thunb. ib. Willd. n. 6. (Crotalaria oppoſita; Linn. Suppl. 322. Liparia oppoſita; Linn. Syſt. Veg. ed. 13. 554. Spartium capenſe; Sp. Pl. 995. Cytiſus capenſis; Berg. Cap. 217.)—Leaves elliptic-lanceolate; the upper ones moſtly oppoſite. Flowers lateral, on ſhort ſolitary ſtalks.—Native of the Cape, apparently unknown in our gardens. Linnæus and his ſon confounded many different things under this ſpecies, ſome of which being marked in their herbarium as having been gathered by Thunberg, we preſume to be among thoſe he has defined; yet it is not poſſible to determine them all by his ſhort characters, ſeveral of which unfortunately contradict the ſpecific names. The *ſtem* of the preſent is deſcribed by the younger Linnæus as ſimple, he conſidering as *flower-ſtalks* the copious, alternate, leafy *branches*, three or four inches long, on which one or two pair of the lower *leaves* are oppoſite; the proper floral leaves, like thoſe of the ſtem, being alternate: all the *leaves* are elliptic-lanceolate, or ſomewhat obovate, acute, entire, ſingle-ribbed, an inch or more in length. *Flowers* either lateral or axillary, among the uppermoſt leaves, ſolitary, each on a ſimple *ſtalk* about the length of its *calyx*. *Corolla* yellow, not half ſo large as the laſt ſpecies.

6. R. *axillaris*. Axillary Rafnia. Thunb. ib. Willd. n. 7.

n. 7.—"Leaves lanceolate, alternate or oppoſite. Flowers terminal."—This and all the following were gathered by profeſſor Thunberg, at the Cape. In the Linnæan herbarium is a ſpecimen, by whom gathered does not appear, which ſeems to anſwer to the above character, (except the *leaves* being linear-lanceolate,) and which may perhaps explain the paradoxical contrariety between the ſpecific name and character. In this ſpecimen the *flowers* are really *terminal*, being ſolitary at the ends of copious, ſhort, leafy, lateral *branches*, which are *axillary*. The whole *foliage* has a Hyſſop-like aſpect.

7. R. *angulata*. Angular Rafnia. Thunb. ib. Willd. n. 8.—"Leaves lanceolate, alternate. Flower-ſtalks lateral. Stem angular."

8. R. *ſpicata*. Spiked Rafnia. Thunb. ib. Willd. n. 9.—"Leaves lanceolate, alternate. Flowers axillary, racemoſe."—Of this ſpecies alone, it ſeems, Willdenow had ſeen a dried ſpecimen, and we regret that he did not give us ſome account of it.

9. R. *anguſtifolia*. Narrow-leaved Rafnia. Thunb. ib. Willd. n. 10.—"Leaves lanceolate, alternate. Flower-ſtalks lateral. Stem round."

10. R. *filifolia*. Thread-leaved Rafnia. Thunb. ib. Willd. n. 11.—"Leaves linear-lanceolate, alternate. Flowers axillary."—The Linnæan herbarium contains two ſpecimens, ſpecifically different, which we preſume belong to this and the laſt, but no human ſagacity can appropriate them; except that one of them, with large and ſeemingly purpliſh *flowers*, having rather the narroweſt *leaves*, may be taken for *filifolia*. This is marked as gathered by Thunberg. The other has much ſmaller and yellow *flowers*. The *ſtem* is round in both.

11. R. *retroflexa*. Bent Rafnia. Thunb. ib. Willd. n. 12.—"Leaves obovate. Branches reflexed backwards and forwards."—A ſpecimen from Thunberg anſwers to the above name and character, except the *leaves* being rather linear-lanceolate than obovate. Their colour is ſomewhat glaucous. *Flowers* moſtly terminal, ſolitary, on ſhort *ſtalks*, with an awl-ſhaped *bractea*, or abortive leaf, at the baſe of each ſtalk.

12. R. *erecta*. Upright Rafnia. Thunb. ib. Willd. n. 13.—"Leaves oblong. Flowers lateral. Stem erect."

13. R. *diffuſa*. Proſtrate Rafnia. Thunb. ib. Willd. n. 14.—"Leaves ovate, ſmooth. Stem decumbent."

All the ſpecies turn more or leſs black in drying. For *Rafnia retuſa* of Ventenat, Malmaiſ. t. 53, ſee TEMPLETONIA hereafter, and Ait. Hort. Kew. v. 4. 269.

RAFSO, in *Geography*, a ſmall iſland on the E. ſide of the gulf of Bothnia. N. lat. 61° 37'. E. long. 21° 12'.

RAFSUND, a town of Sweden, in the province of Jamptland; 28 miles S.E. of Froſon.

RAFT, in *Sea Language*, a ſort of float formed by an aſſemblage of various planks, or pieces of timber, faſtened together ſide by ſide, ſo as to be conveyed more commodiouſly to any ſhort diſtance in a harbour or road, than if they were ſeparate. The timber and planks, with which merchant-ſhips are laden in the different parts of the Baltic ſea, are attached together in this manner, in order to float them off to the ſhipping.

This means of conveying timber to navigable ſituations may be advantageouſly practiſed in many places. It is found of great utility in many of the northern parts of the iſland as well as others, near canals and waters, where a cheap conveyance for ſuch articles is required.

The balſa or catamaran uſed by the Indians and Spaniards in South America, is only a raft made of the trunks of the balſa; for an account of which, ſee the article BOAT. They have one maſt, on which is hoiſted a large ſquare ſail; and a pair of ſheers, whoſe heels reſt on each ſide the raft. When a fore-ſtay ſail is ſet, a pair of ſheers is rigged forward. Theſe rafts were the firſt conveyance by water, no doubt, long before veſſels of a better conſtruction were thought of; and what is rather ſurpriſing, they are made to ſail with foul winds, and ſteer, as well as any other kind of veſſel, by means of an invention ſimilar to, and perhaps the original of, that which is now called "a ſliding-keel." They have for this purpoſe planks about ten feet long, and fifteen to eighteen inches wide, which ſlide vertically in the ſpaces between the trunks which form the raft. It is only neceſſary to immerge them more or leſs, and put down a greater or leſs number at the fore or after part of the raft, to make it either luff-to, or fall-off from the wind, tack, veer, lie-too, and perform every neceſſary manœuvre. The number of theſe planks is five or ſix, and if one of theſe planks be drawn up forward, the raft will keep away; and, if one is raiſed abaft, it will come to the wind. This ſort of raft, from the ſimpleneſs of its conſtruction, might perhaps be well adapted to many caſes of emergency, after ſhipwreck upon coaſts, deſtitute of all other materials for ſhipbuilding.

RAFT-*Port*, in a *Ship*, a ſquare hole cut through the futtocks of ſome ſhips, immediately under the counter, to receive the planks or pieces of timber which are brought to lade her for tranſportation; and which, on account of their great length, could not be received aboard otherwiſe.

RAFTERING, in *Agriculture*, a provincial term uſed for a ſort of ploughing in narrow ridges, or ſmall ridglets. It is uſeful for expoſing a large ſurface of earth to the influence of the atmoſphere.

RAFTERS, in *Building*, are pieces of timber, which, ſtanding by pairs on the reaſon-piece or raiſing-piece, meet in an angle at the top, and form the roof of a building.

It is a rule in architecture, that no rafters ſhould ſtand farther than twelve inches from one another.

For the ſizes or ſcantlings of rafters, it is provided by act of parliament, that *principal* rafters from 12 feet 6 inches to 14 feet 6 inches long, be 5 inches broad a-top, and 8 at the bottom, and 6 inches thick. Thoſe from 14, 6, to 18, 6 long, to be 9 inches broad at the foot, 7 a-top, and 7 thick. And thoſe from 18, 6, to 21, 6, to be 10 inches broad at the foot, 8 a-top, and 8 thick.

Single rafters, 6 feet 6 inches long, to be 4 and 3 inches in their ſquare.

RAFTY, a provincial term ſignifying damp and muſty, as corn or hay in a wet ſeaſon.

RAG, or RAKE, among *Hunters*, denotes a company or herd of young colts.

RAG, or *Ragg*, *Rowley*, in *Mineralogy*. See FERRILITE.

RAG, a torn piece of cloth of any ſort. See the next article.

RAGS, *Woollen*, as well as the clippings of pitch marks upon ſheep, are good manure. The rags ſhould be chopped ſmall, about an inch or two ſquare, and ſcattered on the earth at the ſecond ploughing; for being thereby covered they will begin to rot by ſeed-time. They imbibe the moiſture of dews and rain, retain it long, and, according to Dr. Home, keep looſe dry ſoils in a moiſt ſtate. They formerly coſt about fourpence a buſhel at London, from whence many loads were ſent every year to Dunſtable, which is thirty-three miles, where they are laid on even ſtiff lands, juſt after the ſowing of the corn, allowing to the acre four ſacks, of ſix buſhels each; they are much higher now, at more than double

double this price, and no quantity of any great account to be procured. See MANURE, and TOP-*dreſſing*.

The farmers in Oxfordſhire make uſe of rags of this ſort, procuring them from London and other places, at the rate of from eight to nine pounds the ton, which, with the carriage, ſtand them in upon the farms from nine pounds ten ſhillings to ten pounds. By ſome they are ſpread upon the clover lands, lays or layers for wheat, in the proportions of from three or four to ſix hundred weight to the acre. Tried with dung in this way, in the quantity of ſeven hundred weight to the acre, the dung is found the better dreſſing. They are alſo applied for turnips, for which crop they are ploughed in before the winter, as ſoon as the wheat-ſowing is over: if ploughed in at the time of ſowing turnips, they will not work for that crop. Some for this crop give half a coat of rags, and half a coat of ſheep-fold. When applied on the clovers they ſeldom laſt longer than two years. Others think that half a coat of rags, and half a coat of dung, is the moſt beneficial method of applying this ſort of manure. Some think rags are more durable than any other manure. Rags are occaſionally brought from Whitney to this diſtrict, at from ſeven ſhillings and ſixpence to eight ſhillings and ſixpence the hundred weight, and five hundred weight ſpread upon the acre: they commonly laſt only one crop, but ſometimes for two, and are found ſuperior to any thing for wheat. They are ploughed in; and if the ſeaſon be very dry, do not anſwer ſo well. They are ſuppoſed to do beſt on a ſummer fallow for that crop.

In Suſſex rags are chiefly of ſervice in the hop grounds, for which they are thought an excellent manure. Very great benefit is ſaid to have been derived from the application of theſe rags, in contributing to preſerve this ſort of plantation in a ſtate of conſtant moiſture and vegetation in the drieſt ſeaſons, when grounds which have been manured with dung, have been dried up, and the hop crops have failed. Rags have likewiſe been found very uſeful on the mowing grounds in ſome parts of Lancaſhire, when laid upon them in a pretty full proportion. When cut or chopped ſufficiently ſmall, they readily ſink down upon the ſurface of the land, and do not afford any ſort of interruption to the ſcythe, while they abſorb and keep in the moiſture, which is of material benefit to ſuch graſs lands as are inclined to be dry.

RAG, in a *Ship*. See BOLTS.

RAGAL, in *Geography*, a town of Germany, in the county of Pludentz; 10 miles E. of Pludentz.

RAGALBUTO, a town of Sicily, in the valley of Demona; 23 miles S. of Cefalu.

RAGALMATO, a town of Sicily, in the valley of Mazara; 8 miles N. of Naro.

RAGAMMEE, a town of Ceylon, near the W. coaſt; 58 miles S. of Columbo.

RAGANELLO, a river of Naples, which runs into the gulf of Tarento, near Civita Mandonia.

RAGAPILLY, a town of Hindooſtan, in Golconda, near the left bank of the Godavery; 5 miles S.E. of Badrachillum.

RAGATZ, a town of Switzerland, in the county of Sargans; 5 miles S.S.E of Sargans.

RAGAY, a town on the S. coaſt of the iſland of Luçon. N. lat. 13° 50′. E. long. 122° 40′.

RAGGED, in *Heraldry*. See RAGULED.

RAGGED *Hawk*, in *Falconry*, is a hawk that hath its feathers broken.

RAGGED *Robin*, in *Botany*. See LYCHNIS.

RAGGED *Harbour*, in *Geography*, a bay on the E. coaſt of Newfoundland, being a part of Catalina bay; 2 leagues N. of Catalina harbour. N. lat. 49° 45′. W. long. 53° 40′.

RAGGED *Helmet*, a ſmall iſland in the Mergui Archipelago. N. lat. 10° 9′.

RAGGED *Iſland*, a ſmall iſland in the Eaſt Indian ſea, near the iſland of Paraguay. N. lat. 11° 24′. E. long. 119° 30′. —Alſo, a ſmall iſland among the Bahamas. N. lat. 22° 27′. W. long. 77° 16′.

RAGGED *Point*, a cape on the E. coaſt of the iſland of Borneo. S. lat. 2° 13′. E. long. 116° 40′.—Alſo, a cape on the N. coaſt of the iſland of St. Chriſtopher. N. lat. 17° 30′. W. long. 62° 42′.

RAGGIVOLO, a town of Italy, in the department of the Mincio; 19 miles S. of Mantua.

RAGHU, in *Hindoo Mythology*, is the name of the anceſtor of Rama, one of their deified heroes, who is hence ſometimes called Raghuva, or ſon of Raghu. Budha, or Boodha, another of the Indian deities, is ſaid to have had a ſon alſo of this name.

RAGHUVA, a name of the Hindoo deified hero Rama, ſignifying a deſcendant of Raghu, a warlike character. All theſe names are ſtill very common among Hindoos: whether confined to the ſect who, as chiefly worſhipping Rama, are called Ramanuj, or more extenſively given, we are not informed. See RAMA.

RAGIAN, in *Geography*, a town of Perſia, in the province of Farſiſtan; 130 miles N.W. of Schiras. N. lat. 30° 40′. E. long. 50° 8′.

RAGLAND, a ſmall village of Monmouthſhire, here mentioned on account of its caſtle, the ruins of which evincing its grandeur and magnificence, command the attention of travellers. During the rebellion it was held for the king, and defended to the laſt extremity by the marquis of Worceſter; 8 miles W. of Monmouth.

RAGMAN'S ROLL, or *Ragimund's Roll*. See ROLL.

RAGNIT, in *Geography*, a town of Pruſſian Lithuania, on the river Memel, endowed with the privileges of a town in the year 1722. Its ancient caſtle was famous even in the times of Paganiſm. The knights of the Teutonic order rebuilt it, with additional works, in 1255; but being deſtroyed in 1355, it was rebuilt a ſecond time, and called Landſhuth; but afterwards it obtained the name of Ragnit from the river which paſſes by it; 56 miles E.N.E. of Königſberg. N. lat. 55° 5′. E. long. 22° 18′.

RAGOGNA, a town of Italy, in Friuli; 16 miles N.W. of Udina.

RAGOOGUR, a town of Hindooſtan, in the Malwa country, and circar of Kitchwana; 116 miles N.E. of Ougein. N. lat. 24° 23′. E. long. 77° 30′.

RAGOTSKI, FRANCIS, in *Biography*, the ſecond of the name, prince of Tranſylvania, diſtinguiſhed by his courage and patriotiſm, was born in 1676, at the caſtle of Borſhi, in Hungary. When he was only a year old he loſt his father, prince Francis, and was left to the care of his mother, Helena Sereni, who afterwards married count Tekeli. During his education he was carefully watched by the houſe of Auſtria, and his correſpondence with his mother, who had retired to Conſtantinople, was entirely broken off. He was now ſuffered to travel to moſt of the courts of Europe, and to contract a marriage with the princeſs of Heſſe Rhinfelds. Zealouſly attached to the independence of his country, which was kept in a ſtate of great degradation by the Imperialiſts, he ſecretly entered into a negociation with the French king, Lewis XIV., but being betrayed by one of his confidents, he was arreſted, and a charge of treaſon was preferred againſt him. The ſentence of guilty was ſoon pronounced, and he was committed to the cuſtody of an officer,

officer, who, however, connived at his eſcape, and he arrived in a dragoon's habit at the frontiers of Poland. Here he received aſſurances of aſſiſtance from France, and immediately publiſhed an eloquent manifeſto, calling upon the nation to free itſelf from the Auſtrian yoke. Numbers joined him; being, however, but half armed, he was fearful of truſting his cauſe in their hands, and withdrew to the frontiers of Poland, where he was joined by freſh recruits. With theſe he ventured to make ſome progreſs; ſtormed ſeveral fortreſſes; and took a ſevere revenge upon the Imperialiſts, who had given no quarter to the Hungarian inſurgents.

At this period the crown of Poland was vacant, through the depoſition of Auguſtus by Charles XII. of Sweden, and the Poliſh chiefs were deſirous of placing it upon the head of Ragotſki. But he had no ſuch ambitious views: his great object was to liberate his country, and he refuſed to deſert its cauſe for any other proſpects. He accordingly purſued his ſucceſſes, and by the reduction of Tokay, obtained the ſubmiſſion of almoſt the whole of Lower Hungary. So high was his reputation, that the diet of Alba Julia, in 1704, proclaimed him prince of Tranſylvania, with which dignity he was afterwards ſolemnly inveſted. He obtained likewiſe the title of protector of Hungary, and Lewis XIV. ſent to him a public embaſſy. He ſoon began to feel the difficulty of ſupporting a popular inſurrection againſt the arms and policy of a powerful ſovereign, as well by the abandonment of ſome of his allies, as by the deſertion of his troops. He had another opportunity of giving a refuſal to the crown of Poland, which was offered him by the czar Peter, ſhewing thereby his ſincere attachment to the cauſe of his country, and he employed all the reſources of valour and good conduct to ſupport a declining cauſe. In 1711, a treaty was concluded between the Hungarian ſtates and the emperor, into which he refuſed to enter, although the firſt article ſecured his life and property, with the title of prince of Tranſylvania. Mortified by the failure of his patriotic exertions, he withdrew to Turkey, renouncing his great eſtates, and preferring an honourable poverty to a ſplendid ſervitude. He afterwards paſſed ſome time in France, then returning to Turkey, he fixed his final reſidence at the caſtle of Rodoſto, on the ſea of Marmora. "There," ſays his biographer, "a Chriſtian among Mahometans, and a philoſopher among barbarians, he tranquilly cloſed his life in 1733, at the age of 61." He left "Memoirs of his Life," which were publiſhed in the "Revolutions de Hongrie," printed at the Hague in 1739. In 1751 there appeared a work, entitled "Teſtament politique et moral du Prince Ragotſki," the authenticity of which is doubted. Moreri.

RAGOUT, or RAGOO, a ſauce or ſeaſoning, intended to increaſe or recover the appetite when languiſhing, or loſt.

The term is French, but naturalized. It is alſo uſed for any high-ſeaſoned diſh, prepared of fleſh, fiſh, greens, or the like, by ſtewing them with the addition of bacon, ſalt, pepper, cloves, and the like high-flavoured ingredients.

We have ragoos of beef, of cray-fiſh, of giblets, of aſparagus, of endive, of cocks-combs, of gammon, of celery, &c.

The ancients had a ragout, called *garum*.

RAG-PAVING. See PAVING.

RAG-STONE, a name given by our artificers to a kind of ſtone, which they uſe for ſetting an edge upon knives, chiſſels, and other tools. It is a greyiſh-coloured ſtone, containing a large quantity of talcky particles, and ſplits eaſily into thin flakes. It is a ſoft ſtone, and is uſed only to finiſh the ſetting an inſtrument after the edge has been prepared by grinding or rubbing the tool upon ſome other ſtone of a coarſer texture. We have this from Newcaſtle and many other parts of the north of England, where there are very large rocks of it in the hills. This kind of ſtone is in ſome diſtricts conſiderably blended and intermixed with the ſubſoil, rendering it of a more barren and unfertile quality.

RAGUENET, L'ABBE, in *Biography*. In 1702 the publication of a pamphlet, entitled "Paralele des Italiens et des François en ce qui regarde la Muſique et les Operas," by this author, a man of taſte and intelligence, who had reſided ſome time at Rome, gave birth to a long, but ineffectual controverſy, concerning the degrees of perfection, and ſuperiority of French and Italian muſic. The book was licenſed by Fontenelle, who ſaid in his teſtimony, that "he thought it would be very agreeable to the public, provided they were capable of equity." This declaration, however, did not prevent Freneuſe, the continuator of Bonnet's "Hiſtoire de la Muſique," from attacking the author and Italian muſic in a moſt furious manner, treating both with equal contempt and obloquy.

The French, after this period, ſeem to have enjoyed their lyric *ſommeils* in great comfort and tranquillity till 1752; when the performance of Pergoleſi's "Serva Padrona" at Paris, by a company of burletta ſingers from Italy, ſet the muſical republic in a flame which has not yet been extinguiſhed.

There had, indeed, been a *ſenſation* excited, that was rather turbulent, and tending to a civil war, on the firſt appearance of Rameau as a dramatic compoſer in 1733, who, by new harmonies and accompaniments, had given offence to the true believers in the worſhip of Lulli; but this ſoon ſubſided, and the nation not only heard his compoſitions with rapture, but reverenced him as "a theoriſt, to whom muſic was as much indebted as phyſics and philoſophy to Newton."

This little work was publiſhed in Engliſh in 1709, and has been ſaid to be tranſlated by Galliard. If this worthy profeſſor was the tranſlator, it was before he had made himſelf ſo completely maſter of the Engliſh language, as he appeared to be afterwards, in his tranſlation of "Toſi on florid Song." The Engliſh of this *paralele* is feeble and inaccurate; many of the notes, however, are good, and manifeſt a perſon who had been in Italy, and well knew the ſtate of muſic in that country, as well as in England, at the beginning of the laſt century, during our firſt attempts at operas, before the arrival of Handel.

RAGUIER, LE, the name given by the French ſailors to a wind peculiar to the gulf of Alexandretta or Scanderoon, which, ruſhing from the ſnowy ſummits of the mountains, frequently forces ſhips to drag their anchors ſeveral leagues.

RAGULED, or RAGGED, in *Heraldry*, is applied to an ordinary, *e. gr.* a croſs, whoſe outlines are jagged or knotted.

He beareth ſable, a croſs raguled, or, by the name of *Sloway*.

Ragged differs from indented, as the latter is regular, and the former not.

The bearing is very ancient: Julius Cæſar gave for his badge, a boar's head, on a ragged ſtaff.

RAGULED is ſometimes alſo uſed in the ſenſe of truncated, or couped, and applied to a branch that is ſawed from the tree; or a ſtock ſawed from its root.

RAGUN, in *Geography*, a town of Germany, in the principality of Anhalt-Deſſau, on the Mulda; 9 miles S. of Deſſau.

RAGUNDA, a river of Sweden, which riſes in the lake

lake Storfio, and in the province of Medelpadia, changes its name to Indal.

RAGUSA, a ſmall republic, ſituated on the eaſtern ſhore of the Adriatic, and nevertheleſs regarded as an Italian ſtate. It has a population of about 56,000 perſons, on an extent of 352 ſquare miles. As this ſtate is adjacent to the territory formerly belonging to the Venetians in Dalmatia, its government was formed on the model of the Venetian ariſtocracy. Its religion is the Catholic, and its language the Slavonic, though moſt of the inhabitants ſpeak Italian. The ſee is archiepiſcopal, with ſix ſuffragans, and its commerce is conſiderable. The chief magiſtrate of the ariſtocracy in this iſland, called the "rector," is changed every month. Here is alſo a council of ten, and a great council compoſed of all the nobles above twenty years of age, and theſe nominate the "Pregadi," a ſenate of ſixty, which ſuperintends all ſtate affairs, receives and deputes ambaſſadors, and confers offices. The revenue of Raguſa was formerly eſtimated at a ton of gold, or about 10,000*l.* ſterling. This ſmall republic has found it neceſſary to engage the protection of the Turks, for which it pays a tribute of about 20,000 ſequins; though the commerce is beneficial to the Ottomans, in ſupplying them with ammunition. Jealouſy of their neighbours induces the Raguſans to ſhut the gates of their city, except for a few hours in the day. The capital is Raguſa; and it has been lately annexed, together with Dalmatia, to the kingdom of Italy. It now (1814) probably waits for a new allotment. The Raguſans have many country-houſes at Gravoſa, another ſea-port town. Stagno is another little town, ſubject to Raguſa. Of the Raguſan iſles, the chief is Milet, or Melada, fertile in oranges, lemons, and good wine. On the north there is a tolerable haven, with a town of the ſame name. Three or four little iſles in that neighbourhood alſo acknowledge the ſovereignty of Raguſa.

RAGUSA, the capital of the above-mentioned iſland, is an ancient city, being the Raguſium of the Romans, and in the tenth century it became the metropolis of Dalmatia. In the 13th century it was conquered by the Venetians, and afterwards for a time ſubject to the crown of Hungary. It is a well-built city, and its commerce is not inconſiderable. The harbour might be rendered capable of a firm defence; and the circumjacent iſles are beautified by nature and art. Earthquakes, however, have been terrible; and that of 1667 deſtroyed 6000 perſons; 248 miles N.W. of Saloniki. N. lat. 42° 58′. E. long. 18° 18′.

Raguſa keeps accounts in ducats of 40 groſſetti, each groſſetto being divided into 6 ſoldi; but at the public offices accounts are moſtly kept in perperi of 12 groſſetti. Formerly the ducat repreſented a real coin ſtruck at Raguſa, and had a fixed value; but ſince it has become a money of account, it is always equivalent to the Turkiſh piaſtre, and therefore liable to a change of value. At Raguſa no gold coins are ſtruck; its ſilver are the old tallari or dollars, commonly called Viſlini or Raguſine, weighing 1 oz. 7 car. (Raguſa wt.), containing 17 parts of pure ſilver to 13 of alloy, and reckoned at 1½ ducat, or 60 groſſetti; but on account of the depreciation of the ducat, the value of the tallari has been proportionably raiſed in weight. The new tallari, called libertine, weighing 1 oz. 10 car. and containing 9 parts of pure ſilver to 6 of alloy, was valued at 80 groſſetti. But ſince the year 1796, ducats have been coined of 40 groſſetti, weighing ½ an ounce; alſo perperi of 12 groſſetti, weighing 20 carats, and half perperi in proportion: theſe three coins contain 9 parts of pure ſilver, and 11 of alloy. The groſſetti, none of which have been lately coined, are ſtill in circulation: they weigh the 60th part of an ounce, and bear the ſame value with the paras of Conſtantinople. The ducat of 1796 is worth 13¼*d.* ſterling, which is nearly the value of the Turkiſh piaſtre. The tallaro, or Raguſina of 1759, is worſe than the Engliſh ſtandard 4 oz. 2 dwt.; its weight is 18 dwt. 7½ gr., content in pure ſilver 256.4 gr., and its value in ſterling 2*s.* 11¾*d.* That of 1794 is worſe 3 oz. 19 dwt., its weight 18 dwt. 17¼ gr.; its content in pure ſilver 267.6 gr., and value in ſterling 3*s.* 1¼*d.* The ducat of 1797 worſe 5 oz. 11 dwt.; its weight 8 dwt. 17¾ gr., content in pure ſilver 97 gr., and value in ſterling 1*s.* 1½*d.* The tallaro or Raguſina has upon it the head of the chief magiſtrate, or rector; legend RECTOR REIP. RHACUSIN: reverſe, arms of the city, legend, DUCAT. ET SEM. REIP. RAC., *i. e.* ducat and half of the republic of Raguſa. Pieces of 1794, &c. bear the head of a woman, with RESPUBL. RHACUS., reverſe, a ſhield, with the word LIBERTAS, incloſed by two branches, over which is a crown, legend, DUCE DEO FIDE ET JUST. The ducat bears the whole length of a biſhop, legend, AUSPICIIS TUIS A DEO: reverſe, arms of the city, legend, DUCAT REIP. RHACUSINÆ.

The pound with which gold and ſilver are weighed at Raguſa conſiſts of 12 ounces; the ounce is divided into 6 ſaggi; the ſaggio into 22 carats, and the carat into 4 grains. But the pound of commercial weight is equal to 5607 Engliſh grains, or 12 oz. 13dr. avoirdupois; the former being 5062¾ Engliſh grains. The ell of Raguſa meaſures 227½ French lines, or 20¼ Engliſh inches. Kelly's Un. Cambiſt.

RAGWORT, in *Botany*. See OTHONNA, SENECIO, and SOLIDAGO.

RAGWORT, in *Agriculture*, a very pernicious plant of the weed kind, which is ſometimes termed ſeagrim. It has a green ſtalk in its early ſtate, but, as it advances in age, inclining to violet or purple, eſpecially downwards. Its flowers are yellow, and thick-ſet, and compoſed each of a number of ſmall pointed leaves. It runs to ſeed in the latter end of ſummer. The ſmell, both of the ſtalk and leaves, which are jagged, as well as the flower itſelf, are ſo offenſive to animals, as that hardly any will feed upon it, except when almoſt ſtarved.

It has been propoſed to deſtroy it by picking out the roots, and feeding the land cloſe with ſheep. It moſtly affects meadows and paſture lands when the ſoils are good.

RAHA, in *Geography*. See JERICHO.

RAHABAH, or RABBA, town of Arabia Deſerta, near the Euphrates, on the road by which caravans travel from Syria to the Arabian Irak; 110 miles S.W. of Moſul. N. lat. 35° 5′. E. long. 40° 21′.

RAHABAH *Melik Ben Tauk*, a town of Aſiatic Turkey, in the province of Diarbekir, on the Euphrates; 50 miles S. of Kerkiſich.

RAHABY, a town of the deſert of Syria, containing about five or ſix thouſand inhabitants, ſituated on a plain, ſurrounded with date-trees; 70 miles N. of Meſghid Ali.

RAHANPOUR, a town of Bengal; 42 miles N.W. of Nattore.

RAHAPA, a ſmall iſland in the Eaſt Indian ſea, near the E. coaſt of Borneo. N. lat. 4° 58′. E. long. 114° 4′.

RAHAS, in *Ichthyology*, a name given by ſome authors to the torpedo, or cramp-fiſh.

RAHEINA, in *Geography*, a bay on the W. coaſt of Mowhee, one of the Sandwich iſlands. N. lat. 20° 50′. E. long. 203° 19′.

RAHEMAT, a large lake in the Arabian Irak, 90 miles in circuit, near Meſghid Ali.

RAHENSTEIN, a town of Bohemia, in the circle of Saatz; 19 miles S.W. of Saatz.

RAHMANIE′, a town, or rather village, of Egypt, built

built on the W. bank, at the entrance of the canal of Damankour, which is navigable only at the riſe of the Nile; 9 miles S. of *Faoué*; which ſee.

RAHMETABAD, a town of Perſia, in the province of Irak; 20 miles N.E. of Conſar.

RAHNIS, or RANIS, a town of Saxony, in the circle of Neuſtadt; 10 miles S.W. of Neuſtadt. N. lat. 50° 33'. E. long. 11° 40'.

RAHNY, a town of Bengal; 25 miles N.W. of Dinagepour.

RAHON, a town of France, in the department of the Jura; 6 miles S. of Dôle.

RAHOON, a town of Hindooſtan, in the ſubah of Lahore; 108 miles S.E. of Lahore. N. lat. 31° 7'. E. long. 75° 42'.

RAHU, in *Aſtronomy*, is the Hindoo name of the planet of the aſcending node, or dragon's head. Ketu is the name of the other node; and a fable, in the uſual ſtyle of mythological allegory, is given under that article, of their origin and miſhap. The malignant Rahu was decapitated, and Ketu was his head. In one painting of the Hindoo zodiac, the headleſs Rahu is repreſented of a black colour, in red clothing, mounted on an owl, and holding a lotos in his hand: in another, he holds a ſpear, and ſtands on a tortoiſe. In the fable given under Ketu it is related that Viſhnu was the decapitator of Rahu: other accounts aſſign that office to Narayana. Among the Hindoos, as we have had occaſion to remark in ſeveral articles, their ſciences, as well as their hiſtory and religion, are enveloped in a maſs of mythological allegory: a farther inſtance of which, connected with the ſubject of this article, is ſeen under ECLIPSE (*Note.* A reference being made from the article KETU to this, we take the opportunity of correcting two typographical errors in that article. In its early part, for *Karyapa*, read *Kaſyapa*; and in the fourth line of the ſecond column, for *or* read *a*.)

RAHWAY, in *Geography*. See RAWA.

RAI, or RAE, an ancient town of Perſia, in the province of Irak, before Iſpahan the capital of Perſia. This was once a grand and proud city; and its ruins ſtill cover a great extent of country. It holds a diſtinguiſhed place in the annals of Perſia: it is mentioned by Arrian and Diodorus Siculus, as the capital of the province of Rhages, ſo called from the calamities brought upon this part of the empire by the earthquakes to which it formerly was, and is ſtill ſubject. It is frequently mentioned in the wars of the renowned Haroun al Raſhid; it was the capital of this part of Perſia, in the reign of Alp-Arſlan, and continued to flouriſh until it was ſacked by the generals of Jenghis Khan. Its ruins are ſituated five miles S. of Tehraun, the preſent capital of Perſia; and in the centre of them is a village, called Sheik Abdul Azzeem, from a ſon of the ſeventh Imam, to whoſe memory a noble moſque and mauſoleum have been erected.

RAJA, denoting *king*, an appellation given in Hindooſtan, or the empire of the Mogul, to princes deſcended from thoſe that ruled there before the conqueſt of the Moguls; who exerciſed all rights of ſovereignty, only paying a tribute to the Great Mogul, and obſerving the treaties by which their anceſtors recognized his ſuperiority.

There are ſome rajahs who ſtill retain a more independent ſovereignty in the mountains: the Indians call them *rai*; the Perſians, plurally, *raian*: our travellers *rajahs*, or *ragias*. Theſe have under their command ſoldiers, called *rajapoots*, or perſons deſcended from rajahs, who are a robuſt and brave people, and who enter into the ſervice of thoſe who will pay them. The Great Mogul has ſeveral of theſe rajahs in his ſervice.

The chief lords of the Moguls, *viz.* the vice-roys, governors of provinces, and chief miniſters of ſtate, F. Catrow obſerves, are called *omhras*; and the idolatrous rajahs, or Indian lords who governed petty ſtates before the conqueſt of their country, held the ſame rank at court with the omhras.

All the difference was, that the children of the rajahs ſucceeded their fathers in the ſhow of the ſovereignty left them; whereas the children of the Mahometan lords loſe all in loſing their fathers.

The Indians account four ages from the beginning of the world: and in the ſecond, which laſted 1,296,000 years, they hold the rajas or kchatrys had their riſe; a noble caſt, though inferior to the Bramins. Vice then, they ſay, began to creep into the world; men only lived to 300 years, and their ſtature was reduced, &c.

RAIA, the *Ray*, in *Ichthyology*, a genus of fiſhes of the order Chondropterygia, of which the generic character is, that it has five oblique ſpiracles on each ſide, placed beneath the neck; the head is ſmall, pointed, and not diſtinct from the body; the mouth is beneath tranſverſe, toothed; the body is broad, thin, and flat.

The individuals of this genus are all inhabitants of the ſea only: they keep at the bottom, and in winter cover themſelves with ſand and mud: they feed on teſtaceous animals, fiſh, or any animal ſubſtances which they may happen to meet with. They grow to a large ſize, ſometimes exceeding 200lbs. in weight. The females are the larger, and produce their young alive, only one at a time, which, like the ſhark tribe, are incloſed in a quadrangular, black, horny ſhell, the corners of which end in ſlender incurved points, but not extending into long filaments, like thoſe of the ſhark: the eyes are half covered with a thin membrane, oblong, placed on the upper part of the head: above theſe, in the place of noſtrils, is a broad ſulcus or groove, divided by a reticulate membrane, conſiſting of creſted folds, and cloſed with a valve: behind this ſulcus are two ſmall ſemilunar orifices: the tongue is very broad, ſhort, and ſmooth. The ventral fins are covered with a thick ſkin, and ſurrounding the body; the ventral at the baſe are connected with the anal; the fleſh is generally eatable; the liver is large, and producing a great quantity of pure oil.

Of this genus there are nineteen ſpecies, divided into three ſections: *viz.* A, comprifing the electric ray, or torpedo and ſkates: theſe have ſharp teeth. B, including the ſting-ray and thornbacks, having obtuſe teeth. And C, which are denominated uncertain, comprifing five ſpecies, which inhabit the Red ſea, or about the Cape of Good Hope, but which have not yet been ſufficiently examined.

Section A.—*With ſharp Teeth.*

Species.

* TORPEDO; Electric Ray. The body of this fiſh is entirely ſmooth and flat. The ſpecies inhabits the Mediterranean, and grows to a large ſize: ſome have been taken that have weighed from 60 to 80lbs. each, but the average weight is leſs than 20lbs. It is of a dirty clayiſh colour; the head and body are round, and but indiſtinctly ſeparated. The body is extremely thin; behind the eyes are two wide foramina, which have been ſuppoſed to be intended by nature for conveying ſound; they are beſet with ſix cutaneous fingers on their inner circumference, and communicate with the mouth. The torpedo can live about twenty-four hours out of the ſea, and a ſhort time longer, if put into freſh water;

water; it inhabits thoſe places where the bottom is ſandy, and buries itſelf ſuperficially by flinging the ſand over its back with a ſort of vibration, which it gives to its extremities. It is in this ſituation that the torpedo aſtoniſhes and terrifies the unwary paſſenger, who inadvertently treads upon it, by the exertion of its electrical or benumbing faculty. This power is ſerviceable to the animal in two important reſpects; as a means of defence againſt voracious fiſhes, and as a method by which he is enabled to procure his ſubſiſtence from among the ſmaller tribes; for the former, when electrified, are deprived of all poſſibility of ſeizing their prey; and the latter, after having unwarily approached the torpedo, and received the ſhock, are incapable of making their eſcape. (See TORPEDO.) The food of the torpedo is ſurmullets and plaiſe; the former are ſo ſwift, that it is impoſſible for the torpedo to take them by purſuit, and as this fiſh has been found in its ſtomach, it is preſumed that it was taken by means of the electrical ſhock. The torpedo has been taken off Pembroke, at Torbay, and near Waterford in Ireland. It is caught like other flat fiſh, with the trawl, and is commonly found in water forty fathom deep, in company with other ſpecies of this genus.

* BATIS; the Skate. This ſpecies is varied; the middle of the back is ſmooth; the tail is beſet with a ſingle row of ſpines. It inhabits the European ocean, and is thought to be the largeſt fiſh of the genus: the body above is cinereous, ſometimes with a few black lines, beneath white, with waved lines of black dots; round the eyes are numerous ſmall, hooked ſpines; in the males the fins are full of ſpines. Of all the larger fiſhes, the ſkates are the moſt numerous, and their numbers are in a great meaſure owing to their ſize, and to the protection afforded them by thoſe frightful ſpines which nature has afforded them. There is not one of the rapacious tribes, excepting, perhaps, the cachalot and white ſhark, that has a ſwallow ſufficiently large to receive them, and even theſe are probably deterred from their purpoſes of deſtruction by the armour with which their prey is covered. Of ſome the ſize is ſuch as to defy all powers of deſtruction which even the ſhark himſelf poſſeſſes. In England ſome of the ſpecies have been taken, weighing upwards of two hundred weight, but even this is far inferior to their enormous bulk in other parts of the world. Near the iſland Guadaloupe, a ray was killed more than twenty-five feet long, and almoſt fourteen broad. After all, the fiſhes of this tribe probably attain a much larger ſize than that of any individual which has ever yet been examined. It is only the ſmalleſt of the kind that approach the ſhores; the largeſt continue for ever prowling at the bottom in the unfathomable caverns of the ocean, where they continue perhaps to grow for a century.

The fiſhes generate in March and April, at which time they ſwim near the ſurface of the water, ſeveral males purſuing one female. The females caſt their *purſes*, as they are called, in May, and continue to produce till September: they are very prolific, not leſs than three hundred eggs having been found in the body of a ſingle female. The rays generally frequent thoſe parts of the ſea where the bottom is black and muddy, where they devour every thing indiſcriminately, but they are more delicate with regard to a baited hook. They devour any putrid ſubſtances whatever, but if the bait has been taken up and ſuffered to lie for any time in the open air, they will not touch it; they appear to perceive the line, and to dread it; but the impulſe of hunger overcomes their caution, and even though they perceive the danger, if thoroughly hungry, they devour the bait, as if regardleſs of the conſequences. See SKATE.

OXYRINCHUS; Sharp-noſed Raia. Varied; middle of the back with ten ſpinous tubercles. This is ſimilar in ſhape to the ſkate, but with a longer and ſharper ſnout: the colour of the whole upper part is cinereous, with ſeveral pale or whitiſh ſpots, intermixed with a few ſlight duſky ſtreaks or variegations; beneath it is white, with duſky or blueiſh ſtreaks; down the back and tail runs a ſingle row of ſpines, and a few others are placed about the region of the eyes: the ſides of the tail are alſo ſometimes furniſhed with a row of ſmaller or weaker ſpines than thoſe on the upper part; the eyes are large, as is alſo the mouth. This ſpecies, like the ſkate, ſometimes, but not often, is taken of a very conſiderable ſize. It is a native of the Mediterranean and Northern ſeas.

MIRALETUS. This ſpecies has a ſmooth belly and back: it has ſpines near the eyes, and a triple row of them on the tail. It inhabits the Mediterranean; the body above is marked with an occellate ſpot.

* FULLONICA; the Fuller Ray. The back is covered with ſpines; the eyes with a ſingle row; pectoral fins and tail with a triple row. It inhabits the European ſeas; grows to a large ſize; the body above is cinereous, with numerous black ſpots; beneath it is white. The ſnout of this fiſh is ſhort and pointed; the nictitant membrane is fringed; the teeth are ſmall and ſharp; and the tail is ſlender. It has been thought by ſome authors that this is only a variety of the next ſpecies.

* RUBUS; Rough Ray. The back of this ſpecies has a ſingle ſpine; and the tail is beſet with a triple row of ſpines. This is greatly allied to the thornback, but covered with more numerous ſpines, every part of the ſkin on the upper ſurface being muricated with ſharp curved aculei of different ſizes: of theſe, one row of the largeſt runs down the middle of the back, and three, or ſometimes five, along the tail; others are diſperſed about the eyes and the flaps of the pectoral fins: the general colour is a yellowiſh or whitiſh-grey, ſometimes variegated with duſky or browniſh clouds and ſtreaks; the under ſide is white, and beſet with very numerous ſcattered ſpines, but leſs ſtrong than thoſe on the upper ſide. It is about the ſize of a thornback. Mr. Pennant mentions one that meaſured nearly three feet from the noſe to the tip of the tail. It is a native of the Mediterranean and other ſeas.

B.—*Teeth obtuſe.*

Species.

SEPHEN. Body nearly round; tail twice as long as the body, winged beneath, and with two long ſpines above, ſerrate on each ſide. It inhabits the Red ſea, and is ſometimes ſo large, as to reach three yards acroſs; body above brown, with three rows of large hemiſpherical tubercles down the middle of the back; beneath it is quite flat and ſmooth, and it is of a reddiſh-white. It is from the ſkin of this ſpecies that the beautiful ſubſtance called *Galuchat* is prepared by the French, and which, being coloured with blue, green, or red, according to the fancy of the article, and afterwards poliſhed, is ſo frequently uſed for various kinds of caſes, teleſcope tubes, &c. For this purpoſe the ſmaller or younger ſpecimens are preferred; the tubercles in the more advanced or full-grown animals being too large.

There is a variety of this ſpecies: the length of the ſpecimen deſcribed by Dr. Ruſſell was about $9\frac{1}{2}$ inches; the tail is about two feet nine inches long; the colour of the whole animal is a dull leaden above, with a deep blue tail; beneath it is duſky white; on the middle of the back there are only two pearl-formed tubercles inſtead of three; the tail is furniſhed with a ſharp ſpine and a fin beneath. It is a native of the Indian ſeas.

Aquila. The body is ſmooth; the tail is pinnate, with a long ſerrate ſpine. This ſpecies is of a rhomboidal ſhape, but with a conſiderable dilatation: the pectoral fins approach to a ſubfalcated form: the colour is cinereous above; pale or whitiſh beneath: the head is rather large, and the ſnout produced: the eyes are large and prominent, with yellow irides: the tail is long, ſlender, ſharp-pointed, and furniſhed about the middle with a ſpine ſimilar to that of the ſting-ray. This ſpecies grows to a very great ſize, ſometimes meaſuring ten, twelve, or even fifteen feet in length, and weighing upwards of three hundred pounds. It is found in the Mediterranean, Atlantic, and Indian ſeas, and is ſaid to ſwim in a ſlower manner than moſt other rays; it preys on ſmaller fiſhes, and is ſuppoſed to ſtrike and kill, or at leaſt diſable its prey with the caudal ſpine: when taken, it is obſerved to vibrate the tail with great ſtrength and rapidity in all directions. It is not reckoned among the edible fiſhes; but the liver, which is very large, is ſaid ſometimes to be eaten, though it is more frequently uſed for the purpoſe of preparing from it a clear oil, which it affords in great plenty.

* Pastinaca; Sting-ray. The body of this ſpecies is ſmooth; its tail has a long ſharp ſpine, ſerrate on the fore part, and another on the back: there are two other varieties, of which the one has a ſmooth body; the back is beſet with two ſpines, ſerrate on the fore part; the body of the other is covered with ſpots.

This ſpecies is deſcribed as having a body ſomewhat approaching to the ovate, the pectoral fins leſs pointed than in ſome other ſpecies of this diviſion. The ſnout is pointed; the body more convex than uſual; the colour of the whole animal above of a yellowiſh-olive, but the back is ſometimes found to approach to a blueiſh-brown; beneath it is whitiſh; the tail is of a conſiderable length, and without a fin, very thick at the baſe, and gradually tapering to the extremity, which is very ſlender: near the middle it is armed, on the upper part, with a very long, flattened, and ſharp-pointed bone or ſpine, finely ſerrated in a reverſed direction on both ſides: with this the animal is capable of inflicting very ſevere wounds on ſuch as incautiouſly attempt to handle it; and it anſwers the purpoſe both of an offenſive and defenſive weapon. This weapon is annually caſt, and as it frequently happens that the new ſpine has arrived at a conſiderable ſize before the old one has been caſt, the animal is occaſionally found with two, in which ſtate it has been ſometimes erroneouſly conſidered as a diſtinct ſpecies. This fiſh is ſaid not to grow to a very large ſize. It is found in the Mediterranean, Atlantic, and Indian ſeas, and is numbered among the edible rays. On account of the danger attending the wounds inflicted by the ſpine, it is uſual with the fiſhermen to cut off the tail as ſoon as the fiſh is taken. In ſome countries it is ſaid to be illegal to ſell the fiſh with the tail adhering to it.

It was formerly thought that the ſpine of the fiſh poſſeſſed a venomous quality, by infuſing into a wound made by it ſome very active poiſon; this is now proved to be completely erroneous, and the effects ſometimes produced by it ariſe entirely from the deepneſs of the puncture and laceration, which, if taking place in a tendinous part, or among the larger nerves and blood-veſſels, have often proved fatal. It may not be amiſs to obſerve, that ſome ancient writers have deſcanted upon the effects of this animal's powerful weapon in terms of conſiderable luxuriance; it was ſuppoſed to be not only poiſonous in the living animal, but to preſerve its poiſon when taken from the fiſh, and affixed to the head of an arrow or a ſpear; it was ſaid even to deſtroy the moſt healthy and flouriſhing plant by its touch, and even to cauſe trees to die by ſtriking the bark with its point. It formed the head of the fatal ſpear preſented by Circe to her ſon Telegonus, by which he was rendered ſuperior to his enemies, and with which he, at length, unconſciouſly, ſlew his father Ulyſſes. The general habits of this ſpecies are ſimilar to thoſe of the reſt of the genus, often lying flat, and in ambuſcade on the ſoft mud at the bottom of the ſhores which it frequents, and ſeizing its prey by ſurprize; at other times it will purſue it through the depths of the ocean.

* Clavata; Thornback. The body of this ſpecies is ſpinous; the teeth tuberculate; acroſs the belly is a ſtrong ſemilunar cartilage. This ſpecies grows to a very conſiderable ſize, though rarely equal in magnitude to the ſkate already deſcribed; in its general appearance it reſembles that fiſh, but is ſomewhat broader in proportion, and is readily diſtinguiſhed from the ſkate by the very ſtrong, curved ſpines with which its upper ſurface is covered; theſe are moſt conſpicuous down the middle and on each ſide of the back, where four or ſix, of much larger ſize than the reſt, are generally ſeen; the remaining parts being furniſhed with many ſcattered ſpines of a ſmaller ſize, intermixed with ſtill more minute ones, and the whole ſkin is of a rough, or ſhagreen-like ſurface; the back is marked with an uncertain number of pale or whitiſh round ſpots of different ſizes, and which are commonly ſurrounded with a blackiſh or dark coloured edge; theſe ſpots are ſaid to be cauſed by the ſhedding of the ſpines at different intervals; along the middle of the back runs a ſingle row of ſtrong ſpines, continued to the tip of the tail; the colour of the ſkin is a browniſh-grey, with irregular blackiſh or duſky variegations; the under part is white, with a light caſt of fleſh-colour, and about the middle of the body, as well as on the fins, are diſpoſed ſeveral ſpines ſimilar to thoſe on the upper ſide, but leſs ſtrong. The thornback is an inhabitant of the Mediterranean and other ſeas, and is held in ſome eſteem as food, though not conſidered equal to the ſkate in goodneſs.

Rhinobatos. Body long, tapering; ſnout lengthened. This is reckoned a very remarkable ſpecies, and is thought to connect in ſome degree the genera of raia and ſqualus, the body being much longer than in the preceding kinds of ray; the ſnout is lengthened, but not very ſharp; and the body, which is moderately convex above, and flat beneath, gradually tapers from the ſhoulder to the tail, which is furniſhed above with two fins, of an oblong ſhape, and ſituated at a conſiderable diſtance from each other: the tip of the tail is alſo dilated into an oblong fin. The colour of the whole fiſh is of a dull earthy brown, paler beneath, and the ſkin is every where roughened by minute tubercles. This fiſh is ſaid to grow to the length of about four feet, and is a native of the European ſeas. It is very frequently ſeen about the coaſts of Naples.

Djiddensis. Tail-fin two-lobed; ſpines in a triple row at the beginning of the back, and afterwards in a ſingle row; the firſt dorſal fin is above the ventral. It inhabits the Red ſea, and is about two yards long. The body is a little rough, and of a pale aſh colour; above it is varied with whitiſh ſpots; beneath it is whitiſh; behind the vent are a few brown and white ſtripes.

Lymma. Body oval, ſmooth, teſtaceous, with blue ſpots; pinnate tail with a ſingle ſpine. It inhabits the Red ſea; is hardly a foot long; the ſpots oval, unequal, beneath whitiſh. It is much allied to the eagle-ray, and is of a reddiſh-brown colour above; the tail is ſomewhat longer than the body, marked above, for half its length, with two longitudinal blue ſtripes, and is furniſhed about the middle with one, and ſometimes with two, large and ſerrated ſpines, which

which are covered at their baſe by a blueiſh-brown ſkin; the under part of the body is pale or whitiſh.

ARNAK. Body orbicular, ſilvery; tail round, without a fin, and furniſhed with two ſpines. It inhabits the Red ſea; the teeth are granulate.

C. *Uncertain.*

OMMESSCHERIT. Tail round and ſpotted. It inhabits the Red ſea, and very much reſembles the R. paſtinaca.

TAJARA. Tail round; body beneath ſnowy. It inhabits the Red ſea. When juſt taken, it beats violently with its fins.

SCHOUKIE. Body with a few remote ſpines. It inhabits the Red ſea. The Arabians make ſcabbards for their ſwords out of its ſkin.

MULA. Beneath ſnowy; tail round, variegated. It inhabits the Red ſea, and approaches the ſhores by night. The ſpine on its tail inflicts a dangerous wound.

RAPENSIS. Back with a ſingle fin; the tail is ſhort, pinnate at the end; the body is ſmooth and unarmed; and the ſnout is a little obtuſe. It inhabits near the Cape of Good Hope, is ſhaped ſomething like the torpedo, except that it has a fin on the back. The body is ſmall and orbicular; above it is convex, beneath flat.

RAJABARRY, in *Geography*, a town of Bengal; 10 miles S. of Dacca. N. lat. 23° 24′. E. long. 90° 36′.

RAJACOTTY, a town of Thibet; 60 miles N.N.W. of Sirinagur.

RAJAGUNGE, a town of Aſſam; 16 miles S. of Gentiah.

RAJAGUR, a town of Hindooſtan, in Bahar; 35 miles W.S.W. of Gayah.—Alſo, a town of Hindooſtan, in Guzerat; 10 miles N.E. of Champaneer.

RAJAHUN, a town of Hindooſtan, in the circar of Cicacole; 12 miles W. of Cicacole.

RAJAKERA, a town of Hindooſtan, in the province of Agra.

RAJAMUNDRY, a circar of Hindooſtan, bounded on the N. by the circar of Cicacole and Golconda, on the E. by the bay of Bengal, on the S. by the circar of Ellore, and on the W. by Golconda. It is croſſed by the Bain Gonga from N. to S.—Alſo, the capital of the above-mentioned circar, ſituated between Ellore and Cicacole, on the Godavery. Its principal riches conſiſt of foreſts of teak-wood. N. lat. 17°. E. long. 81° 57′.

RAJANAGUR, a town of Bengal; 25 miles S. of Dacca.—Alſo, a town of Hindooſtan, in the circar of Rajamundry; 7 miles N.E. of Rajamundry.

RAIANIA, in *Botany*, ſo called in honour of our immortal naturaliſt, the Rev. John Ray, the moſt accurate in obſervation, the moſt philoſophical in contemplation, and the moſt faithful in deſcription, amongſt all the botaniſts of his own, or perhaps any other, time. His life will be given hereafter, in its proper place. Plumier, who eſtabliſhed this genus, finding the name *Raia* preoccupied by zoologiſts, contrived to call the plant *Jan-Raia;* which Linnæus turned about into *Rajania*, ſtill retaining the idea of the Chriſtian name, combined with the other. But ſuch an idea is ludicrous to Engliſh ears, and is happily not, in general, perceived. We preſume to alter the orthography in one letter, writing the word as it is always pronounced, and deducing it regularly from the Latin *Raius*, by which name the perſon commemorated is known all over the literary world.—Plum. Gen. 33. t. 29. Linn. Gen. 525. Schreb. 692. Willd. Sp. Pl. v. 4. 788. Mart. Mill. Dict. v. 4. Ait. Hort. Kew. v. 5. 391. Juſſ. 43. Lamarck Illuſtr. t. 818. Gærtn. t. 14.—Claſs and order, *Dioecia Hexandria.* Nat. Ord. *Sarmentaceæ*, Linn. *Aſparagi*, Juſſ.

Gen. Ch. Male, *Cal.* Perianth bell-ſhaped, in ſix deep, oblong, pointed ſegments, moſt ſpreading in their upper part. *Cor.* none. *Stam.* Filaments ſix, briſtle-ſhaped, ſhorter than the calyx; anthers ſimple.

Female, *Cal.* Perianth ſuperior, of one leaf, bell-ſhaped, in ſix deep ſegments, permanent, withering. *Cor.* none. *Piſt.* Germen inferior, compreſſed, with a prominent border at one ſide, three-celled; ſtyles three, the length of the calyx; ſtigmas obtuſe. *Peric.* Capſule membranous, of three cells, without valves, crowned by the calyx; two of the cells barren, almoſt obliterated, without wings; the third fertile, compreſſed, extended into a very large, half-ovate, membranous wing. *Seed* ſolitary, nearly elliptical, compreſſed.

Eſſ. Ch. Male, Calyx in ſix deep ſegments. Corolla none. Female, Calyx in ſix deep ſegments. Corolla none. Styles three. Capſule membranous, with one wing. Seed ſolitary.

Section 1. *Leaves ſimple.*

1. R. *haſtata.* Halberd-leaved Raiania. Linn. Sp. Pl. 1461. (Jan-Raia ſcandens, folio oblongo, anguſto et auriculato; Plum. Gen. 33. Bryonia fructu alato, foliis auriculatis; Plum. Amer. 84. t. 98.)—Leaves haſtate; ſomewhat heart-ſhaped at the baſe.—Gathered by Plumier, about Port-de-paix in the iſland of Hiſpaniola. *Root* perennial, ſometimes large and ovate; ſometimes four or five inches long, and two thick, round at each end, like a ſauſage. Its ſubſtance reſembles that of a radiſh, without any internal fibres; the bark thin, aſh-coloured, a little rugged and warty; the fleſh very white, taſting like a bean. This root throws up only one very ſlender, long, climbing, ſmooth, knotty *ſtem*, thickeſt at the baſe, where it is accompanied by ſeveral fibrous radicles. We preſume it to be annual. *Leaves* ſcattered, ſpreading, on ſhort ſtalks, ſmooth and membranous, about three inches long; heart-ſhaped, dilated, abrupt, and ſeven-ribbed at the baſe; then ſuddenly elongated into a nearly linear, entire, central, three-ribbed lobe, bluntiſh, with a ſmall point; the under ſide paler, and rather downy. *Stipulas* in pairs, awl-ſhaped, minute. *Flowers* ſmall, whitiſh, in ſimple, axillary, drooping cluſters. *Bracteas* minute, ovate, acute, ſolitary at the baſe of each partial ſtalk. *Fruit*, as Plumier ſays, like half that of a maple-tree, of a ſilvery hue when young, but afterwards tawny.

2. R. *cordata.* Heart-leaved Raiania. Linn. Sp. Pl. 1461. Ait. n. 1. (Jan-Raia ſcandens, foliis tamni; Plum. Ic. 148. t. 155. f. 1.)—Leaves ovate; ſomewhat heart-ſhaped at the baſe; ſeven-ribbed.—Native of the Weſt Indies, from whence it was ſent to Kew garden, in 1786, by Mr. Alexander Anderſon. It flowers in the ſtove in July, and we cannot but wiſh ſome accurate botaniſt would publiſh a good figure and deſcription of the plant, out of reſpect to its name. Plumier repreſents the habit of the *root, ſtem*, &c. much like the foregoing; but the *leaves* are regularly ovate, pointed, more or leſs heart-ſhaped at their baſe, and furniſhed with ſeven ribs continued from that part to the point. Theſe ribs are connected by numerous tranſverſe veins. *Inflorescence, flowers*, and *fruit*, much as in *R. haſtata*, but having ſeen no ſpecimen, we can ſay nothing reſpecting the *ſtipulas* or *bracteas*, none of which are noticed in the plate.

3. R. *ovata.* Ovate-leaved Raiania. Swartz Ind. Occ. v. 1. 638. Mart. Mill. Dict. n. 4.—"Leaves ovate, pointed, three-ribbed."—Native of buſhy places, on the hills of Hiſpaniola. *Stem* ſhrubby, twining, thread-ſhaped,

ſubdivided; with ſlender, ſmooth, leafy *branches*. *Leaves* rather diſtant, ſtalked, ſmooth on both ſides, pointed, entire, three-ribbed, veiny; ovate at the baſe. *Footſtalks* round, ſmooth, often as long as the leaves. *Cluſters* axillary, numerous, longer than the leaves, ſlender, many-flowered, rather zigzag. *Flowers* dioecious; the males in compound *cluſters*; females in ſimple ones, all ſtalked, and turned toward one ſide. *Corolla* very minute, yellowiſh-green in the male, reddiſh in the female bloſſoms. *Capſule* compreſſed, with an ovate, falcate, membranous wing. *Swartz.*

4. R. *anguſtifolia*. Narrow-leaved Raiania. Swartz Ind. Occ. v. 1. 639. Mart. n. 3.—" Leaves linear-lanceolate; rounded at the baſe, three-ribbed.—Native of extremely dry buſhy places, in the weſt part of Hiſpaniola, where it climbs upon high trees, flowering in May. *Root* annual. *Stem* thread-ſhaped, round, twining, flaccid, ſubdivided, ſmooth. *Leaves* nearly a ſpan long, entire, three-ribbed, veiny, ſmooth. *Footſtalks* ſmooth, red, twiſted according to the direction of the ſtem. *Cluſters* axillary, in pairs, the length of the leaves, pendulous, ſlender, many-flowered; the *flowers* very minute, nearly ſeſſile, red, polygamous, five or ſix on each of the alternate partial ſtalks, all leaning one way. *Bracteas* very minute, acute, blood-red, under the flowers. On ſome plants the latter are entirely male, with ſix nearly ſeſſile *anthers*; on others all hermaphrodite, with ſix perfect *ſtamens*, a triangular oblique *germen*, no *ſtyle*, but three minute *ſtigmas*. *Capſule* as in the reſt of the ſpecies. *Swartz.*

5. R. *quinquefolia*. Five-leaved Cluſtered Raiania. Linn. Sp. Pl. 1462. (Jan-Raia ſcandens quinquefolia; Plum. Ic. 149. t. 155. f. 2.)—Leaves five together at each joint, elliptic-oblong. Cluſters lateral, between the joints.—Native of the Weſt Indies, but hitherto obſerved by Plumier only. This ſeems to have the habit of all the foregoing, except that the *ſtem* has tumid joints, at each of which ſtand five elliptic-oblong, obtuſe, entire, three-ribbed *leaves*, about three inches long, on ſhort *footſtalks*. The *cluſters* are repreſented not axillary, as in the others, but lateral and alternate, from the ſpaces of the *ſtem* between the joints.

Section 2. *Leaves compound.*

6. R. *quinata*. Five-leaved Umbellate Raiania. Thunb. Jap. 148. Mart. n. 6.—Leaves five on a common ſtalk, emarginate. Umbels axillary.—Obſerved by Thunberg about Nagaſaki and in Koſido, in Japan, flowering in April and May. The Japaneſe call this plant *Fagi Kadſura*, and *Akebi*. *Stem* twining, round, ſmooth, aſh-coloured, branched. *Leaves* ſeveral together, axillary, ſtalked, ſmooth, of five ſeparately ſtalked, umbellate, ovate, entire *leaflets*, each from three-quarters of an inch to an inch and a half long, emarginate with a point. *Common footſtalks* thread-ſhaped, ſmooth, two inches or more in length; *partial* half as long as the finger nail. *Flowers* in umbels, from the ſame buds as the leaves, on ſlender ſtalks as long as the footſtalks; partial ſtalks capillary, the length of the nail. This ſpecies differs from the laſt in having compound *leaves*, and umbellate *flowers*. *Thunberg.*

7. R. *hexaphylla*. Six-leaved Cluſtered Raiania. Thunb. Jap. 149. Mart. n. 7.—Leaves ſix on a common ſtalk, oblong, acute. Flowers racemoſe.—Native of the country of Fakonia, in Japan, among buſhes, flowering in April. Its vernacular names are *Akebi*, *Mbe Kadſura*, and *Tſu So*. The *ſtem* is round, ſtriated, ſmooth, climbing. *Leaves* alternate, ſmooth, ſix on a ſtalk, umbellate, on ſlender partial ſtalks, oblong, acute, entire, veiny, two inches long; pale at the back. *Common footſtalks* round, bent, three or four inches long, ſwelling at each extremity. *Flowers* in axillary cluſters, ſnow-white. Differs from *R. quinata* in having moſtly ſix leaflets on a ſtalk, which are acute, reticulated with veins at the back, and larger than in that ſpecies. The *flowers* moreover grow in cluſters, not umbels.

RAJAPILLA, in *Geography*, a town of Hindooſtan, in Myſore; 16 miles N.N.E. of Anantpour.

RAJAPORUM, a town of Hindooſtan, in Barramaul; 35 miles S. of Darempoury.

RAJAPOUR, a town of Hindooſtan, in the circar of Hiſſar; 48 miles W. of Hiſſar.—Alſo, a town of Hindooſtan, in the circar of Gohud; 10 miles W. of Janſi.—Alſo, a ſea-port of Hindooſtan, in Concan, where the Engliſh and French had formerly factories. The place has a good harbour, but it is not now frequented; 6 miles N. of Geriah.—Alſo, a town of Bengal; 16 miles S. of Silhet.—Alſo, a town of Bengal; 50 miles N.W. of Burdwan.—Alſo, a town of Hindooſtan, in Bahar; 27 miles W. of Arrah.

RAJARAJESWARI, in *Mythology*, a name of the Hindoo goddeſs Parvati. It means, in Sanſcrit, conſort of the lord of the king of kings. In the maſculine it is Rajrajeſwara, and is then a name of her lord Siva. See that article.

RAJARSHI, is one deſcription of ſaint or ſage, of whom four ſorts are comprehended in the more general term of Riſhi. Rajarſhi means a royal ſage, and is the loweſt of the four; the Devarſhi, or divine ſage, being, as may be ſuppoſed, where Brahmans are the givers of dignity, the firſt. See more hereon under MAHARSHI and RISHI.

RAJASEE, in *Geography*, a town of Hindooſtan, in the circar of Gohud; 10 miles S.W. of Datteah.

RAJASERAI, a town of Hindooſtan, in the circar of Sirhind; 17 miles E.S.E. of Sirhind.

RAIBACH, a town of Bavaria, in the territory of Rothenburg; 7 miles S. of Rothenburg.

RAIBAUG, a town and circar of Hindooſtan, in Viſiapour; 23 miles S. of Maſritch. N. lat. 16° 35′. E. long. 74° 52′.

RAIBOLINI, FRANCESCO, in *Biography*. See FRANCIA, IL.

RAJBULHAUT, in *Geography*, a town of Bengal; 30 miles S. of Burdwan. N. lat. 22° 45′. E. long. 88° 7′.

RAICAN, a town of Perſia, in the province of Irak; 15 miles N.E. of Hamadan.

RAICZ, a town of Hungary; 6 miles S.S.E. of Boleſko.

RAIDURGAM, a town of Hindooſtan, in the Carnatic; 15 miles W. of Tricolore.

RAIDY, a town of Bengal; 25 miles S.W. of Doeſa.

RAIE, a town of Aſiatic Turkey, in the province of Diarbekir; 118 miles S.W. of Diarbekir.

RAJEEATA, a town of Hindooſtan, in Guzerat; 78 miles W. of Gogo.

RAJEE-BEDUROO, a town of Hindooſtan, in Lahore; 27 miles E. of Jummoo.

RAJEGAUT, a town of Bengal; 24 miles S.S.E. of Iſlamabad.

RAJEGUR, a town of Bengal; 26 miles S. of Burdwan.—Alſo, a town of Hindooſtan, in the circar of Gangpour; 23 miles S.W. of Gangpour.—Alſo, a town of Hindooſtan in Mewat; 20 miles E. of Cotputly.—Alſo, a town of Hindooſtan, in the circar of Gohud; 27 miles S.W. of Narwa.—Alſo, a town of Hindooſtan, in the circar of Burdelcund; 22 miles S.E. of Chatterpour.—Alſo,

a town of Hindooſtan; 20 miles E.S.E. of Allahabad. N. lat. 24° 49'. E. long. 80° 17'.

RAJEGUSDAR, a town of Hindooſtan, in Lahore; 35 miles E.N.E. of Behnbur.

RAJEHAUT, a town of Bengal; 16 miles N.W. of Biſſunpour. N. lat. 23° 13'. E. long. 86° 40'.

RAJEMAL, a circar of Bengal, bounded on the N. by Purneah, on the E. by Purneah, Mauldah, Dinagepour, and Raujeſhy, on the S. by Sultanabad, and on the W. by Hindooa and Boglipour.—Alſo, the capital of the above circar, lying on the W. bank of the Ganges, nearly in the parallel of Mauldah, and about 20 miles from it; at the foot of the chain of hills which projects into the river at Sielygully and Terriagully. It is in a ruinous ſtate, although not above 1½ century ago the reſidence of the viceroy; and has hardly the population of an ordinary market-town at preſent. Its ſituation is romantic, but not pleaſant; for in Hindooſtan, the hills and eminences being always covered with wood, that beautiful ſwelling of the ground, which is ſo juſtly admired in European landſcapes, is loſt; and the fancy is preſented at beſt with nothing beyond a wild ſcene; which can only be reliſhed by being contraſted with ſoft and beautiful ones. It is more than thirty miles above the head of the delta of the Ganges, and therefore M. d'Anville placed it erroneouſly by aſſigning its ſituation at this place. N. lat. 25° 2'. E. long. 87° 56'.

RAJEMATCHY, a town of Hindooſtan, in Viſiapour; 37 miles N.W. of Poonah.

RAJEMUNGALUM, a town of Hindooſtan; 16 miles S. of Tinevelly.

RAJETEA, one of the South-ſea iſlands, named alſo *Ulietea;* which ſee.

RAJETPOUR, a town of Bengal; 15 miles S. of Rogonatpour.

RAJEWICE, a town of Lithuania; 42 miles S.S.E. of Brzeſc.

RAIGIRI, a town of Hindooſtan, in Golconda; 10 miles S.E. of Beder.

RAIGUR, a town of Hindooſtan, in the circar of Sumbulpour; 15 miles N. of Sumbulpour.

RAJIK, a town of Syria, on the Euphrates; 18 miles S. of Bembig.

RAIL, in *Architecture*, is applied variouſly; particularly to thoſe pieces of timber which lie horizontally between the pannels of wainſcot, and over and under them.

The word is alſo applied to thoſe pieces of timber which lie over and under balluſters in balconies, ſtaircaſes, &c.

Alſo, to the pieces of timber that lie horizontally from poſt to poſt in fences, with pales or without. See FENCE.

RAILS, in a *Ship*, are long narrow pieces of fir, or oak, with mouldings of regular members of architecture ſtruck on them, which are faſtened, or ſometimes wrought from the ſolid plank, as ornaments to the ſhip's ſides. The former are now diſcontinued in the navy, as they were found to rot the ſides very much; the latter, wrought from the ſolid plank, are uſed in merchant ſhips. The rails of the head and ſtern are pieces of oak timber handſomely wrought with mouldings. The lower rail along the ſide is named the *waiſt-rail*, and the next above it the *ſheer-rail*, which are generally placed parallel to the top timber line, the ſheer-rail with the top of the ſide amidſhips, and the waiſt-rail about twenty inches below it; the rails next above and parallel to the ſheer-rail are called *drift-rails*, and the rails above the plank-ſheer, if any, the *fife-rails*. The rails of the head are diſtinguiſhed by the *upper* or *main-rail*, the *middle* and the *lower-rail;* and the rails of the ſtern take their names from the parts to which they are fixed, as the *tuck-rail, lower counter-rail, upper counter-rail, foot ſpace-rail, breaſt-rail, taffarel-rail*, and *taffarel fife-rail*. (See *Plate* I. *Ship-building*.) To theſe may be added the thwartſhip pieces of the framing of the great cabin bulk-heads.

RAILS of the *head* are certain curved pieces of timber, extending from the bows on each ſide to the continuation of the ſhip's ſtem, to ſupport the knee of the head, and the ornamental figure fixed upon it.

RAIL, or *Water-Rail*, in *Ornithology*, the name of the *rallus aquaticus* of authors, which is a bird of a long ſlender body, with ſhort concave wings. The bill is ſlender, ſlightly incurvated, and one inch three quarters long: the upper mandible black, edged with red, the lower orange-coloured; the irides red; the head, hind-part of the neck, the back and covert of the wings and tail are black, edged with an olive-brown; the baſe of the wing is white; the quill-feathers and ſecondaries duſky; the throat, breaſt, and upper part of the belly, are aſh-coloured; the ſides under the wings, as far as the rump, finely varied with black and white bars; the tail is very ſhort, conſiſting of twelve black feathers; the ends of the two middle tipt with ruſt colour; the feathers immediately beneath the tail white; the legs are placed far behind, and are of a duſky fleſh colour; the toes very long, and divided to their origin: though the feet are not webbed, it takes the water, will ſwim on it with much eaſe, but is often obſerved to run along the ſurface. It delights leſs in flying than in running, which it does very ſwiftly along the edges of brooks covered with ruſhes. When it runs, it every now and then flirts up its tail, and in flying hangs down its legs. Pennant.

This bird, ſays Mr. Pennant, is properly *ſui generis*, agreeing with no other, but forming a ſeparate tribe; though M. Briſſon and Linnæus place it with the land-rail, and Mr. Ray with the water-hens. It is a well-taſted bird.

RAIL, *Land*, the *rallus crex* of Linnæus, is a migrating bird, with a ſhort, ſtrong, thick bill; always found among corn, graſs, broom, or furze. It leaves this kingdom before winter. They have long legs, and a ſingular note, reſembling the word *crex*, often repeated. The feathers on the crown of the head, hind part of the neck, and the back, are black edged with bay colour; the coverts of the wings of the ſame colour, but not ſpotted; the tail is ſhort and of a deep bay, the belly white, and the legs aſh-coloured. They are in greateſt plenty in Angleſea, where they appear about the 20th of April, ſuppoſed to paſs over from Ireland, where they abound. They are found in moſt of the Hebrides, and the Orkneys. Pennant.

RAILING, in *Rural Economy*, a ſort of fence conſtructed with poſts and rails. It is often made uſe of in protecting young hedge fences, from the cropping of cattle or other animals. Any ſort of coarſe timber does very well for this laſt purpoſe, ſuch as outſide planks, and the boughs or loppings of timber plantations. See FENCE.

RAILLERY, as Dr. Johnſon hath defined it, denotes ſlight ſatire, or ſatirical merriment; and a beautiful writer compares it to a light which dazzles, and which does not burn. It is ſometimes, what it always ought to be, innocent and pleaſant, but it is too frequently offenſive. Raillery is of various kinds; ſerious, ſevere, and good-humoured; there is a kind which perplexes, a kind which offends, and a kind which pleaſes.

It has been juſtly obſerved, that in order to rally well, kindneſs ſhould prevail in every thing that is ſaid, as the character of a friend ſhould be maintained to warrant freedom with a perſon who is addreſſed, eſpecially in this way. Alluſions to paſt follies, and hints that tend to revive what a perſon wiſhes for ever to forget, ſhould never be introduced

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as ſubjects of raillery. It is below the character of perſons of humanity and good breeding, to indulge mirth, while any one in the company is ſuffering, as the effect of that mirth, pain and mortification.

RAILWAY, *Tram* or *Dram-road*, or *Waggon-way*, in *Rural Economy*, a track conſtructed of iron, ſtone, timber, or other material, upon the level ſurface of an inclined plane, or other ſituation, for the purpoſe of diminiſhing friction, and thus ſerving for the eaſy conveyance of heavy loads of any kind of articles. See *Plate* IV. *Canals*, *figs.* 31 to 35. See alſo CANAL.

It has been remarked, that railways have hitherto been confined, almoſt excluſively, to coal-works, and other mines; and that inventions, whoſe only recommendations are ſimplicity and uſefulneſs, are often ſuffered to lie long in a ſtate of public neglect; while others, perhaps, of no real utility, but of more impoſing aſpect, and being pertinaciouſly blazoned forth by intereſted or blinded partiſans, are readily adopted; and baſk, for a while, in the ſunſhine of public favour. The time has, however, at length arrived, when carriages moving on level ſurfaces, or on gently inclining planes, with little friction, and *without* obſtructions, are faſt ſpreading over the face of the country. It has been obſerved that there may be many lime-works, as well as other ſorts, from which railways may be laid, in different directions, with great benefit to their proprietors and the ſurrounding neighbourhoods in general.

With the view of diminiſhing horſe labour, it has been ſuggeſted by Dr. Anderſon, in his Recreations in Agriculture, that where internal canals cannot be eſtabliſhed, this may be effected, and intercourſe facilitated, by means of railways, which have not yet been introduced into general practice. It is further ſtated, that they were firſt ſolely employed for tranſporting coals to a moderate diſtance from the pits, to the places where they could be ſhipped, being univerſally made of wood. And long, ſays he, had they been applied to this uſe, without any idea having been entertained that they could be employed for more general purpoſes. By degrees they were, however, carried to a farther extent; the ſcarcity of wood, and the expence of their repairs, ſuggeſted the idea of employing iron for the purpoſe of improving theſe roads. At the firſt, flat rods of bar-iron were nailed upon the original wooden rails, or as they were technically called, *ſleepers;* and this, though an expenſive proceſs, was found to be a great improvement. But the wood on which theſe reſted being liable to rot and give way, ſome imperfect attempts were made to make them of caſt iron, but theſe were found to be liable to many objections, until the buſineſs was taken in hand by Mr. Outram, engineer, at Butterly Hall, Derbyſhire, who contrived at the ſame time, ſo far to diminiſh the expence, and improve the ſtrength of the road, as to bring them to a degree of perfection, that no one who has not ſeen them can eaſily conceive could have been done. And it is added, that this having been carried into execution in a few caſes, and found to anſwer, has been improved upon and ſimplified by practice, till it is now brought to ſuch a ſtate of perfection as to have given proofs, that it admits of being carried much beyond the limits of what was for many years conceived to be poſſible, and to afford demonſtrative evidence, that it may be in future employed to a wider extent ſtill, to which no limits can be at preſent aſſigned or foreſeen.

There are a great number of railways in Derbyſhire, Shropſhire, Lancaſhire, and many other parts of the country.

In the firſt of the above counties, there are railways of very different lengths; one of five miles in length, leading from the town of Derby to the collieries in the vicinity; another, from the lime-ſtone rocks on the Cranford canal, called the Crick railway, which is about one mile and a half in length; a third from the Beggarlee colliery to the ſame canal, denominated Barber and Walker's railway, of ſimilar length; a fourth from the lime-works in the neighbourhood of Boſton, to the canal near Whaley bridge, termed the Peak-foreſt railway, which is about ſix miles in length; a fifth called the Marple railway, of about one mile and a half long, on the Peak-foreſt canal; ſixthly, railways over Bliſworth-hill near Nottingham, on the Grand Junction canal, which are three miles and a half in length, and conſtructed in a double manner; a ſeventh, which has the name of the Aſhby de la Zouch railway, has four miles of double and eight miles of ſingle rails. Some of theſe railways are formed in a very complete manner, eſpecially thoſe which have been made ſince the various improvements of them were introduced. They have been of prodigious utility and advantage to the county, both in regard to its agricultural improvements and its manufacturing intereſts and concerns.

Theſe ſorts of railway roads have likewiſe been introduced into many parts of the county of Salop, with vaſt benefit and ſucceſs to the different intereſts of the diſtrict. They have here had a new application, in being employed for the purpoſe of conveying heavy weights from different levels on canals.

Speaking of the great utility of canals in the carriage of various articles in this county, it is obſerved by Mr. Telford, an able engineer, that another mode of conveyance has frequently been adopted to a conſiderable extent; which is that of forming roads by means of iron rails laid along them, upon which materials are carried in waggons, which contain from ſix to thirty hundred weight; experience, he thinks, has now convinced us, that in countries the ſurfaces of which are rugged, or where it is difficult to obtain water for lockage, where the weight of the articles of the produce is great in compariſon with their bulk, and where they are moſtly to be conveyed from a higher to a lower level, that in thoſe caſes, iron railways are in general preferable to canal navigation.

It is ſuppoſed, that on a railway well conſtructed, and laid with a declivity of fifty-five feet in a mile, one horſe will readily take down waggons containing from twelve to fifteen tons, and bring back the ſame waggons with four tons in them. This declivity, therefore, ſuits well, when the imports are only one-fourth part of what is to be exported. If the empty waggons only are to be brought back, the declivity may be made greater; or an additional horſe applied on the returning journey will balance the increaſe of declivity. If the length of the railway were to be conſidered, it may, it is ſuppoſed, without much inconvenience, be varied from being level to a declivity of one inch in a yard, and by dividing the whole diſtance into ſeparate ſtages, and providing the number of horſes ſuitable for each portion of railway, according to the diſtance and degree of declivity, the whole operation may be carried on with regularity and diſpatch.

It is upon the whole believed, that this uſeful contrivance may be varied ſo as to ſuit the ſurface of many difficult countries, at a comparatively moderate expence. It may be conſtructed in a much more expeditious manner than navigable canals; it may be introduced into many diſtricts where canals are wholly inapplicable; and in caſe of any change in the working of mines, pits, or manufactories, the rails may be taken up and laid down again in new ſituations, at no very great expence or trouble.

It is alſo further noticed, that ſome parts of this and the neighbouring counties, in which canals had once been intended

intended to be formed, have ſince been looked over and examined with the view of having iron railways inſtead of navigable cuts; and in many caſes this may be the moſt adviſable and proper, particularly in all ſituations where difficulties ariſe in the conſtructing of navigable canals, or other ſorts of works for water carriage.

The county of Lancaſter, too, has a great many of theſe iron railways for the convenience, accommodation, and advantage of the different collieries, manufactories, and other works, where heavy loads are to be tranſported. The coal work near St. Helans, in the vicinity of Liverpool, has a double railway ſome miles in length; and at the iron-works of lord Belcarras, near Wigan, as well as his cannel coal pits near the ſame place, there are double railways of very conſiderable length. To the ſouth of the town of Preſton, at a ſmall diſtance from Bamber bridge, there is likewiſe one communicating with the Lancaſter and Kendal canal, which is alſo double and of great length; ſerving to convey the coals from the ſouthern parts of the county to that canal, in order to their diſtribution in the northern parts, and the adjoining diſtricts.

On the eaſt ſide of the ſame county they alſo prevail in many places, and are found of the greateſt uſe, being the means of diſpatching much buſineſs in a ready manner and without much expence of labour.

The utility of theſe railways has been found to be extremely great in other coal-works and canals, where they are at preſent very extenſively employed; and it has been ſuggeſted, that they may be applicable in other caſes, as for ſhortening the team labour of a farm ſo as to bring it within one day's journey, where more than one were formerly neceſſary, by which a great ſaving in labour and expence may be made. Alſo, in rendering the buſineſs of lime works more eaſy and expeditious in different inſtances. It has likewiſe been hinted by Mr. Beatſon, in the firſt volume of Communications to the Board of Agriculture, that they might be had recourſe to on roads where there are unavoidable riſes or falls, for taking up or letting down heavy loaded waggons or other carriages. It is obſerved, that near Colebrook Dale there is one at a ſmall diſtance from the iron bridge, upon which loaded boats are drawn up to a canal, two hundred and twenty feet above the level of the river Severn, and let down in a ſimilar manner into it, by which means twenty-two locks are ſaved, and the work executed in an expeditious manner. It is ſuppoſed, that this is the greateſt inclined plane in Europe, or perhaps in the world, for though they are much uſed in China in the place of locks, he has never heard of any of them being equal in height to this. The rails are beſt made of iron. It is added, that they have been found uſeful in improving ſoft, moſſy, boggy lands, on which horſes cannot travel; a rail road of this ſort having been formed through a peat moſs near Manchester by Mr. Wakefield, while it was under improvement, at the expence only of about three hundred pounds a mile, on which a ſingle horſe was capable of drawing with the greateſt facility ſeven waggons at once, each being loaded with about ſeven hundred weight of marle, bearing in the whole forty-nine hundred weight, and with the weight of the waggons upwards of three tons. This was performed, it is obſerved, over a place where a few months before a dog could hardly venture without the danger of being *ſwamped*. On the Ketley and other canals in the county of Shropſhire, vaſt advantages have been derived from laying railways upon inclined planes, and letting down and drawing up the different articles by means of machinery, as may be ſeen in the very able Agricultural Report of that diſtrict, where excellent repreſentations of them are given.

Beſides theſe different caſes of railways, another has been ſuggeſted by the writer of the Annals of Agriculture, which is that of having them laid from the ſtack-yards to the thraſhing machines, by which the grain may be conveyed to them at any time with eaſe and convenience, as well as any particular ſtack that may be wanted.

It is further ſtated by the ingenious Dr. Anderſon, that the beſt idea he can give of the benefit that may reſult to the community from the uſe of this kind of railways, will be from ſtating ſome facts reſpecting them, which were lately communicated to the Society of Arts by Mr. Wilkes, of Meaſham, near Loughborough, in Leiceſterſhire; a ſpirited and judicious agriculturiſt. He had a railway of this ſort made, which was about five miles in extent, leading from a coal-mine to a market. He found it ſo fully to anſwer his expectations after it was finiſhed, that he communicated to the above ſociety an account of ſome trials he had made of it, requeſting that ſuch of the members of that reſpectable inſtitution as were deſirous of information on that head, would do him the honour to witneſs ſome experiments that he wiſhed to make upon it, for the information of the public. A committee of the members was accordingly deputed for that purpoſe, and before them he ſhewed that a moderate ſized horſe, of about twenty pounds value, could draw upon it with eaſe down hill (the deſcent being one foot in a hundred) thirty-two tons, and without much difficulty forty-three, and ſeven tons up hill, independent of the carriages. The doctor concludes from theſe facts, that upon a perfect level a horſe could draw with eaſe from ten to twenty tons. It is obſerved, that Mr. Wilkes's railway, on which the experiments were made, was, from local circumſtances, laid upon wooden ſleepers, and is not ſo perfect as thoſe done upon ſtone. But it is added, that twenty tons are the load which ſuch a horſe could draw with eaſe, travelling at the uſual waggon rate, in boats upon a canal; ſo that the number of horſes required in this way will not be much, if at all, greater than on a canal. Certain advantages attach to this mode of conveyance, which do not ſo well apply to a canal, and *vice verſâ*; but it is not his intention to draw a parallel between theſe two modes of conveyance. Nobody can entertain any doubt, he thinks, about the utility of canals where they are eaſily practicable. He only wiſhes to point out this as an eligible mode of conveyance where canals cannot be conveniently adopted.

It is further remarked, that it was cuſtomary at the firſt, to put the whole load to be drawn by one horſe upon railways into one waggon; but now, when the load is ſo much augmented, it has been found eligible to divide it into many parts, ſo that no one waggon ſhall carry more than one or two tons; by this method the weight is ſo divided, that the preſſure is never ſo great upon one point as to be in danger of too much cruſhing the road; the carriages can be made much more limber and light in all their parts, and they are much more eaſily moved, and more manageable in all reſpects than they otherwiſe would have been. And another advantage of this arrangement, which deſerves to be particularly adverted to, is, that it admits of ſhifting the carriages ſo as to leave a load, as it were, in parcels at different places where they may be required, without trouble or expence. This, when it comes to be fully underſtood and carried into practice, will, he thinks, be a convenience of ineſtimable value, a thing that has been always wanted, and never yet has been found though it has been diligently ſought for. The able writer has here endeavoured to illuſtrate its importance and utility in tranſporting goods from the wet docks now forming on the Iſle of Dogs to London, and in carrying roads to different diſtant parts of the country; in which caſes,

caſes, and in all where there is much buſineſs to be done, they would require to be double, one for going, and the other for coming upon, to prevent interruption and interference.

And he afterwards offers a few remarks, tending to ſhew the practicability of the meaſure, and to guard againſt ſetting out upon a bad plan, which might, he ſuppoſes, in time to come, fruſtrate the good that might have reſulted from the undertaking; merely premiſing, that he propoſes theſe railways ſolely for the purpoſe of conveying weighty loads, leaving the roads, as at preſent, open for coaches and light carriages.

Alſo with a view to diſcover how far it may be practicable to introduce theſe iron railways into general uſe, he has made ſome inquiries reſpecting the expence of making them; and although this muſt vary according to the abundance and goodneſs of materials, and other circumſtances, the following ſtatement may ſerve to give ſome general notions on that head. In the moſt eligible ſituation, where materials are abundant and good, and circumſtances favourable, the loweſt expence at which a *ſingle* railway of this ſort can be made, will be about one thouſand pounds a mile. But as a ſingle railway muſt be liable to great inconveniencies, unleſs under very particular circumſtances, double railways ought to be conſidered as the only uſeful ſort. Theſe, for public purpoſes, according to the opinion of the inventor, ſhould be very ſubſtantially made. The metal uſed ſhould be of the ſtouteſt ſort, and of ſubſtance enough, not merely to carry the weights propoſed, but to be equal to bear almoſt any blow or ſhock that they may be likely to experience; and, thus made, what they will loſe by ruſt or wear, will be long ere it materially weakens them. Made after ſuch a manner, in favourable ſituations in the country, a double railway may, he thinks, coſt about two thouſand pounds a mile, but in the neighbourhood of London, where the charge of every thing is high, and where they ſhould be of the ſtrongeſt ſort, we ſhould ſuppoſe they might coſt nearly three thouſand pounds a mile. It is bad economy, he thinks, to ſave on articles of this ſort at the firſt; for the little expence thus laid out then will ſave much in repairs: how ſmall theſe repairs are, may be imagined from this circumſtance, that when a road is thus made, the undertaker does not ſcruple to ſupply all that are broken, free of charge, for the firſt three years. Say then that ſuch a road coſt three thouſand pounds a mile, this would bring a charge upon the turnpike of 150*l.* a-year; ſay 50*l.* more for annual repairs; this is, in all, 200*l. per annum.* Compare this with the expence of keeping the preſent roads in repair. It has been ſuggeſted to him, that there is annually laid out in repairs upon the road from Hyde Park Corner to Hounſlow, conſiderably above one thouſand pounds a mile; ſo that the difference of expence is, even at the beginning, very much in favour of railways: and were the money thus at firſt expended to be gradually paid off, the tolls might thus be lowered almoſt to nothing. And, he thinks, that a turnpike road cannot be made in almoſt any ſituation for leſs, as he is told, than 1000*l. per* mile; but where it is of conſiderable width, as near great towns, it will run from 1500*l.* to 2000*l. per* mile; and in annual repairs, including the purchaſe price of materials, carting them on the road, ſpreading, raking off, and carting away again, from 100*l.* to 1000*l.* a mile. Say 1500*l.* prime coſt, the intereſt is 75*l.* and 150*l.* for repairs, the annual charge of ſuch road will be 225*l.* This is an expence of 100*l.* a-year more than the other. But for the preſent, let us ſuppoſe that they will be equal, the extra charge for purchaſing ground for a new waggonway, &c. being equal to that ſurplus; let us now ſee what would be the difference of charge to the employers of theſe waggons in the two caſes. Suppoſing the road to be ſo much employed as that 100 waggons (or loaded carriages to the ſame amount) paſs each day, carrying ſix tons each, drawn by eight horſes; theſe, at one ſhilling each waggon for toll (or two-pence a ton), would produce 5*l.* a day, or 1825*l* a-year; which, at the rate of eight miles for each turnpike, would be 228*l. per* mile, the ſurplus being produced by road horſes and light carriages. The charge then to the employer, for this ſtage, muſt be 1825*l.* and the keep of 800 horſes, beſides ſervants, incidental charges, and owner's profits for the tranſporting of 600 tons of goods a day. Say that the ſame horſes travel two ſtages a day, the turnpike money would be doubled; that is, 3650*l. per annum;* the keep of 800 horſes, at 2*s.* each *per diem,* is 29,200*l.* Theſe ſums added make 32,850*l.*; owner's profit and incidental charges, ſay 10 *per cent.*, 3285*l.*; in all 36,135*l.*, or, on 219,000 tons (being 600 tons a day), about one-fourth *per* ton. And ſuppoſing the ſame quantity of goods carried on the railway, and the ſame turnpike money paid, and that each horſe drew only fifteen tons, this would require only, he thinks, forty horſes; the keep of which, at 2*s.* a day, would be 1460*l.*, add the toll, 1825*l.* is 3285*l. per annum.* Owner's profit, &c. upon this ſum 10 *per cent.* as above, 328*l.*; in all 3613*l.*, or about four-pence a ton, juſt one-tenth part of the charge in the other caſe. He thinks, that when the object comes to be conſidered in this point of view, few meaſures that can be propoſed will hold forth ſuch an important national improvement as this would be. Conſidered with regard to the conſumption of the produce of the earth (an object at preſent deſerving the fulleſt attention, as this improvement can be applied to almoſt every part of the country), it would, he ſuppoſes, reduce the number of heavy road horſes to one-eighth part of what they are at preſent, and of courſe augment the number of cattle or other conſumeable proviſions in a proportionate degree, ſo as greatly to lower the price of the neceſſaries of life. It would, in the next place, lower the price of the carriage of goods of all kinds to an amazing extent; and laſtly, as a conſequence of that, it would give ſuch encouragement to agriculture, as no other meaſure that can be contrived could ever effect, and that without coſting one ſhilling expence to any one individual, or to the ſtate. On the contrary, by inducing cheapneſs of proviſion, and affording ſuch efficacious encouragement to manufactures and to agriculture, it would produce a general proſperity, which, by augmenting the conſumption of taxable commodities, would augment the public revenue; while, at the ſame time, every individual would feel himſelf relieved from the preſſure of many taxes that prove diſtreſsful to him at preſent. After juſtly reprobating every ſort of gambling ſpeculations by monied men in undertakings of this nature, and ſhewing the numerous evils that attend them, he adviſes it, as highly neceſſary to prevent theſe railways from ever becoming private property, on any account, to keep them open and patent alike, to all who ſhall chooſe to employ them as a king's highway, under ſuch regulations as it ſhall be found neceſſary to ſubject them to by law. In ſhort, they ſhould, he thinks, be put upon the ſame footing, in all reſpects, as public roads are at preſent, only under the direction of a diſtinct ſet of commiſſioners, who ſhould have the ſuperintendance of every thing that concerns this ſpecies of roads only. Theſe commiſſioners ſhould be veſted with authority under an act of parliament, to erect turnpikes upon them, to levy certain ſtipulated tolls, and to mortgage the produce of theſe tolls for the purpoſe of raiſing money to be applied in the neceſſary purchaſes of land, and making the roads. In the act it

ſhould

ſhould be expreſsly ſtipulated, that the produce of theſe tolls ſhould be applied ſolely to keeping the road in repair, paying the intereſt of ſums borrowed, and clearing off the principal as faſt as the collections would admit; and when the whole money borrowed was thus paid off, the tolls ſhould be ſo lowered as only to produce money ſufficient to keep the roads in a ſtate of continually good repair. Thus would the expence of tranſporting goods be annually diminiſhing, and the proſperity of the country be thereby augmenting from day to day. He adds, that he is particularly earneſt in this buſineſs, as he has not been an unconcerned obſerver of the effects that have reſulted from the eſtabliſhment of turnpike roads in Scotland, which were begun within his recollection; and theſe effects have been ſuch as no man who had not ſeen it would have believed could ever have taken place. Diſtance may be ſaid to be thus diminiſhed from place to place; lands that were originally far beyond the influence of the town as a market for any thing elſe than live-ſtock, are thus brought, as it were, cloſe to its gates; and the value of the produce of many articles is thus to them augmented fourfold, while they are at the ſame time diminiſhed to the public. Not only is the value of produce raiſed, but the quantity alſo of that produce is augmented exceedingly by means of manures which become then acceſſible. Foſſile manures, ſuch as chalk, lime, and marle, which were formerly confined to a narrow ſpot, expand themſelves as if it were by a magical power, and by that expanſible influence diffuſe around fertility, riches, and plenty. Coals and other weighty articles that may be uſeful in arts or manufactures of various kinds, which never were, nor ever could have been of any value to the owners of them, ſo long as the expence of tranſportation exceeded a certain ſum, find a ready market to any extent as ſoon as the price falls below that rate, thus contributing not only towards the enriching of the owners, but to the furniſhing of employment to the various perſons who muſt be engaged in preparing or tranſporting them to market, and the univerſal accommodation of the whole. Around every market you may ſuppoſe a number of concentric circles drawn, within each of which certain articles become marketable which were not ſo before, and thus become the ſource of wealth and proſperity to many individuals. Diminiſh the expence of carriage but one farthing, and you widen the circle; you form, as it were, a new creation, not only of ſtones, and earth, and trees, and plants, but of men alſo, and what is more, of induſtry, of happineſs, and joy. It is added, that by making theſe roads the property of the public, and free to every perſon to bring his own waggons upon them wherever he pleaſed, farmers, when near them, would make bye roads of the ſame ſort leading into theſe from their reſpective premiſes; the inhabitants of villages and country diſtricts would join together, and at one common expence make roads of the ſame ſort leading to a greater diſtance inwards, as they now make bye roads for themſelves. Thus would all be accommodated; thoſe who had buſineſs enough to furniſh a ſufficient load for one horſe might go to market with it when they pleaſed: thoſe who had dealings on a ſmaller ſcale could have one, two, or more waggons of their own conjoined with thoſe of others to make up a load for one horſe: and thoſe of ſtill ſmaller means could have one waggon loaded with the joint articles belonging to two, three, or more. A ton weight might then be puſhed before a man to market for many miles, as a wheelbarrow is now. It is ſcarcely poſſible, he ſuppoſes, to contemplate an inſtitution from which would reſult a greater quantum of harmony, peace, and comfort, to perſons living in the country, than would naturally reſult from this arrangement. In fact, he knows, he ſays, no *one* meaſure, that would tend ſo effectually to lower the price of the neceſſaries of life, and reſtore abundance.

In what regards the method of forming and conſtructing theſe railways, it is obſerved by the ſame writer, that the following has been given by the inventor as the moſt improved plan: firſt, that the beſt line the country affords ſhould be traced out, having regard to the direction of the carriage of articles or trade to be expected; and if ſuch trade be both ways in nearly equal quantities, a line as nearly horizontally level as poſſible ſhould be choſen. If the trade is all in one direction, as is generally the caſe between mines and navigation, then the moſt deſirable line is one with a gentle gradual deſcent, ſuch as ſhall make it not greater labour for the horſes employed to draw the loaded waggons down, than the empty ones back; and this will be found to be the caſe on a railway deſcending about one foot vertical in one hundred feet horizontal. Or, if the railway and carriages are of the very beſt conſtruction, the deſcent vertical may be to the length horizontal as 1 to 50, where there is little or no upgate loading. In caſes between mines and navigations the deſcents will often be found greater than could be wiſhed. On a railway on the improved plan, where the deſcent is more than as 1 to 50, ſix or eight waggons, loaded with thirty or forty hundred weight each, will have ſuch a tendency to run downwards, as would require great labour of one horſe to check and regulate, unleſs that tendency was checked by ſledging ſome of the wheels. On ſuch, and ſteeper roads, iron ſlippers are applied, one or more to a gang of waggons, as occaſion may require. Each ſlipper being chained to the ſide of one of the waggons, and, being put under the wheel, forms a ſledge. Where the deſcent is very great, ſteep inclined planes, with machinery, may, it is obſerved, be adopted, ſo as to render the other parts of the railway eaſy. On ſuch inclined planes the deſcending loaded waggons being applied to raiſe the aſcending empty, or partly loaded ones, the neceſſity of ſledging the wheels is avoided; and the labour of the horſe greatly reduced and leſſened.

In order to obtain the deſired levels, gentle deſcents, or ſteep inclined planes, and to avoid ſharp turns, and circuitous tracks, it will often be found prudent to croſs valleys by bridges and embankments; to cut through ridges of land; and in very rugged countries ſhort tunnels may, he thinks, ſometimes be neceſſary. The line of railway being fixed, and the plans and ſections by which the ſame is to be executed and ſettled, the ground for the whole muſt be formed and effectually drained. The breadth of the bed for a ſingle railway, ſhould be, in general, four yards; and for a double one ſix yards, excluſive of the fences, ſide drains, and ramparts.

That the bed of road being ſo formed to the proper inclination, and the embankments and works thereof made firm, the ſurface muſt be covered with a bed of ſtones broken ſmall, or good gravel, ſix inches in thickneſs or depth. On this bed muſt be laid the ſleepers, or blocks to faſten the rails upon. Theſe ſhould be of ſtone in all places where it can be obtained in blocks of ſufficient ſize. They ſhould be not leſs than eight, nor more than twelve inches in thickneſs; and of ſuch breadth (circular, ſquare, or triangular,) as ſhall make them 150lbs. or 200lbs. weight each. Their ſhape is not material, ſo as they have a flat bottom to reſt upon, and a ſmall portion of their upper ſurface level, to form a firm bed for the end of the rails. In the centre of each block ſhould be drilled a hole, an inch and a half diameter, and ſix inches in depth, to receive an octagonal plug of dry oak, five inches in length; for it ſhould not reach the bottom of the hole; nor ſhould it be larger than ſo as to put in

eaſily, and without much driving; for if too tight fitted it might when wet burſt the ſtone. Theſe plugs are each to receive an iron ſpike or large nail, with a flat point and long head, adapted to fit the counter-ſunk notches in the ends of two rails, and thereby to faſten them down in the proper poſition, or ſituation in which they are to lie.

With regard to the rails, they ſhould be of the ſtouteſt caſt-iron, one yard in length each, formed with a flanch on the inner edge, about two inches and a half high at the ends, and three and a half in the centre; and ſhaped in the beſt manner to give ſtrength to the rails, and keep the wheels in their track. The ſoles of the rails, for general purpoſes, ſhould not, he thinks, be leſs than four inches broad; and the thickneſs proportioned to the work they are intended for. On railways for heavy burdens, great uſe, and long duration, the rails ſhould be very ſtout, weighing 40lbs., or, in ſome caſes, nearly half an hundred weight each. For railways of leſs conſequence, leſs weight of metal will do; but it will not be prudent to uſe them of leſs than 30lbs. weight each, in any ſituation expoſed to breakage above ground. But it is obſerved that in mines, and other works under ground, where very ſmall carriages only can be employed, very light rails are uſed, forming what are called train roads, on a ſyſtem introduced by Mr. Carr; and theſe kinds of light railways have been much uſed above ground in Shropſhire, and other counties where coals and other minerals are obtained.

It is added, that in fixing the blocks and rails great attention is required to make them firm. No earth or ſoft materials ſhould be uſed between the blocks and the bed of ſmall ſtones or gravel, on which the rails muſt all be fixed by an iron gage, to keep the ſides at a regular diſtance, or parallel to each other. The beſt width of road for general purpoſes is four feet two inches between the flanches of the rails; the wheels of the carriages running in tracks about four feet ſix inches aſunder. Rails of particular forms are neceſſary where roads branch out from or interſect each other; and where carriage roads croſs the railways; and, at turnings of the railways, great care is required to make them perfectly eaſy. The rails of the ſide forming the inner part of the curve ſhould be fixed a little lower than the other; and the rails ſhould be ſet a little under the gage, ſo as to bring the ſides nearer together than in the ſtraight parts: theſe deviations in level and width to be in proportion to the ſharpneſs of the curve. The blocks and rails being fixed and ſpiked faſt, nothing more remains to be done than to fill the horſe-path, or ſpace between the blocks, with good gravel, or other proper materials; a little of which muſt alſo be put on the outſide of the blocks to keep them in their proper places. This gravel ſhould always be kept below the ſurface of the rails on which the wheels are to run, to keep the tracks of the wheels free from dirt and obſtructions. The form of the rails muſt be ſuch as will free them from dirt if the gravelling is kept below their level.

And in the conſtructing of the carriages great attention to avoid friction is neceſſary, particularly in the formation of the wheels and axles, which muſt be adapted to the ſort of railways and kind of loading; but for which general directions cannot be given in a narrow compaſs. It is probable that this valuable invention may alſo be applicable to many other purpoſes in agriculture or manufactures, as it becomes more fully underſtood, and the facilities which it affords are better known. See CANAL.

RAIMALPOUR, in *Geography*, a town of Hindooſtan, in Viſiapour; 15 miles E. of Sattara.

RAIMONDI, IGNATIUS, in *Biography*. This worthy muſical profeſſor, whoſe performance, character, and private virtues, are well known to our country, after a reſidence in it of more than thirty years, is honourably mentioned by Ernſt Ludwig Gerber, the continuator of Walther's Muſical Lexicon, in 2 vols. 8vo., 1792. He ſays, that this expreſſive and pleaſing performer on the violin, and agreeable compoſer for his inſtrument, was born in Italy, a ſcholar of Barbella, ſettled at Amſterdam in 1772, where he remained the principal violin during twelve years, having ſucceeded the famous Locatelli. He had publiſhed nine different works for violins at Berlin and Amſterdam, before the year 1785. About the year 1773 he arrived in London, ſince which time he has publiſhed many pleaſing compoſitions, particularly his "Battaglia," which is the beſt imitative inſtrumental muſic of that kind that has come to our knowledge.

RAIMPOUR, in *Geography*, a town of Hindooſtan, in Rohilcund; 30 miles S. of Bereilly.

RAIN, a town of Hindooſtan, in Guzerat, on the gulf of Cutch; 45 miles W. of Noanagur.—Alſo, a town of Bavaria; 16 miles N. of Augſburg. N. lat. 48° 37'. E. long. 10° 52'.

RAIN, or *Old Rain*, a town of Scotland, in Aberdeenſhire, near which are the remains of a palace of the former biſhops of Aberdeen; eight miles S.E. of Inverary.

RAIN, the diſtillation of water which deſcends from the atmoſphere in drops of various ſizes. By this circumſtance rain is diſtinguiſhed from dew or fog; in the former of which the drops are ſo ſmall, that they are quite inviſible; and in the latter, though they are of a larger ſize, they ſeem to have little more ſpecific gravity than the atmoſphere itſelf, and may therefore be reckoned hollow ſpherules rather than drops.

Rain is, apparently, a precipitated cloud; as clouds are nothing but vapours raiſed from moiſture, waters, &c.

And vapours are demonſtratively nothing elſe but little bubbles or veſiculæ detached from the ſurface of the terraqueous globe by the power of the ſolar or ſubterraneous heat, or ſome other cauſe. Theſe veſiculæ, being ſpecifically lighter than the atmoſphere, are buoyed up by it, until they arrive at a region where the air is in a juſt balance with them; and here they float, till by ſome new agent they are converted into clouds, and thence either into rain, ſnow, hail, miſt, or the like.

But the agent in this formation of the clouds into rain, and the vapours into clouds, has been much controverted. Some philoſophers have ſuppoſed that the cold, which conſtantly occupies the ſuperior regions of the air, chills and condenſes the veſiculæ, at their arrival from a warmer quarter; congregates them together, and occaſions ſeveral of them to coaleſce into little maſſes: and by theſe means their quantity of matter increaſing in a greater proportion than their ſurface, they become an overbalance to the thin air, and accordingly deſcend in rain.

Dr. Derham accounts for the precipitation thus; that the veſiculæ being full of air, when they meet with a colder air than that they contain, this internal air is contracted into a leſs ſpace; and conſequently the watery ſhell, or caſe, is rendered thicker, ſo as to become heavier than the air, &c.

It has, however, been objected to this hypotheſis, that rain often happens in very warm weather; and though it be allowed, that the condenſation may be owing to the cold of the upper regions, yet the drops acquire a conſiderable increaſe of ſize as they deſcend. *E. G.* On the ſummit of a hill they are ſmall and occaſion only a drizzling ſhower; but in deſcending the hill it becomes more conſiderable, and at the bottom of the hill the drops are much larger, and the

the rain is impetuous. Hence it appears that the vapours are condenſed when the atmoſphere is warm as well as when it is cold.

Others only allow the cold a part in the action, and aſcribe a ſhare of it to the winds, alleging, that a wind blowing againſt a cloud will drive its veſiculæ upon one another, by which means ſeveral of them, coaleſcing as before, will be enabled to deſcend; and the effect will be ſtill more conſiderable, if two oppoſite winds blow together toward the ſame place. To which they add, that clouds already formed, happening to be augmented by freſh acceſſions of vapour, continually aſcending, may on this account be enabled to deſcend.

Againſt the above ſtated hypotheſis of Derham, it has been objected that the veſiculæ of vapour, if they be ſuch, are filled, not with air, but fire or heat in a latent ſtate, and till they part with this heat, the vapour cannot be condenſed. Cold is not always ſufficient to produce this effect, for in the moſt ſevere froſts the air is ſerene, and parts with little or none of its vapours, for a conſiderable time. It is alſo alleged, that the winds have no conſiderable agency, ſince blowing upon vapour is ſo far from condenſing it, that it unites more cloſely with the air; and wind is known very much to promote evaporation. See VAPOUR.

Yet the grand cauſe, according to Rohault, ſtill remains: that author conceives it to be the heat of the air, which after continuing for ſome time near the earth, is at length carried up on high by a wind, and there thawing the ſnowy villi, or flocks of the half-frozen veſiculæ, reduces them into drops; which coaleſcing, deſcend, and have their diſſolution perfected in their progreſs through the lower and warmer ſtages of the atmoſphere Others, as Dr. Clarke, &c. aſcribe this deſcent of the clouds rather to an alteration of the atmoſphere than of the veſiculæ; and ſuppoſe it to ariſe from a diminution of the ſpring, or elaſtic force of the air.

This elaſticity, which, as they ſay, depends chiefly or wholly on the dry terrene exhalations, being weakened, the atmoſphere ſinks under its burden, and the clouds fall, on the common principle of precipitation.

Now, the little veſiculæ, by any or all theſe means, being once upon the deſcent, will perſiſt therein. notwithſtanding the increaſe of reſiſtance they every moment meet with in their progreſs through ſtill denſer and denſer parts of the atmoſphere. For, as they all tend toward the ſame point, *viz.* the centre of the earth, the farther they fall, the more coalitions will they make; and the more coalitions, the more matter will there be under the ſame ſurface; the ſurface only increaſing as the ſquares; but the ſolidity as the cubes; and the more matter under the ſame ſurface, the leſs friction or reſiſtance there will be to the ſame matter.

Thus if the cold, the wind, &c. happen to act early enough to precipitate the aſcending veſiculæ, before they are arrived at any conſiderable height, the coalitions being few in ſo ſhort a deſcent, the drops will be proportionably ſmall: and thus is formed what we call *dew*. See DEW.

If the vapours prove more copious, and riſe a little higher, we have a *miſt* or *fog*; which ſee reſpectively.

A little higher ſtill, and they produce a ſmall rain, &c. If they neither meet with cold, nor wind enough to condenſe or diſſipate them, they form a heavy, thick, dark ſky; which laſts ſometimes ſeveral weeks. This hypotheſis of the diminution of the atmoſphere's elaſticity, requires a more ſatisfactory explication of the cauſe of this diminution. By aſcribing it to terrene exhalations, we only ſolve one difficulty by introducing another; for we are totally unacquainted with the nature and operation of theſe exhalations. But let the cauſe be what may be ſuppoſed, if it act equally, and at once, upon all the vapour in the air, all that vapour muſt be at once precipitated; and the conſequence muſt be, that, inſtead of gentle ſhowers continuing for a conſiderable time, we muſt have copious water-ſpouts, laſting only for a few minutes or ſeconds, which, inſtead of refreſhing the earth, would drown and lay it waſte.

Thoſe who admit either of the above hypotheſes, account for many of the phenomena of the weather; *e. gr.* why a cold is always a wet ſummer, and a warm a dry one; becauſe the principle of precipitation obtains in the one caſe, and is wanting in the other. Why we have ordinarily moſt rain about the equinoxes; becauſe the vapours ariſe more plentifully than ordinary in the ſpring, as the earth becomes looſened from the brumal conſtipations; and becauſe, as the ſun recedes from us in autumn, the cold increaſing, the vapours that had lingered above during the ſummer heats, are now diſpatched down, &c. Why a ſettled, thick, cloſe ſky ſcarcely ever rains till it have been firſt clear; becauſe the equally diffuſed vapours muſt firſt be condenſed, and congregated into ſeparate clouds, to lay the foundation of rain; by which means the reſt of the face of heaven is left open, and pervious to the rays of the ſun, &c.

For other phenomena of rain, as they relate to the weather-glaſs, ſee BAROMETER, and WEATHER.

It cannot be doubted, that there is a connection between the deſcent of the barometer and the fall of rain; but no ſatisfactory reaſon has yet been aſſigned for the circumſtance; nor is it poſſible to foretell with certainty that rain will follow any changes in the height of the barometer that have been obſerved. The immediate dependence of rain, or of any other atmoſpherical phenomena, on the influence of the moon, appears to be rendered highly improbable, not only by mathematical calculations of the effects of the moon's attraction, but alſo by the irregularity of the obſervations which have been adduced in favour of a ſuch a connection. (See *Influence of the* MOON.) But however uncertain the ultimate cauſes of rain may be in general, their effects in ſome places are ſufficiently conſtant, to be attributed to permanent local circumſtances, and in particular to the periodical recurrence of ſimilar winds.

For a more particular account of other theories, for explaining the aſcent of vapours, the formation of clouds, and the fall of rain, ſee VAPOUR.

Beſides the cauſes of rain, mentioned above, Deſaguliers thinks it owing to the loſs of electricity in the vapours of which they were formed.

Other writers, in the progreſs of this part of philoſophical ſcience, have conſidered rain as an electrical phenomenon: or at leaſt they have ſuppoſed, that the powers of electricity may concur with other cauſes in producing it. Signior Beccaria, whoſe obſervations on the general ſtate of electricity in the atmoſphere have been more extenſive and accurate than thoſe of any other perſon, reckons rain, hail, and ſnow, among the effects of a moderate electricity in the atmoſphere. Clouds that bring rain, he thought, were produced in the ſame manner as thunder clouds, only by a moderate electricity. He deſcribes them at large, and the reſemblance which all their phenomena bear to thoſe of thunder-clouds is very ſtriking. He notes ſeveral circumſtances attending rain without lightning, which render it probable, that it is produced by the ſame cauſe as when it is accompanied with lightning. Light has been ſeen among the clouds by night in rainy weather; and even by day rainy clouds are ſometimes ſeen to have a brightneſs evidently independent of the ſun. The uniformity with

which the clouds are ſpread, and with which the rain falls, he thought, were evidences of an uniform cauſe like that of electricity. The intenſity alſo of electricity in his apparatus generally correſponded very nearly to the quantity of rain that fell in the ſame time. Sometimes all the phenomena of thunder, lightning, hail, rain, ſnow, and wind have been obſerved at one time; which ſhews the connection they all have with ſome common cauſe. Signior Beccaria, therefore, ſuppoſes, that, previous to rain, a quantity of electric matter eſcapes out of the earth, in ſome place where there was a redundancy of it; and in its aſcent to the higher regions of the air, collects and conducts into its path a great quantity of vapours. The ſame cauſe that collects, will condenſe them more and more; till, in the places of the neareſt intervals, they come almoſt into contact, ſo as to form ſmall drops; which, uniting with others as they fall, come down in rain. The rain will be heavier in proportion as the elaſticity is more vigorous, and the cloud approaches more nearly to a thunder-cloud. He imitated the appearance of clouds that bring rain, by inſulating himſelf between the rubber and conductor of his electrical machine; and with one hand dropping colophonia into a ſpoon faſtened to the conductor, and holding a burning coal, while his other hand communicated with the rubber. In theſe circumſtances the ſmoke ſpread along his arm, and, by degrees, all over his body, till it came to the other hand that communicated with the rubber. The lower ſurface of this ſmoke was every where parallel to his clothes, and the upper ſurface was ſwelled and arched like clouds replete with thunder and rain. In this manner, he ſuppoſes, the clouds that bring rain diffuſe themſelves from over thoſe parts of the earth which abound with electric fire, to thoſe parts that are exhauſted of it; and by letting fall their rain, reſtore the equilibrium between them. Signior Beccaria alſo thought, that the electricity communicated to the air, which both receives and parts with it ſlowly, would account for the retention of vapours in a clear ſky; for ſmall disjointed clouds, not diſperſed into rain; for the ſmaller and lighter clouds in the higher regions of the air, which are but little affected by electricity; and alſo for the darker, heavy, and ſluggiſh clouds in the lower regions, which retain more of it. He even imagined that ſome alteration in the weight of the air might be made by this electricity of it: the phenomena of rain, he thought, favoured the ſuppoſition, that the electric matter in the air did, in ſome meaſure, leſſen its preſſure: for when the electric matter is actually in the air, collecting and condenſing the vapours, the barometer is loweſt. When the communication is made between the earth and the clouds by the rain, the quickſilver begins to riſe; the electric matter, which ſupported part of the preſſure, being diſcharged. Lettere dell Elettricismo. Prieſtley's Hiſt. &c. of Electricity, vol. i. p. 427, &c. 8vo.

Dr. James Hutton's theory of rain is ſtated and amply illuſtrated in the 1ſt volume of the Edinburgh Tranſactions, p. 47, &c. It is well known that atmoſpheric air is capable, with a certain degree of heat, of diſſolving a given quantity of water. (See VAPOUR.) Dr. Hutton aſcertains the ratio of the diſſolving power of air, in relation to water, with different degrees of heat; and thus, by mixing a portion of tranſparent humid warm air with a portion of cold air, the mixture becomes opaque, and part of the water will be precipitated; or, in other words, the vapour will be condenſed into rain. Hence he obſerves, that ſince the capacity of air for moiſture increaſes faſter than the temperature, there muſt be a depoſition of moiſture when two ſaturated portions of air at different temperatures are mixed. Dr. Hutton ſuppoſes that heat and ſolution do not increaſe by equal increments; but that, in reality, if heat be ſuppoſed to increaſe by equal increments along a ſtraight line, ſolution will be expreſſed by ordinates to a curve, whoſe convex ſide is turned towards that line. That the power of ſolution is not increaſed in the ſame ratio with heat is, however, hypothetical, except when we riſe pretty high in the ſcale, when its proportional increaſe is ſomewhat doubtful; nor has our author ſupported it by experiment. The condenſation of the breath in air is not to the purpoſe, unleſs we ſuppoſe the air to be already ſaturated with vapour. In any view, it can only amount to this, that to render it viſible, the heat muſt be diminiſhed in a greater proportion than can be compenſated by the power of ſolution in the body of air, in which the portion expired is at firſt immerſed. In order to explain the origin of rain from this cauſe, we muſt always ſuppoſe a conſtant diminution of heat to take place at the moment of the condenſation of the vapour; but we actually find, that the change from a ſtate of vapour to the fluid ſtate is attended with heat; ſo that rain muſt at once oppoſe its own cauſe, and continued rains would be impoſſible without the aid of other cauſes. Dr. Hutton endeavours, from his own ſyſtem, to explain the regular and irregular ſeaſons of rain, with regard either to the generality of its appearance, or the regularity of its return. And to obviate the apparent exceptions of the theory, from the generality of rain, he explains the proportional quantities of rain, and adds a comparative eſtimate of climates, in relation to rain with the meteorological obſervations made in our own climate. As our limits will not allow our doing full juſtice to our author's reaſoning, we muſt refer to his own paper on the ſubject.

Mr. Dalton, in his "Meteorological Eſſays," (Eſſ. vi.) expreſſes his approbation of Dr. Hutton's theory in general; to this purpoſe, he ſays, "the principles of none appear to me to be more plauſible and conſiſtent with facts." Dr. Hutton, as we have above ſhewn, conſiders the varieties of heat and cold, affecting the ſolvent power of the atmoſphere, as the ſole cauſes of rain; and Mr. Dalton obſerves, when we conſider that evaporation and the precipitation of vapour are diametrically oppoſite, it is reaſonable to ſuppoſe that they ſhould be promoted by oppoſite cauſes: and as heat and dry air are favourable to evaporation, ſo cold, operating upon air replete with vapour, promotes its precipitation. Dr. Hutton, however, ſeems to conſider water as chemically combined with the atmoſphere, and that cold produces precipitation in a manner ſimilar to what it does in water ſaturated with ſalt, or in other chemical proceſſes; whereas Mr. Dalton ſuppoſes, that a portion of the vapour, conſidered as a diſtinct and peculiar fluid, is condenſed into water by cold; but the effects reſulting from the two theories will be the ſame. See METEOROLOGY, and VAPOUR.

M. de Luc, in the 2d volume of his "Thoughts on Meteorology," has directed particular attention to the various circumſtances that attend rain. He has alſo examined the ſeveral hypotheſes of different authors, and concludes, that they are altogether inſufficient to account for the formation of it. In this inquiry the grand queſtion under diſcuſſion is, what becomes of the water that riſes in vapour into the atmoſphere? or what is the ſtate in which it ſubſiſts there, between the time of its evaporation, and its falling down in rain? If it continues in the ſtate of watery vapour, or ſuch as is the immediate product of evaporation, it muſt poſſeſs the diſtinctive characters eſſential to that fluid; it muſt

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make the hygrometer move towards humidity, in proportion as the vapour is more or leſs abundant in the air: on a diminution of heat, the humidity, as ſhewn by the hygrometer, muſt increaſe; and on an increaſe of the heat, the humidity muſt diminiſh; and the introduction of other hygroſcopic ſubſtances, drier than the air, muſt have the ſame effect as an augmentation of heat. Theſe are the properties of vapour, on every hypotheſis of evaporation; and, therefore, all the water that exiſts in the atmoſphere, without poſſeſſing theſe properties, is no longer vapour, but muſt have changed its nature. M. de Luc ſhews, that the water which forms rain, though it has ever been conſidered and reaſoned upon as producing humidity, does not poſſeſs this property, and muſt, therefore, have paſſed into another ſtate. As he thinks that the vapour paſſes into an inviſible ſtate in the interval between evaporation and its falling again in rain, and that in this ſtate it is not ſenſible to the hygrometer, he conſiders the laws of hydrology as inſufficient for explaining the formation of rain; but he does not pretend to have diſcovered the immediate cauſe of the formation of clouds and rain. If it is not in the immediate product of evaporation that rain has its ſource; if the vapours change their nature in the atmoſphere, ſo as no longer to be ſenſible to the hygrometer, or to the eye; if they do not become vapour again till clouds appear; and if, when the clouds are formed, no alteration is perceived in the quality of the air; we muſt acknowledge it to be very probable, that the intermediate ſtate of vapour is no other than air, and that the clouds do not proceed from any diſtinct fluid contained in the atmoſphere, but from a decompoſition of a part of the air itſelf, perfectly ſimilar to the reſt. For other obſervations on the aſcent and nature of vapour, and the ſubſequent formation of rain, we refer to the articles METEOROLOGY, and VAPOUR.

As to the general quantity of rain that falls, and its proportion in ſeveral places at the ſame time, and in the ſame place at ſeveral times, we have many obſervations, journals, &c. in the Memoirs of the French Academy, the Philoſ. Tranſ. and many other publications; from which we ſhall make the following extracts.

Upon meaſuring the rain falling yearly, its depth, at a medium, is found as in the following table.

Depth of Rain falling yearly, and its Proportion in ſeveral Places.

	Inches.
At Townley, in Lancaſhire, obſerved by Mr. Townley	42½
Upminſter, in Eſſex, by Dr. Derham	19¼
Zurich, in Swiſſerland, by Dr. Scheuchzer	32¼
Piſa, in Italy, by Dr. Mich. Ang. Tilli	43¼
Paris, in France, by M. de la Hire	19
Liſle, in Flanders, by M. de Vauban	24

	At Upminſter.	At Paris.
	Inches.	Inches.
1700	19.03	21.37
1701	18.69	27.77
1702	20.38	17.45
1703	23.99	18.51
1704	15.80	21.20
1705	16.93	14.82
Mediums	19.14	20.19

From the Meteorological Journal of the Royal Society, kept by order of the preſident and council, it appears that the whole quantity of rain at London, in each of the years ſpecified below, was as follows: *viz.*

	Inches.
1774	26.328
1775	24.083
1776	20.354
1777	25.371
1778	20.772
1779	26.785
1780	17.313
Medium of theſe ſeven years	23.001

Proportion of the Rain of the ſeveral Seaſons to one another.

1708.	Depth at Piſa.	Depth at Upminſter.	Depth at Zurich.
	Inches.	Inches.	Inches.
January	6.41	2.88	1.64
February	3.28	0.46	1.65
March	2.65	2.03	1.51
April	1.25	0.96	4.69
May	3.33	2.02	1.91
June	4.90	2.32	5.91
July	0.00	1.11	3.50
Auguſt	2.27	2.94	3.15
September	7.21	1.46	3.02
October	5.33	0.23	2.44
November	0.13	0.86	0.62
December	0.00	1.07	2.62
Half Year	36.76	19.24	32.66

See Philoſ. Tranſ. abr. vol. iv. pt. ii. p. 81, &c. and alſo Meteorological Journal of the Royal Society, publiſhed annually in the Phil. Tranſ.

As rain-gages have been fixed of late years in almoſt every part of the kingdom, we are enabled to determine, with conſiderable exactneſs, the depth of water which the rain yields in any given place. It may be obſerved, however, that inland counties have leſs rain than maritime ones, eſpecially thoſe which border on the weſtern ſeas. But ſtill a greater difference ſeems to take place between a mountainous country, and a champaign or flat country. In the former there often falls double or triple the quantity of rain in a year that there does in the latter, and never leſs than an equal quantity. It is alſo obſerved, that thoſe winds bring moſt rain that blow from the quarter in which is the moſt and neareſt ſea; as are weſt and ſouth-weſt winds. The rain-gage alſo ſhews, that more rain is collected in the inſtrument, as it is placed nearer the ground; without any appearance of a difference, between two places, on account of their difference of level above the ſea, provided that the inſtrument is as far from the ground at the one place, as it is at the other. Theſe effects are noticed in the Phil. Tranſ. for 1769 and 1771, the former by Dr. Heberden, and the latter by Mr. Daines Barrington. Dr. Heberdeen ſays, "A compariſon having been made between the quantity of rain which fell in two places in London, about a mile diſtant from one another, it was found that the rain in one of them conſtantly exceeded that in the other, not only every month, but almoſt every time that it rained. The apparatus uſed in each of them was very exact, and both made by the ſame artiſt; and upon examining every probable cauſe, this unexpected variation did not appear to be owing

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to any miſtake, but to the conſtant effect of ſome circumſtance which, not being ſuppoſed to be of any moment, had never been attended to. The rain-gage in one of theſe places was fixed ſo high, as to riſe above all the neighbouring chimnies; the other was conſiderably below them; and there appeared reaſon to believe, that the difference in the quantity of rain in theſe two places was owing to this difference in the placing of the veſſel in which it was received. A funnel was, therefore, placed above the higheſt chimnies, and another upon the ground of the garden belonging to the ſame houſe, and there was found the ſame difference between theſe two, though placed ſo near one another, which had been between them, when placed at ſimilar heights in different parts of the town. After this fact was ſufficiently aſcertained, it was thought proper to try whether the difference would be greater at a much greater height; and a rain-gage was therefore placed upon the ſquare part of the roof of Weſtminſter Abbey. Here the quantity of rain was obſerved for a twelvemonth, the rain being meaſured at the end of every month, and care being taken that none ſhould evaporate by paſſing a very long tube of the funnel into a bottle through a cork, to which it was exactly fitted. The tube went down very near to the bottom of the bottle, and therefore the rain which fell into it would ſoon riſe above the end of the tube, ſo that the water was no where open to the air except for the ſmall ſpace of the area of the tube: and by trial it was found that there was no ſenſible evaporation through the tube thus fitted up.

The following table ſhews the reſult of theſe obſervations.

From July the 7th, 1766, to July the 7th, 1767, there fell in a Rain-gage, fixed

1766.	Below the top of a houſe.	Upon the top of a houſe.	Upon Weſtminſter Abbey.
	Inches.	Inches.	Inches.
From the 7th to the end of July	3.591	3.210	2.311
Auguſt	0.558	0.479	0.508
September	0.421	0.344	
October	2.364	2.061	1.416
November	1.079	0.842	0.632
December	1.612	1.258	0.994
1767, January	2.071	1.455	1.035
February	2.864	2.494	1.335
March	1.807	1.303	0.587
April	1.437	1.213	0.994
May	2.432	1.745	1.142
June	1.997	1.426	1.145
July 7	0.395	0.309	
	22.628	18.139	12.099

By this table it appears, that there fell below the top of a houſe above a fifth part more rain than what fell in the ſame ſpace above the top of the ſame houſe; and that there fell upon Weſtminſter Abbey not much above one-half of what was found to fall in the ſame ſpace below the tops of the houſes. This experiment has been repeated in other caſes with the ſame reſult. What may be the cauſe of this extraordinary difference, has not yet been diſcovered; but it may be uſeful to give notice of it, in order to prevent that error, which would frequently be committed in comparing the rain of two places without attending to this circumſtance."

Such were the obſervations of Dr. Heberden on firſt announcing this circumſtanee, *viz.* of different quantities of rain falling at different heights above the ground. Two years afterward, Daines Barrington, eſq. made the following experiments and obſervations, to ſhew that this effect, with reſpect to different places, reſpected only the ſeveral heights of the inſtruments above the ground at thoſe places, without regard to any real difference of level in the ground at thoſe plaees.

Mr. Barrington cauſed two other rain-gages, exactly like thoſe of Dr. Heberden, to be placed, the one upon mount Rennig, in Wales, and the other on the plane below, at about half a mile's diſtance, the perpendicular height of the mountain being 450 yards, or 1350 feet; each gage being at the ſame height above the ſurface of the ground at the two ſtations.

The reſults of the experiment are as below:

1770.	Bottom of the mountain.	Top of the mountain.
	Inches.	Inches.
From July 6 to 16 - -	0.709	0.648
July 16 to 29 - -	2.185	2.124
July 29 to Aug. 10 -	0.610	0.656
Sept. 9, both bottles had run over.		
Sept. 9 to 30 - -	3.234	2.464
Oct. 17, both bottles had run over.		
Oct. 17 to 22 - -	0.747	0.885
Oct. 22 to 29 - -	1.281	1.388
Nov. 20, both bottles were broken by the froſt.	8.766	8.165

"The inferenee to be drawn from theſe experiments, Mr. Barrington obſerves, ſeems to be, that the increaſe of the quantity of rain depends upon its nearer approximation to the earth, and ſcarcely at all upon the height of places, provided the rain-gages are fixed at about the ſame diſtance from the ground.

"Poſſibly alſo a much controverted point between the inhabitants of mountains and plains may receive a ſolution from theſe experiments; as in an adjacent valley, at leaſt, very nearly the ſame quantity of rain appears to fall within the ſame period of time as upon the neighbouring mountains."

Dr. Heberden alſo adds the following note. "It may not be improper to ſubjoin to the foregoing account, that, in places where it was firſt obſerved, a different quantity of rain would be collected, according as the rain-gages were placed above or below the tops of the neighbouring buildings; the rain-gage below the top of the houſe into which the greater quantity of rain had for ſeveral years been found to fall, was above fifteen feet above the level of the other rain-gage, which, in another part of London, was placed above the top of the houſe, and into which the leſſer quantity always fell. This differenee, therefore, does not, as Mr. Barrington juſtly remarks, depend upon the greater quantity of atmoſphere through which the rain deſcends: though this has been ſuppoſed by ſome, who have thence concluded that this appearance might readily be ſolved by the accumulation of more drops, in a deſcent through a great depth of atmoſphere."

In the examination of the reſults from meteorological tables, it ſhould be obſerved, that ſeveral years' account of the rain at any place is required, before a medium yearly quantity can be obtained with ſufficient accuracy. The following table, formed by Mr. Dalton, and publiſhed in the firſt part of the fifth volume of Manchester Memoirs, gives us the largeſt collection of accounts of rain fallen in different places in England that has to our knowledge hitherto appeared. They are chiefly taken from the Tranſactions of the Royal Society, and of other ſocieties.

Counties (Maritime).	Places.	Mean annual Depth in Inches.
Cumberland	Kefwick, 7 years	67.5
	Carliſle, 1 year	20.2
Weſtmoreland	Kendal, 11 years	59.8
	Fell-foot, 3 years	55.7
	Waith Sutton, 5 years	46
Lancaſhire	Lancaſter, 10 years	45
	Liverpool, 18 years	34.4
	Manchefter, 9 years	33
	Townley	41
	Crawſhawbooth, near Haſlingden, 2 years	60
Gloucestershire	Briſtol, 3 years	29.2
Somersetshire	Bridgewater, 3 years	29.3
Cornwall	Ludguan, near Mount's Bay, 5 years	41
	Another place, 1 year	29.9
Devonshire	Plymouth, 2 years	46.5
Hampshire	Selbourne, 9 years	37.2
	Fyfield, 7 years	25.9
Kent	Dover, 5 years	37.5
Eſſex	Upminſter	19.5
Norfolk	Norwich, 13 years	25.5
Yorkſhire	Barrowby, near Leeds, 6 years	27.5
	Garſdale, near Sedburgh, 3 years	52.3
Northumberand	Widdrington, 1 year	21.2

Counties (Inland).	Places.	Means.
Middleſex	London, 7 years	23
Surrey	South Lambeth, 9 years	22.7
Hertfordshire	Near Ware, 5 years	25
Huntingdonshire	Kimbolton, 7 years	25
Derbyſhire	Chatſworth, 15 years	27.8
Rutlandshire	Lyndon, 21 years	24.3
Northamptonshire	Near Oundle, 14 years	23
	General mean	35.2

The general mean of 35.2 inches is, as our author apprehends, a little above the medium for England and Wales, as the greater number of places are thoſe where much rain falls. If we take up a mean for each of the above-mentioned counties, (where more than one place in a county is given,) and then a general mean from the counties, the reſult is a reduced mean of 31.3. Even then it may be objected, that the greater part of the counties are maritime; but it muſt be obſerved, that there is no account of rain in Wales: and we may ſafely conclude, that the rain in Wales would exceed the laſt-mentioned mean as much as the inland counties of England, not in the above liſt, would fall ſhort; becauſe Wales is both a mountainous country, and expoſed to the ſea.

We will, therefore, conclude, that the mean annual depth of rain in England and Wales, deduced from theſe twenty counties, is 31 inches: a quantity which ſubſequent obſervations, our author is confident, will not diminiſh, and probably not increaſe much.

The editors of the Encyclopedia, under the article *Weather*, from 16 places of obſervation, make the annual mean for Great Britain 32.53 inches; and M. Cotte, in the Journal de Phyſique for 1791, gives a mean derived from 147 places, in different parts of the world, equal to 34.7 inches.

If we take the dew (ſee Dew) at 5 inches annually, we ſhall have 36 inches of water at a medium annually, on the ſurface of the earth, in England and Wales, reckoning 31 for rain and 5 for dew. Admitting the computation of Guthrie, the area of England and Wales is 46,450 ſquare miles. This, reduced to ſquare feet, gives 1,378,586,880,000; which, multiplied by 3 feet, the annual depth of rain and dew, gives 4,135,760,690,000 cubic feet of water, = 153,176,320,000 cubic yards, or 28 cubic miles = 115 thouſand millions of tons in weight, nearly. This immenſe maſs of water is diſpoſed of partly by the ſupply of rivulets, and the ſoaking into the earth a ſmall way, ſo as to break out again in lower ground in the form of ſprings, and thence make its way to ſome river, by which it is conveyed to the ſea; and partly by being raiſed into the atmoſphere in the proceſs of evaporation. The decompoſition of water by vegetables is not noticed, becauſe it is preſumed, that in the courſe of nature the principles are combined, and water formed again. See River, Spring, Evaporation, and Vapour.

As to the uſe of rain, we may obſerve that it moiſtens and ſoftens the earth, and thus fits it for affording nouriſhment to plants: by falling on high mountains, it carries down with it many particles of looſe earth, which ſerve to fertilize the ſurrounding vallies, and purifies the air from noxious exhalations, which tend in their return to the earth to meliorate the ſoil; it moderates the heat of the air; and is one means of ſupplying fountains and rivers. However, vehement rains in many countries are found to be attended with barrenneſs and poorneſs of the lands, and miſcarriage of the crops in the ſucceeding year: and the reaſon is plain; for theſe exceſſive ſtorms waſh away the fine mould into the rivers, which carry it into the ſea, and it is a long time before the land recovers itſelf again. The remedy to the famine, which ſome countries are ſubject to from this ſort of miſchief, is the planting large orchards and groves of ſuch trees as bear eſculent fruit; for it is an old obſervation, that in years, when grain ſucceeds worſt, theſe trees produce moſt fruit of all. It may partly be owing to the thorough moiſtening of the earth, as deep as their roots go, by theſe rains, and partly to their trunks ſtopping part of the light mould carried down by the rains, and by this means furniſhing themſelves with a coat of new earth. Phil. Tranſ. N° 90.

The water afforded by rain is found highly refreſhing to almoſt all ſorts of vegetable crops, and to promote their growth in a rapid manner, when not produced in too great abundance at a time. This effect, which may often be perceived to take place in a ſudden manner, after warm ſhowers in the early ſpring months, is probably cauſed by the large proportion of oxygen that is contained in rain-water, as well as from the neceſſary moiſture being afforded to the fibres of the roots of the plants. Too much rain may be injurious, however, by leſſening the neceſſary coheſion and compactneſs of ſoils, by which they may not afford proper firmneſs to the roots of growing vegetables. And another injury may be produced by the too frequent occurrence of haſty ſhowers, by which a large proportion of the decompoſing vegetable and animal materials of lands, which are ſoluble or diffuſible in water, may be conveyed away into the ditches, rivers, and ultimately into the ſea, and of courſe prove the cauſe of infertility. In hilly ſituations, this effect may ariſe from even ſlight ſhowers; on which account, they have been adviſed to be ploughed in a ſlanting direction, as by that means the rains may be more perfectly detained in the ſoils. And it has been ſuggeſted by Dr. Darwin, that as the foliage or buds of plants require more moiſture for their vigorous growth than their flowers, in this climate, continued rains may be liable not only to waſh off the farina

from the burſting anthers, and in that way prevent the impregnation of the piſtillum, but alſo delay the ripening of the ſeeds or fruit, from the want of a due evaporation of their perſpirable matter, as well as from the leſs ſolar light in cloudy ſeaſons. On this account it is, he ſuppoſes, that in the north of Scotland the oats are ſaid ſeldom to ripen till the froſt commences, with the dry ſeaſon which accompanies it.

Thus, as the effects of rain are ſo very conſiderable on vegetation, it would be highly uſeful to aſcertain the quantity or depth of rain that falls annually in different diſtricts, and the difference in the effects which are produced by it. See WATER and WEATHER.

The vaſt quantities of rain which fall in ſome diſtricts, from the peculiar nature of their ſituations, eſpecially where they are of the grazing or paſture kind, as thoſe of Cheſhire, Lancaſhire, and ſome others, are often highly beneficial to their general fertility; the natural graſs paſtures of which diſtricts, though frequently of inferior qualities to thoſe in many other places, are, in conſequence of this circumſtance, rendered ſuperior in their abundance of graſs, the ſtrength of its vegetation, and the richneſs of its quality. The former of the above counties may indeed, without any impropriety, be reckoned one of the moſt productive graſs-land diſtricts in the kingdom, as is fully evinced by the great abundance and ſuperiority of its dairy products. The graſs lands in this tract of country moſtly retain their full verdure during the moſt ſultry and parching ſeaſons, except where they are of a ſandy or gravelly nature in their under ſtrata. Where they are near to the ſea, however, in this as well as other parts, they are liable to become moſſy, or be covered with the moſs plant, either in conſequence of ſo much of the ſpray from it falling in the manner of ſlight rain, or ſome other cauſe of that kind.

The quantity of rain falling upon land has much influence upon its temperature, or ſtate of heat, and, of courſe, great effect on vegetation in that way; and the nature of its mixture with it, or the manner in which it is diſtributed through its parts, or combined with its different earthy materials, is another means by which it becomes of great importance, as it relates to the ſupplying of nouriſhment and ſupport to vegetables as crops.

Rain falling in large quantities, on particular ſorts of retentive ſoils, is a frequent cauſe of that kind of injurious wetneſs, which ſtands ſo much in need of ſurface-draining to remove it. See SURFACE-*Draining*.

The nature and cauſes of ſhowers and rain are extremely curious and intereſting in ſeveral different points of view, both to the agriculturiſt and the philoſophical inquirer.

RAINS, *Preternatural*. We have numerous accounts in hiſtorians of preternatural rains, ſuch as the raining of ſtones, of duſt, of blood, nay, and of living animals, as young frogs, and the like. We are not to doubt the truth of what thoſe who are authors of veracity and credit relate to us of this kind, ſo far as to ſuppoſe that the FALLING *of Stones* (which ſee) and duſt never happened; the whole miſtake (if it be ſo with regard to the firſt inſtance) is the ſuppoſing them to have fallen from the clouds; but as to the blood and frogs, it is very certain that they never fall at all, but the opinion has been a mere deception of the eyes. Men are extremely fond of the marvellous in their relations; but the judicious reader is to examine ſtrictly whatever is reported of this kind, and is not to ſuffer himſelf to be deceived.

There are two natural methods by which quantities of ſtones and duſt may fall in certain places, without their having been generated in the clouds, or fallen as rain. The one is by means of hurricanes: the wind which we frequently ſee tearing off the tiles of houſes, and carrying them to conſiderable diſtances, being equally able to take up a quantity of ſtones, and drop them again at ſome other place. But the other, which is much the moſt powerful, and probably the moſt uſual way, is for the eruptions of volcanos, and burning mountains, to toſs up, as they frequently do, a vaſt quantity of ſtones, aſhes, and cinders, to an immenſe height in the air; and theſe being hurried away by the hurricanes and impetuous winds, which uſually accompany thoſe eruptions, and being in themſelves much lighter than common ſtones, as being half calcined, may eaſily be thus carried to vaſt diſtances, and their falling in places where the inhabitants know nothing of the occaſion, they cannot but be ſuppoſed by the vulgar to fall on them from the clouds. It is well known, that in the great eruptions of Ætna and Veſuvius, ſhowers of aſhes, duſt, and ſmall cinders, have been ſeen to obſcure the air, and overſpread the ſurface of the ſea for a great way, and cover the decks of ſhips; and this at ſuch a diſtance, as it ſhould appear ſcarce conceivable that they ſhould have been carried to; and probably, if the accounts of all the ſhowers of theſe ſubſtances mentioned by authors be collected, they will all be found to have fallen within ſuch diſtances of volcanos; and if compared, as to the time of their falling, will be found to correſpond in that alſo with the eruptions of thoſe mountains. We have known inſtances of the aſhes from Veſuvius having been carried thirty, nay forty leagues, and peculiar accidents may have carried them yet farther.

The raining of blood has been ever accounted a more terrible ſight, and a more fatal omen, than the other preternatural rains already mentioned. It is very certain that nature forms blood no where but in the veſſels of animals, and therefore ſhowers of it from the clouds are by no means to be credited. Thoſe who ſuppoſe that what has been taken for blood, has been actually ſeen falling through the air, have had recourſe to flying inſects for its origin, and ſuppoſe it the eggs or dung of certain butterflies diſcharged from them as they were high up in the air. But this ſeems a very wild conjecture, as we know of no butterfly whoſe excrements, or eggs, are of ſuch a colour, or whoſe abode is ſo high, or their flocks ſo numerous, as to be the occaſion of this.

It is moſt probable that theſe bloody waters were never ſeen falling, but the people ſeeing the ſtanding waters blood-coloured, were aſſured, from their not knowing how it ſhould elſe happen, that it had rained blood into them. A very memorable inſtance of this there was at the Hague in the year 1670. Swammerdam, who relates it, tells us, that one morning the whole town was in an uproar, on finding their lakes and ditches full of blood, as they thought, and having been certainly full of water the night before, they agreed it muſt have rained blood in the night; but a certain phyſician went down to one of the canals, and taking home a quantity of this blood-coloured water, he examined it by the microſcope, and found that the water was water ſtill, and had not at all changed its colour, but that it was full of prodigious ſwarms of ſmall red animals, all alive, and very nimble in their motions, whoſe colour and prodigious number gave a red tinge to the whole body of the water they lived in, on a leſs accurate inſpection. The certainty that this was the caſe, did not however perſuade the Hollanders to part with the miracle; they prudently concluded, that the ſudden appearance of ſuch a number of animals was as great a prodigy as the raining of blood would have been; and are aſſured at this day, that this portent foretold the ſcene of war and devaſtation which Lewis XIV. afterwards brought into that country, which had before enjoyed forty years uninterrupted peace.

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The animals, which thus colour the water of lakes and ponds, are the *pulices arboreſcentes* of Swammerdam, or the water-fleas with branched horns. Theſe creatures are of a reddiſh-yellow, or flame colour; they live about the ſides of ditches, under weeds, and among the mud, and are therefore the leſs viſible, except at a certain time, which is in the end of May or beginning of June: it is at this time that theſe little animals leave their receſſes to float looſe about the water, to meet for the propagation of their ſpecies, and by that means become viſible in the colour they give the water. This is viſible, more or leſs, in one part or other of almoſt all ſtanding waters at this ſeaſon; and it is always at this ſeaſon that the bloody waters have alarmed the ignorant.

The raining of frogs is a thing not leſs wonderful in the accounts of authors who love the marvellous, than thoſe of blood, or of ſtones; and this is ſuppoſed to happen ſo often, that there are multitudes who pretend to have been eye-witneſſes of it. Theſe rains of frogs always happen after very dry ſeaſons, and are much more frequent in the hotter countries than the cold ones. In Italy they are very frequent; and it is not uncommon to ſee the ſtreets of Rome ſwarming both with young frogs and toads in an inſtant, in a ſhower of rain; they hopping every where between the people's legs, as they walk, though there was not the leaſt appearance of them before. Nay, they have been ſeen to fall through the air down upon the pavements. This ſeems a ſtrong circumſtance in favour of their being rained down from the clouds, but when ſtrictly examined, it comes to nothing; for theſe frogs, that are ſeen to fall, are always found dead, lamed, or bruiſed by the fall, and never hop about as the reſt; and they are never ſeen to fall, except cloſe under the walls of houſes, from the roofs and gutters of which they have accidentally ſlipped down.

To the raining of frogs we ought to add the raining of graſs-hoppers and locuſts, which have ſometimes appeared in prodigious numbers, and devoured the fruits of the earth. There has not been the leaſt pretence for ſuppoſing that theſe animals deſcended from the clouds, but that they appeared on a ſudden in prodigious numbers. The naturaliſt, who knows the many accidents attending the eggs of theſe, and other the like animals, cannot but know that ſome ſeaſons will prove particularly favourable to the hatching of them, and the prodigious number of eggs that many inſects lay, could not but every year bring us ſuch abundance of the young, were they not liable to many accidents, and had not provident nature taken care, as in many plants, to continue the ſpecies by a very numerous ſtock of ſeeds, of which perhaps not one in five hundred need take root, in order to continue an equal number of plants.

The raining of fiſhes has been a prodigy alſo much talked of in France, where the ſtreets of a town at ſome diſtance from Paris, after a terrible hurricane in the night, which tore up trees, blew down houſes, &c. were found in a manner covered with fiſhes of various ſizes. Nobody here made any doubt of theſe having fallen from the clouds; nor did the abſurdity of fiſh, of five or ſix inches long, being generated in the air, at all ſtartle the people, or ſhake their belief in the miracle, till they found upon enquiry that a very well-ſtocked fiſh-pond, which ſtood on an eminence in the neighbourhood, had been blown dry by the hurricane, and only the great fiſh left at the bottom of it, all the ſmaller fry having been toſſed into their ſtreets.

Upon the whole, all the ſuppoſed marvellous rains have been owing to ſubſtances naturally produced on the earth, and either never having been in the air at all, or only carried thither by accident.

RAIN, *Freezing*. See FREEZING.

RAIN-*Bird*, in *Ornithology*. See CUCULUS *Pluvialis*.

RAIN-*Fowl*, an Engliſh name given by many to the common green woodpecker, or *picus viridis*, from an obſervation that it is always moſt clamorous when rainy weather is coming on. The Latins have, for the ſame reaſon, called it the *pluvialis avis*. See PICUS.

RAIN-*Gage*, called alſo *Ombrometer* and *Pluviameter*, an inſtrument for meaſuring the quantity of rain that falls. That which is mentioned under the article OMBROMETER, conſiſts of a tin funnel *d* (*Plate* XXIV. *Miſcellany*, *fig.* 2.), whoſe ſurface is an inch ſquare, a flat board *a a*, and a glaſs tube *b b*, ſet into the middle of it in a groove, and an index with diviſions *c*, *c*; the board and tube being of any length at pleaſure. The bore of the tube is about half an inch, which, ſays Mr. Pickering, the inventor, is the beſt ſize. This machine is fixed in ſome free and open place, as the top of the houſe, &c.

The rain-gage employed in the houſe of the Royal Society, is deſcribed by Mr. Cavendiſh in the Phil. Tranſ. for 1776, p. 384. The veſſel which receives the rain is a conical funnel, ſtrengthened at the top by a braſs ring, twelve inches in diameter. The ſides of the funnel, and inner lip of the braſs ring, are inclined to the horizon, at an angle of above 65°, and the outer lip at an angle of above 50°, which are ſuch degrees of ſteepneſs, that there ſeems to be no probability either that any rain which falls within the funnel, or on the inner lip of the ring, ſhould daſh out, or that any which falls on the outer lip ſhould daſh into the funnel. A vertical ſection of the funnel appears in *Plate* XXIV. *Miſcellany*, *fig.* 3; A B C and *a b c* being the braſs ring, B A and *b a* the inner lip, and B C and *b c* the outer. This veſſel is placed on ſome flat leads, on the top of the ſociety's houſe. It can hardly be ſcreened from any rain by the chimnies, as none of them are elevated above it in an angle of more than 25°, and as it is raiſed $3\frac{1}{2}$ feet above the roof, there ſeems no danger of any rain daſhing into it by rebounding from the lead.

In fixing rain-gages care ſhould be taken that the rain may have free acceſs to them, without being impeded or overſhaded by buildings, &c. and therefore the tops of houſes are to be preferred. Alſo, when the quantities of rain collected in them, at different places, are compared together, the inſtruments ought to be fixed at the ſame height above the ground at both places; becauſe at different heights the quantities are always different, even in the ſame place. And hence alſo, any regiſter or account of rain in the gage ought to be accompanied with a note of the height at which the inſtrument is placed above the ground. Dalton found the rain of a gage 50 yards high, in ſummer two-thirds, and in winter one-half as much as that of a gage below. Mr. Dalton obſerves, that a ſtrong funnel, made of ſheet iron, tinned and painted, with a perpendicular rim, two or three inches high, fixed horizontally in a convenient frame, with a bottle under it to receive the rain, is ſufficient for this purpoſe.

The rain-gage is an invention which ſhould be in the poſſeſſion of every correct farmer in every part of the kingdom, and which would thereby have much tendency to the improvement of agriculture as contributing to the knowledge of the degree of moiſture which prevails in the ſoils, after ſhowers or heavy rains, with greater accuracy and correctneſs than has been hitherto the caſe.

It is noticed by Mr. Naiſmith, in his Agricultural Survey of Clydeſdale, that profeſſor Anderſon, of the univerſity of Glaſgow, has invented, perhaps, the moſt ingenious and accurate rain-gage of any that has yet been known. It receives

the rain at a little more than one hundred feet above the level of the ſea; accounts of which have been regularly kept ſince the year 1781; but previouſly to that period the rain was meaſured by an old rain-gage. It is to be regretted, however, that the exact nature of this invention is not more fully explained; and that other cheap plain inventions of this nature are not better known to the farmer.

RAIN-*Water*. See WATER.

RAINS, in the *Sea Language*, denote all that tract of ſea to the northward of the equator, between four and ten degrees of latitude; and lying between the meridian of Cape Verde and that of the eaſternmoſt iſlands of the ſame name.

It takes its name from the almoſt continual calms, conſtant rains, and thunder and lightning, to a great degree, always found there. The winds, when they do blow, are only ſmall uncertain guſts, and ſhift about all round the compaſs; ſo that ſhips are ſometimes detained here a long while, and can make but very little way.

RAINANGBONG, in *Geography*, a town of the Birman empire, ſituated near a river in which there are ſeveral wells of petroleum, whence its name ſignifying a town through which flows a river of earth-oil. N. lat. 20° 26′. E. long. 94° 46′.

RAINBOW, *Iris*, or, ſimply, the *bow*, a meteor in form of a parti-coloured arch, or ſemicircle, exhibited in a rainy ſky, oppoſite to the ſun, by the refraction of his rays in the drops of falling rain.

There is alſo a ſecondary, or fainter bow, uſually ſeen inveſting the former at ſome diſtance. Among naturaliſts, we alſo read of *lunar* rainbows, *marine* rainbows, &c.

The rainbow, ſir Iſaac Newton obſerves, never appears but where it rains in the ſun-ſhine; and it may be repreſented artificially by contriving water to fall in little drops, like rain, through which the ſun ſhining, exhibits a bow to a ſpectator placed between the ſun and the drops; eſpecially if a dark body, *e. gr.* a black cloth, be diſpoſed beyond the drops.

That the rainbow is oppoſite to the ſun, has always been obſerved. It was, therefore, natural to imagine, that the colours of it were produced by ſome kind of reflection of the rays of light from drops of rain or vapour. The regular order of the clouds was another circumſtance that could not have eſcaped the notice of any perſon. But though mere reflection had in no other caſe been obſerved to produce colours, and it could not but have been obſerved that refraction is frequently attended with that phenomenon, ſo that ſome of the ancients, as we learn from Ariſtotle's tract on meteors, knew that the rainbow was cauſed by the refraction of the ſun's light in drops of falling rain; yet no perſon ſeems to have thought of having recourſe to a proper refraction in this caſe before one Fletcher of Breſlaw, who, in a treatiſe which he publiſhed in 1571, endeavoured to account for the colours of the rainbow by means of a double refraction, and one reflection. But he imagined that a ray of light, after entering a drop of rain, and ſuffering a refraction, both at its entrance and exit, was afterwards reflected from another drop, before it reached the eye of the ſpectator. He ſeems to have overlooked the reflection at the farther ſide of the drop, or to have imagined that all the bendings of the light within the drop would not make a ſufficient curvature, to bring the ray of the ſun to the eye of the ſpectator. Antonio de Dominis, biſhop of Spalato, whoſe treatiſe, "De Radiis Viſus et Lucis," was publiſhed by I. Bartolus, in 1611, was the firſt perſon who advanced, that the double refraction of Fletcher, with an intervening reflection, was ſufficient to produce the colours of the rainbow, and alſo to bring the rays that formed them to the eye of the ſpectator, without any ſubſequent reflection. He diſtinctly deſcribes the progreſs of a ray of light entering the upper part of the drop, where it ſuffers one refraction, and after being thereby thrown upon the back part of the inner ſurface, is from thence reflected to the lower part of the drop; at which place undergoing a ſecond refraction, it is thereby bent ſo as to come directly to the eye. To verify this hypotheſis, he procured a ſmall globe of ſolid glaſs, and viewing it when it was expoſed to the rays of the ſun, in the ſame manner in which he had ſuppoſed that the drops of rain were ſituated with reſpect to them, he actually obſerved the ſame colours which he had ſeen in the true rainbow, and in the ſame order. The theory of A. de Dominis was adopted, and in ſome degree improved, by Deſcartes. Philoſophers were, however, for a long time at a loſs when they endeavoured to aſſign reaſons for all the particular colours, and for the order of them. Indeed, nothing but the doctrine of the different refrangibility of the rays of light, which was a diſcovery reſerved for the great ſir Iſaac Newton, could furniſh a complete ſolution of this difficulty.

Dr. Barrow, in his "Lectiones Opticæ," (Lect. 12. n. 14.) ſays, that a friend of his, meaning Mr. Newton, communicated to him a method of determining the angle of the rainbow, which was hinted to Newton by Sluſius, without making a table of the refractions, as Deſcartes did. The doctor ſhews the method, with other curious particulars. But the ſubject was given more perfectly by Newton afterwards, in his "Optics," prop. 9; where he makes the breadth of the interior bow to be nearly 2° 15′, that of the exterior 3° 40′, their diſtance 8° 25′, the greateſt ſemidiameter of the interior bow 42° 17′, and the leaſt of the exterior 50° 42′, when their colours appear ſtrong and perfect.

RAINBOW, *Theory of the*. To conceive the origin of the rainbow, let us conſider what will befall rays of light coming from a very remote body, *e. gr.* the ſun, and falling on a globe of water, ſuch as we know a drop of rain to be.

Suppoſe, then, A D K N (*Plate* XVIII. *Optics, fig.* 1.) to be a drop of rain, and the lines E F, B A, O N, to be rays of light coming from the centre of the ſun; which, on account of the immenſe diſtance of the ſun, we conceive to be parallel.

Now the ray B A being the only one that falls perpendicularly on the ſurface of the water, and all the reſt obliquely, it is eaſily inferred, that all the other rays will be refracted towards the perpendicular. (See REFRACTION.) Thus the ray E F, and others accompanying it, will not go on ſtraight to G; but as they arrive at H I, they will deflect from F to K; where ſome of them, probably, eſcaping into the air, the reſt are reflected upon the line K N, ſo as to make the angles of incidence and reflection equal.

Farther, as the ray K N, and thoſe accompanying it, fall obliquely upon the ſurface of the globule, they cannot paſs out into the air, without being refracted, ſo as to recede from the perpendicular L M; and, therefore, they will not proceed ſtraight to Y, but will deflect to P.

It may be here obſerved, that ſome of the rays, arriving at N, do not paſs out into the air, but are again reflected to Q; where being refracted, like the reſt, they do not proceed right to Z; but, declining from the perpendicular T V, are carried to R; but ſince we here only regard the rays as they may affect the eye placed a little below the drop, *e. gr.* at P, thoſe which deflect from N to Q, we ſet aſide, as uſeleſs; becauſe they never come to the eye. On the contrary, it is to be obſerved, that there are other

rays,

rays, as 2 3, and the like; which, being refracted from 3 to 4, and reflected to 5, and from 5 to 6, may at length, by refraction at 6, arrive at the eye 7, placed beneath the drop.

Thus much is obvious; but to determine precisely the quantities of refraction of each ray, there must be a calculation; by such calculation it appears, that the rays which fall on the quadrant A D, are continued in lines, like those here drawn in the drop A D K N; wherein there are three things very considerable: first, that the two refractions of the rays, in their ingress and egress, are both the same way; so that the latter does not destroy the effect of the former. Secondly, that of all the rays passing out of A N, N P, and those adjoining to it, are the only ones capable of affecting the sense, as being sufficiently close and contiguous, and because they come out parallel; whereas the rest are diverging, and dispersed too far to have any sensible effect, at least to produce any thing so vivid as the colours of the bow. Thirdly, that the ray N P has shade or darkness under it; for, since there is no ray comes out of the surface N 4, it is the same thing as if the part were covered with an opaque body. We might add that the same ray N P has darkness above it; since the rays that are above it are ineffectual, and signify no more than if there were none at all.

Add to this, that all the effectual rays have the same point of reflection, *i. e.* the parallel and contiguous rays, which alone are effectual after refraction, will all meet in the same point of the circumference, and be reflected thence to the eyes.

Farther, it appears, that the angle O N P, included between the ray N P, and the line O N drawn from the centre of the sun, is the angle by which the rainbow is distant from the opposite point of the sun, and which makes the semidiameter of the bow. The method of determining it will be seen in the sequel of the article. But since, besides those rays coming from the centre of the sun to the drop of water, there are many more from the several points of its surface; there are a great many other effectual rays to be considered, especially that from the uppermost, and that from the lowest part of the sun's body.

Since, then, the apparent semidiameter of the sun is about 16 minutes, it follows, that an effectual ray from the upper part of the sun will fall higher than the ray E F by 16 minutes: thus does the ray G H (*fig.* 2.) which, being refracted as much as E F, deflects to I, thence to L, and at length emerging equally refracted with the ray N P, proceeds to M; and makes an angle O N M with the line O N. In the like manner, the effectual ray Q R coming from the lowest part of the sun, falls on the point R, 16 minutes lower than the point F on which the ray E F falls; and this, being refracted, declines to S, whence it is reflected to T; where, emerging into the air, it proceeds to V; so that the line T V, and the ray O T, contain an angle whose magnitude will be ascertained. Again, upon computing the deflections of the rays, which like that 23 (*fig.* 1.) coming from the centre of the sun, and being received into the lower part of the drop, we have supposed to be twice reflected, and twice refracted, and to enter the eye by lines like that 67 (*fig.* 3.) we find that which may be accounted effectual, as 67 with the line 86 drawn from the centre of the sun, contains an angle 867; whence it follows, that the effectual ray from the highest part of the sun, with the same line 86, includes an angle less by 16 minutes; and that from the lowest part of the sun, an angle greater by 16 minutes.

Thus, since A B C D E F is the path of the efficacious ray from the highest part of the sun to the eye in F, the angle 86 F becomes of a certain magnitude ascertained below. In like manner, since G H I K L M is the way of an effectual ray from the lowest part of the sun to the eye, the angle 86 M becomes greater than the former by 16 minutes.

Since, then, we admit several rays to be effectual, besides those from the centre of the sun, what we have said of the shade will need some alteration; for of the three rays described (*figs.* 2 and 3.), only the two extreme ones will have a shadow joined to them, and that only on the outer side. Hence it is evident, that these rays are perfectly disposed to exhibit all the colours of the prism.

For the great quantity of dense or intense light, *i. e.* the bundle of rays collected together in a certain point, *v. gr.* in the point of reflection of the effectual rays, may be accounted as a lucid or radiant body, terminated all around by shade. But the several rays, thus emitted to the eye, are both of different colours; that is, they are fitted to excite in us the ideas of different colours; and are differently refracted out of the water into the air, notwithstanding their falling alike upon the refracting surface.

Hence it follows, that the different or heterogeneous rays will be separated from one another, and will tend separate ways; and the homogeneous rays will be collected, and tend the same way; and, therefore, this lucid point of the drop in which the refraction is effected, will appear fringed or bordered with several colours; that is, red, green, and blue colours will arise from the extremes of the red, green, and blue rays of the sun, transmitted to the eye from several drops, one higher than another, after the same manner as is done in viewing lucid or other bodies through a prism.

Thus, adds sir Isaac Newton, the rays that differ in refrangibility, will emerge at different angles; and, consequently, according to their different degrees of refrangibility, emerging most copiously at different angles, they will exhibit different colours in different places.

A great number, then, of these little globules being diffused in the air, will fill the whole space with these different colours; provided they be so disposed as that effectual rays may come from them to the eye; and thus will the rainbow, at length, arise.

Now, to determine what that *disposition* must be, suppose a right line drawn from the centre of the sun through the eye of the spectator, as the line V X (*fig.* 2.) called the *line of aspect*, or *axis of vision*; being drawn from so remote a point, it may be esteemed parallel to all other lines drawn from the same point; but a right line, falling on two parallels, makes the alternate angles equal.

If, then, an indefinite number of lines be imagined drawn from the spectator's eye to a part opposite to the sun where it rains; which lines make different angles with the line of aspect, equal to the angles of refraction of the differently refrangible rays, these lines, falling on drops of rain illumined by the sun, will make angles of the same magnitude with rays drawn from the centre of the sun to the same drops. And, therefore, the lines thus drawn from the eye will represent the effectual rays that occasion the sensation of any colour.

Now it is known, that the eye, being placed in the vertex of a cone, sees objects upon its surface, as if they were in a circle; and the eye of our spectator is here in the common vertex of several cones, formed by the several kinds of efficacious rays, with the line of aspect. Now in the surface of that whose angle at the vertex, or eye, is the greatest, and in which the others are included, are those drops, or parts

of drops, which appear red; and in the ſurface of that cone whoſe angle is leaſt, are the purple drops; and in the intermediate cones, are the green, blue, &c. drops. Hence, then, ſeveral kinds of the drops muſt appear as if diſpoſed into ſo many circular coloured faſciæ, or arches, as we ſee in the rainbow. (Rohault's Syſtem of Nat. Phil. vol. ii. part iii. cap. 17.) This part of the ſolution ſir Iſaac Newton expreſſes more preciſely, thus: ſuppoſe O (*fig.* 4.) the eye, and O P a line parallel to the ſun's rays; and let P O E, P O F, be angles of 40° 17′, and 42° 2′. And ſuppoſe the angles to turn about their common ſide O P, with their other ſides O E and O F, they will deſcribe the bounds, or verges, of the rainbow.

For if E, F be drops placed any where in the conical ſurface deſcribed by O E, O F, and be illuminated by the ſun's rays S E, S F; the angle S E O being equal to the angle P O E, or 40° 17′, ſhall be the greateſt angle in which the moſt refrangible rays can, after reflection, be refracted to the eye; and, therefore, all the drops in the line O E ſhall ſend the moſt refrangible rays moſt copiouſly to the eye, and therefore ſtrike the ſenſes with the deepeſt violet colour in that region.

And in like manner the angle S F O being = to the angle P O F = 42° 2′, ſhall be the greateſt in which the leaſt refrangible rays after one reflection can emerge out of the drops; and theſe rays ſhall come moſt copiouſly to the eye from the drops in the line O F, and ſtrike the ſenſes with the deepeſt red colour in that region.

And, by the ſame argument, the rays which have intermediate degrees of refrangibility, ſhall come moſt copiouſly from drops between E and F, and ſo ſtrike the ſenſes with the intermediate colours, in the order which their degrees of refrangibility require; that is, in the progreſs from E to F, or from the inſide of the bow to the outſide, in this order; violet, indigo, blue, green, yellow, orange, red; though the violet, by the mixture of the white light of the clouds, will appear faint, and incline to a purple.

Here it may be obſerved, that all the rays but the violet in the line S E will emerge from E in a greater angle than S E O made by the violet, and conſequently will paſs below the eye; and all the rays but the red in the line S F will emerge from F in a leſs angle than S F O made by the red, and conſequently will paſs above the eye; by which means only red will appear in the line S F, and only violet in the line S E.

And, ſince the lines O E, O F, may be ſituated any where in the above-mentioned conical ſurface; what is ſaid of the drops and colours of theſe lines, is to be underſtood of the drops and colours throughout the whole ſuperficies. Thus is the *primary* or *inner bow* formed.

Rainbow, *Secondary*, or *Outer*. As to the ſecondary, or fainter bow, uſually ſurrounding the former, in aſſigning what drops would appear coloured, we excluded ſuch as lines drawn from the eye, making angles a little greater than 42° 2′, ſhall fall upon, but not ſuch as ſhould contain angles much greater.

For, if an indefinite number of ſuch lines be drawn from the ſpectator's eye, ſome of which make angles of 50° 57′, with the line of aſpect, *e. gr.* O G; other angles, of 54° 7′, *e. gr.* O H; thoſe drops on which theſe lines fall muſt of neceſſity exhibit colours; particularly thoſe of 50° 57′.

E. gr. The drop G will appear red; the line G O being the ſame with an effectual ray; which, after two reflections, and two refractions, exhibits a red colour. Again, thoſe drops which receive lines of 54° 7′, *e. gr.* the drop H, will appear purple; the line O H being the ſame with an effectual ray; which, after two reflections and two refractions, exhibits purple.

Now there being a ſufficient number of theſe drops, it is evident there muſt be a ſecond rainbow, formed after the like manner as the firſt.

Thus, according to ſir Iſaac Newton, in the leaſt refrangible rays, the leaſt angle at which a drop can ſend effectual rays after two reflections, is found by computation to be 50° 57′; and in the moſt refrangible, the leaſt angle is found 54° 7′.

Suppoſe, then, O the place of the eye, as before, and P O G, P O H, to be angles of 50° 57′, and 54° 7′; and theſe angles to be turned about their common ſide O P; with their other ſides O G, O H, they will deſcribe the verges, or borders, of the rainbow C H D G.

For, if G, H be drops placed any where in the conical ſuperficies deſcribed by O G, O H, and be illuminated by the ſun's rays, the angle S G O, being equal to the angle P O G, or 50° 57′, ſhall be the leaſt angle in which the then leaſt refrangible rays can, after two reflections, emerge out of the drops; and, therefore, the leaſt refrangible rays ſhall come moſt copiouſly to the eye from the drops in the line O G, and ſtrike the ſenſes with the deepeſt red in that region.

And the angle S H O being equal to P O H, 54° 7′, ſhall be the leaſt angle in which the moſt refrangible rays, after two reflections, can emerge out of the drops; and, therefore, thoſe rays ſhall come moſt copiouſly to the eye from the drops in the line O H, and ſo ſtrike the ſenſes with the deepeſt violet in that region.

And, by the ſame argument, the drops in the region, between G and H, ſhall ſtrike the ſenſes with the intermediate colours, in the order which their degrees of refrangibility require; that is, in the progreſs from G to H, or from the inſide of the bow to the outer, in this order: red, orange, yellow, green, blue, indigo, violet.

And ſince the lines O G, O H, may be ſituated any where in the conical ſurface; what is ſaid of the drops and colours in theſe lines is to be underſtood of the drops and colours every where in this ſuperficies.

Thus are formed two bows, an *interior* and ſtronger, by one reflection; and an *exterior* and fainter, by two; the light becoming weaker and weaker by every reflection.

Their colours will lie in a contrary order to one another; the firſt having the red without, and the purple within; and the ſecond, the purple without, and red within; and ſo of the reſt.

Rainbow, *Artificial*. This doctrine of the rainbow is confirmed by an eaſy experiment; for upon hanging up a glaſs globe, full of water, in the ſun-ſhine, and viewing it in ſuch a poſture as that the rays, which come from the globe to the eye, may, with the ſun's rays, include an angle either of 42°, or 50°; if, *e. gr.* the angle be about 42°, the ſpectator, ſuppoſed at O, will ſee a full red colour in that ſide of the globe oppoſite to the ſun, as at F. And if that angle be made a little leſs, ſuppoſe by depreſſing the globule to E, the other colours, yellow, green, and blue, will appear ſucceſſively, in the ſame ſide of the globe, alſo exceedingly bright.

But if the angle be made about 50°, ſuppoſe by raiſing the globule to G, there will appear a red colour in that ſide of the globe towards the ſun, though ſomewhat faint; and if the angle be made greater, ſuppoſe by raiſing the globe to H, this red will change ſucceſſively to the other colours, yellow, green, and blue.

The ſame thing is obſerved in letting the globe reſt, and raiſing or depreſſing the eye ſo as to make the angle of a juſt

magnitude. Newton's Optics, part ii. prop. 9. prob. 4. p. 147, ed. 3.

RAINBOW, *Dimenſion of the.*—Deſcartes firſt determined its diameter by a tentative and indirect method; laying it down, that the magnitude of the bow depends on the degree of refraction of the fluid; and aſſuming the ratio of the ſine of incidence to that of refraction to be in water as 250 to 187.

But Dr. Halley has ſince, in the Philoſophical Tranſactions, N° 267, given us a ſimple direct method of determining the diameter of the rainbow from the ratio of refraction of the fluid being given; or, *vice verſâ*, the diameter of the rainbow being given, to determine the refractive power of the fluid.

The principles of Dr. Halley's conſtruction for this purpoſe, illuſtrated and facilitated by Dr. Morgan, biſhop of Ely, will be underſtood from the following view of them. Let SN, *sn*, (*Plate* XVIII. *Optics*, *fig.* 5.) be two of the efficacious rays incident upon a drop of rain; theſe, when refracted to the ſame point F, and thence reflected to G, *g*, will have the parts within the drop on one ſide NF, *n*F, equal to thoſe on the other ſide FG, F*g*, from the nature of the circle, and becauſe the angles of incidence CFN, CF*n*, are equal to the angles of reflection CFG, CF*g*. And ſince the parts within the drop are equal and alike ſituated, they will be ſimilarly ſituated with regard to the drop itſelf; and, conſequently, as the incident rays SN, S*n*, are ſuppoſed to be parallel, the emergent rays GR, *gr*, will be alſo parallel. From C, the centre, draw the radii CN, C*n*, CF, then will CNF = CFN be the angle of refraction, and the ſmall arc N*n* is the naſcent increment of the angle of incidence BCN; and as it meaſures the angle at the centre NC*n*, it is double of the angle at the circumference upon the ſame arc, *viz.* NF*n*, which is the naſcent increment of the angle of refraction NFC. Farther, let the ray SN (*fig.* 6.) enter the lower part of the drop, and be twice reflected within the drop at F and G; then is the ray NF equal to the ray FG, and the arc NF = the arc FG. Draw *fg* parallel to FG, and it will be the reflected part of ſome ray *sn*, whoſe obliquity to the drop makes it croſs the ray NF in its refraction; then will the part *nf* = *fg*, and the arc *nf* = *fg*, and the ſmall arc F*f* = G*g*. Therefore, 2F*f* = (F*f* + G*g* = the arc FG − *fg* = NF − *nf* =) N*n* − F*f*; conſequently N*n* = 3F*f*, *i. e.* the naſcent increment of the angle of incidence is equal to three times that of the angle of refraction. After a like manner it may be ſhewn, that after three, four, five, &c. reflections, the increment of the angle of incidence will be four, five, ſix, &c. times greater than that of the angle of refraction. Hence, in order to find the angle of incidence of an efficacious ray, after any given number of reflections, we are to find an angle whoſe naſcent increment has the ſame ratio to the increment of its correſponding angle of refraction, generated in the ſame time, as the given number of reflections (*n*) increaſed by unity has to unity; *i. e.* as *n* + 1 to 1. But theſe increments are as the tangents of the reſpective angles directly. For, let ACD, ABD (*fig.* 7.) be the angles of incidence and refraction propoſed; and if we ſuppoſe the line AC to move about the point A in the plane of thoſe angles, the extremity of it, C, will deſcribe the circular arc C*c*; and when AC is arrived at the ſituation A*c*, the line BD will be thereby removed into the ſituation B*d*. Draw *c*D, then is the angle ACD = ABC + CAB, and the angle A*cd* = AB*c* + *c*AB; therefore the exceſs of A*cd* above ACD, or the increment of ACD, is equal to both the angles CB*c* and CA*c*. But ſince the angle A*c*C differs infinitely little from a right one, a circle deſcribed on the diameter AC ſhall paſs through the points D and *c*; and, therefore, the angles CA*c*, CD*c*, (inſiſting on the ſame arc C*c* of the ſaid circle) will be equal; and, therefore, the increment of the angle ACD is equal to CB*c* + CD*c* = D*cd*. But the naſcent angles D*cd* and DB*c* are as their ſines, that is, as their oppoſite ſides BD and D*c* = DC, the angle CD*c* being infinitely ſmall; but BD : CD :: DE : DA (the line BE being parallel to AC) :: tangent of the angle EBD = ACD : tangent of the angle ABD. Therefore the increment D*cd* of the angle ACD is to the increment CB*c* of the angle ABD (generated in the ſame time) as the tangent of the former to the tangent of the latter directly. Hence the praxis is as follows:

Firſt, *The ratio of the ſine of incidence* I, *to the ſine of refraction* R, *being given; to find the angles of incidence, and refraction of a ray, which becomes effectual after any given number* (*n*) *of reflections.*—Suppoſe any given line, as AC (*fig.* 8.) which divide in D; ſo as that AC : AD :: I : R; and again divide it in E, ſo that AC may be to AE as the given number of reflections, increaſed by unity, is to unity; *i. e.* as *n* + 1 : 1. Upon the diameter CE deſcribe a ſemicircle CBE, and from the centre A, with the radius AD, deſcribe an arc DB interſecting the ſemicircle in B; then drawing AB, CB, and letting fall the perpendicular AF on CB produced; ABC, or its complement to two right angles, ABF, will be the angle of incidence; and ACB the angle of refraction required. For, drawing BE parallel to AF, the triangles ACF and ECB are ſimilar. Now, the ſine of the angle ABC, or ABF, is to the ſine of ACB as AC to AB = AD, *i. e.* as I to R; therefore if ABF be the angle of incidence, ACF will be the angle of refraction. Moreover, the naſcent increment of ABF is to that of ACB (generated in the ſame time) as CF : BF :: CA : AE, on account of the ſimilar triagles; *i. e.* as *n* + 1 to 1, by conſtruction. The ratio, therefore, of the naſcent increment of the angle of incidence ABF to that of the angle of refraction ACB, is that which is required in the angles of incidence and refraction of an efficacious ray, after a given number of reflections; conſequently the angles ABF and ACF are thoſe required. From this conſtruction we may eaſily deduce ſir Iſaac Newton's rule for finding the angle of incidence ABF. See his Optics, p. 148, 149.

For $AC : AB :: I : R$; whence $AC = \frac{I}{R} \times AB$;

and $CF : BF :: n + 1 : 1$; therefore $CF = \overline{n + 1} \times BF$; or (putting $n + 1 = m$) $CF = m \times BF$; and, on account of the right angle at F, $AC^2 - CF^2 = AB^2 - BF^2$, *i. e.* $\frac{II}{RR} AB^2 - m^2 BF^2 = AB^2 - BF^2$; and, therefore, $m^2 BF^2 - BF^2 = \frac{II}{RR} AB^2 - AB^2$; and, conſequently, $\frac{BF}{AB} = \sqrt{\frac{II - RR}{m^2 R^2 - R^2}}$. Hence, becauſe in the firſt bow, the ray emerges after one reflection, we have $n = 1$, $m = 2$, $m^2 = 4$, and $m^2 - 1 = 3$; therefore, $\sqrt{3RR} : \sqrt{II - RR} :: AB : BF$ :: radius : coſine of the angle of incidence. In the ſecond bow, where there are two reflections, $m^2 - 1 = 8$; whence $\sqrt{8RR} : \sqrt{II - RR} :: AB : BF$. In the third bow, after three reflections, $m^2 - 1 = 15$; and $\sqrt{15RR} : \sqrt{II - RR}$ :: AB

:: A B : B F, and so on for any given number of reflections. Wherefore, supposing the ratio of refraction to be, as sir Isaac Newton has determined it, *viz.* as 108 to 81 in the red rays, and as 109 to 81 in the violet rays; we shall have I (in the least refrangible rays) = 108, I I = 11664; and R = 81, and R R = 6561, and $I^2 - R^2 = 5103$, $\sqrt{3\,R\,R} = 140.3$, and $\sqrt{I^2 - R^2} = 71.4$: therefore,

As $\sqrt{3\,R\,R} = 140.3$, whose logarithm is	2.147045
Is to $\sqrt{I^2 - R^2} = 71.4$ - -	1.853913
So is radius - - -	10.000000
To the cosine of the angle of incidence, B A F = 30° 37′ - -	9.706868

Hence the angle of incidence A B F is 59° 23′ in the red rays.

Secondly, *Having given the angle of incidence, and the ratio of* I *to* R, *or of refraction; to find the angle which a ray of light emerging out of a refracting sphere, after a given number of refractions, makes with the axis of vision, or an incident ray; and, consequently, to find the diameter of the rainbow.* The angle of incidence, and the ratio of refraction, being given, the angle of refraction is given; which angle being multiplied by double the number of reflections increased by 2, and double the angle of incidence subtracted from the product, the angle remaining is the angle sought.

In order to find the angle of refraction, say

As I = 108, whose logarithm is -	2.033424
Is to R = 81 - - -	1.908485
So is the sine of incidence 59° 23′ -	9.934798
To the sine of the angle of refraction 40° 12′	9.809859

Then, making the angle C N F (*fig.* 9.) = 40° 12′, N F will be the refracted ray, which at F is reflected into F G, and at G emerges in G R. Produce the incident and emergent rays S N and R G, till they intersect each other at X, and as C F bisects the angle N F G, it will, if produced, bisect the angle S X R. Then C F N = C X N + F N X; but F N X = C N X − C N F, or C F N; therefore C F N = C X N + C N X − C F N; that is, 2 C F N − C N X = C X N; or 80° 24′ − 59° 23′ = 21° 1′ = C X N; therefore 2 C X N = S X R = 42° 2′, which is the measure of the angle that the incident and emerging rays, which are the least refrangible, contain with each other. If instead of the ratio 108 to 81, we take that of 109 to 81, we shall find the values of $\sqrt{3\,R\,R}$, and $\sqrt{I^2 - R^2}$, such as will give the angle of incidence B C N, and the arc B N = 58° 40′, and the angle S X R = 40° 17′, for the most refrangible, or extreme violet rays.

If the ray be twice reflected, *viz.* at F and G, as in the production of the extreme bow, and emerges at H in the direction H A, intersecting the incident ray S N in Y, we may find the angle A Y S thus: produce A H till it meets G X, produced in R; then in the triangle H G R, the external angle H G X = H R G + G H R. But because of equal angles of reflection at F and G, G H R = F G X, therefore H G X − F G X = H G F = H R G = 2 C G F, or C N F. But S X R = 4 C N F − 2 C N X; therefore in the triangle Y X R we have the two internal angles R + X = 6 C N F − 2 C N X = the external angle at Y, *viz.* A Y N. In this case, to find the angles of incidence and refraction, we have $\sqrt{8\,R\,R} : \sqrt{I^2 - R^2}$ :: radius : cosine of the angle of incidence; whence the said angle will be found 71° 50′ = C N X. And as 108 : 81 :: sine of 71° 50′ : sine of 45° 27′ = C N F, the angle of refraction; therefore $\overline{6 \times 45° 27'} - \overline{2 \times 71° 50'} = 129° 3' = A Y N$; and, therefore, its complement A Y S = 50° 57′, the angle required for the least refrangible rays. But for the most refrangible rays, where I : R :: 109 : 81, we have the angle of incidence 71° 26′, and the angle of refraction 44° 47′; and, therefore, the angle A Y S = 54° 7′. In the same manner the same angles are calculated after three or four reflections.

From the preceding problems we obtain the following results, *viz.*

I. Rainbow,	Red	42°	2′	The spectator's back being turned to the sun.
	Violet	40	17	
II. Rainbow,	Red	50	57	
	Violet	54	7	

If the angle made by a ray, after three or four reflections, were required, and therefore the diameters of the third and fourth rainbow (which are scarcely ever seen, on account of the great diminution of the rays, by so many repeated reflections) they will be found,

III. Rainbow,	Red	41°	37′	The spectator being turned towards the sun.
	Violet	37	9	
IV. Rainbow,	Red	43	52	
	Violet	49	34	

Dr. Morgan's Dissertation upon the Rainbow, among the notes upon Rohault's System of Philosophy, part iii. chap. xvii.

Hence, the breadth of the rainbows is easily found: for the greatest semi-diameter of the first bow, *i. e.* from red to red, being 42° 2′, and the least, *viz.* from violet to violet, 40° 17′, the breadth of the fascia or bow, measured across from red to violet, will be 1° 45′; and the greatest diameter of the second bow being 54° 7′, and the least 50° 57′, the breadth of the fascia will be 3° 10′. And hence the distance between the two will be found 8° 55′.

In these measures the sun is only esteemed a point; wherefore, as his diameter is really about 30′, or 32′, so much must be added to the breadth of each fascia or bow, from red to violet, and so much must be subtracted from the distance between them.

This will leave the breadth of the primary bow, 2° 15′; that of the secondary bow, 3° 40′; and the interval between the bows, 8° 25′; which dimensions, deduced by calculation, sir Isaac Newton assures us from his own observations, agree very exactly with those found by actual mensuration in the heavens. Optics, p. 153. ed. 3.

Rainbow, *Particular Phenomena of the.* From this theory of the rainbow, all the particular phenomena of it are easily deduced: hence we see why the iris is always of the same breadth; because the intermediate degrees of refrangibility of the rays between red and violet, which are its extreme colours, are always the same. See *Apparent* Magnitude.

Secondly, Why it is more distinctly terminated on the side of the red than on that of the violet? there being no efficacious rays in the space adjoining to the red drops, *i. e.* to the space between the bows, whence it terminates abruptly; whereas, in the space on the side of the violet ones, there are some rays emitted to the eye, which, though too feeble to affect it strongly, yet have this effect, that they soften the violet edge insensibly, so that it is difficult to determine precisely where it terminates.

Thirdly, Why the bow shifts its situation as the eye does; and, as the popular phrase has it, *flies from those who follow it; and follows those that fly from it?* the coloured drops being disposed under a certain angle about the axis of vision, which

is different in different places: whence alſo it follows, that every different ſpectator ſees a different bow.

Fourthly, Why the bow is ſometimes a larger portion of a circle, ſometimes a leſs? its magnitude depending on the greater or leſs part of the ſurface of the cone, above the ſurface of the earth, at the time of its appearance; and that part being greater or leſs, as the line of aſpect, or axis of viſion, is more inclined or oblique to the ſurface of the earth; which inclination, or obliquity, is greater as the ſun is higher: whence, alſo, the higher the ſun, always the leſs the rainbow.

Fifthly, Why the bow never appears when the ſun is above a certain altitude? the ſurface of the cone, in which it ſhould be ſeen, being loſt in the ground, at a little diſtance from the eye, when the ſun is above 42° high.

Sixthly, Why the bow never appears greater than a ſemicircle, on a plane? ſince be the ſun ever ſo low, and even in the horizon, the centre of the bow is ſtill in the line of aſpect; which, in this caſe, runs along the earth, and is not at all raiſed above the ſurface.

Indeed, if the ſpectator be placed on a very conſiderable eminence, and the ſun in the horizon, the line of aſpect, wherein the centre of the bow is, will be notably raiſed above the horizon (conſidering the magnitude of the circle whereof the bow uſes to be a part). Nay, if the eminence be very high, and the rain near, it is poſſible the bow may be an entire circle.

Seventhly, How the bow may chance to appear inverted, *i. e.* the concave ſide be turned upwards? *viz.* a cloud happening to intercept the rays, and prevent their ſhining on the upper part of the arch: in which caſe, only the lower part appearing, the bow will ſeem as if turned upſide down; which, probably, has been the caſe in ſeveral prodigies of this kind, related by authors.

Indeed the bow may appear inverted from another cauſe: for, if when the ſun is 41° 46′ high, his rays fall upon the ſmooth ſurface of ſome ſpacious lake, in the middle of which a ſpectator is placed; and if, at the ſame time, there be rain falling, to which the rays may be reflected from the lake, it will be the ſame as if the ſun ſhould ſhine below the horizon, and the line of view be extended upwards: thus the ſurface of the cone, wherein the coloured drops are to be placed, will be wholly above the ſurface of the earth.

But ſince the upper part will fall among the unbroken clouds, and only the lower part be found among the drops of rain, the arch will be inverted.

Eighthly, Why the bow ſometimes appears inclined? the accurate roundneſs of the bow depending on its great diſtance, which prevents us from judging of it exactly; if the rain, which exhibits it, chance to be much nearer, we ſhall ſee its irregularities; and if the wind, in that caſe, drive the rain ſo that the higher part be farther from the eye than the lower, the bow will appear inclined.

Ninthly, Why the legs of the rainbow ſometimes appear unequally diſtant? if the rain terminate on the ſide of the ſpectator, in a plane ſo inclined to the line of aſpect as to make an acute angle on the left hand, and an obtuſe angle on the right, the ſurface of the cone, which determines what drops will appear, will fall upon them in ſuch manner as that thoſe on the left hand will appear farther from the eye than thoſe on the right. For the line of aſpect being perpendicular to the plane of the bow, if you ſuppoſe two rectangular triangles, a right and left, the cathetus of each to be the line of view, and the baſe of the ſemi-diameter of the bow, inclined as above; it is evident, ſince thoſe angles of the triangles, next the eye, muſt always be the ſame (*viz.* 43° in the inner bow), the baſis of the right-hand triangle will, in this caſe, appear much longer than that of the left.

Dr. Langwith, in the Phil. Tranſ. N° 375, deſcribes a remarkable rainbow, in which he obſerved ſeveral ſeries of colours, which increaſed the bow to a breadth far exceeding what had been determined by calculation. The colours of the primary rainbow, he ſays, were as uſual; under this was an arch of green, and then alternately two arches of reddiſh-purple, and two of green, and under all a faint appearance of another arch of purple. The order of the colours was, 1. Red, orange, yellow, green, light blue, deep blue, and purple. 2. Light green, dark green, and purple. 3. Green and purple. 4. Green, and faint vaniſhing purple.

M. Bouguer frequently ſaw a phenomenon of this kind, when he was upon the mountains of Peru, where the ſky is often extremely ſerene. Similar appearances have been alſo obſerved by others. Dr. Pemberton has attempted to explain them by means of the Newtonian doctrine of fits of eaſy reflection and tranſmiſſion; but he goes upon the ſuppoſition that the differently-coloured rays have their ſeparate fits, on their arrival at the ſurface of any medium, without any regard to the thickneſs of it; whereas it is plain, that, in ſuch a caſe, all kinds of rays are reflected or tranſmitted promiſcuouſly. It is moſt probable that theſe colours are formed in very minute drops of water or vapour, intermixed with the larger drops, that their formation depends upon the ſame principle with the colours of thin plates, and that they are ſimilar to thoſe of ſeveral kinds of halos. Dr. Pemberton himſelf obſerves, that it is moſt likely that theſe additional rings of colours are formed in the vapour of the cloud, which the air, being put in motion by the fall of the rain, may carry down along with the large drops. This, he ſays, may be the reaſon why theſe colours appear under the upper part of the bow only, this vapour not deſcending very low. As a farther confirmation of this, theſe colours, he obſerves, are ſeen ſtrongeſt when the rain falls from very black clouds, which cauſe the fierceſt rains; by the fall of which the air will be moſt agitated. Phil. Tranſ. abr. vol. vi. p. 140. Prieſtley on Light and Colours, p. 593.

It has been a ſubject of controverſy among biblical critics, whether the antediluvian atmoſphere preſented any ſuch phenomenon as a rainbow. The occaſion of this debate is a paſſage in Geneſis, ch. ix. 12—17. Mr. Whitehurſt, in his "Inquiry into the original State and Formation of the Earth, &c." attempts to eſtabliſh the probability that the antediluvian atmoſphere was ſo uniformly temperate, as to be ſubject to no ſtorms, tempeſts, or rain. The opinion is by no means probable, nor does the above-cited paſſage warrant any ſuch concluſion. The rainbow was then made the ſign or token of God's covenant with Noah, that no ſuch calamity ſhould again take place. אות denotes a ſign or token, and in this ſenſe it is uſed in the caſe of Cain, Gen. iv. 15. The mark ſet upon Cain was, as Shuckford conceives, a ſign or token (אות) given to him, that he ſhould be preſerved from the evil which he deprecated.

Rainbow, *Lunar*. The moon ſometimes alſo exhibits the phenomenon of an iris, or bow, by the refraction of her rays in the drops of rain in the night-time.

Ariſtotle ſays, he was the firſt that ever obſerved it; and adds, that it never happens, *i. e.* is never viſible, but at the time of the full moon; her light, at other times, being too faint to affect the ſight after two refractions, and one reflection.

The lunar iris has all the colours of the ſolar, very diſtinct and pleaſant; only faint, in compariſon of the other; both

both from the different intenſity of the rays, and the different diſpoſition of the medium.

In that mentioned, Philoſophical Tranſactions, N° 331, Mr. Thoreſby obſerves, the largeneſs of the arch was not ſo much leſs than that of the ſun, as the different dimenſions of their bodies, and their diſtances from the earth, ſhould ſeem to require; but as to its entireneſs, and the beauty of its colour, it was admirable. This continued about ten minutes before the interpoſition of a cloud hindered its obſervation.

RAINBOW, *Marine.* The marine or ſea-bow is a phenomenon ſometimes obſerved in a much agitated ſea; when the wind, ſweeping part of the tops of the waves, carries them aloft; ſo that the ſun's rays, falling upon them, are refracted, &c. as in a common ſhower, and paint the colours of the bow.

F. Bourzes, in the Philoſophical Tranſactions, obſerves, that the colours of the marine rainbow are leſs lively, leſs diſtinct, and of leſs duration, than thoſe of the common bow; that there are ſcarce above two colours diſtinguiſhable, a dark yellow on the ſide next the ſun, and a pale green on the oppoſite ſide.

But theſe bows exceed as to number, twenty or thirty being ſometimes ſeen together: they appear at noon-day, and in a poſition oppoſite to that of the common bow, *i. e.* the concave ſide is turned upwards, as indeed it is neceſſary it ſhould be, from what we have ſhewn in accounting for the phenomena of the ſolar bow. A coloured bow is always to be ſeen in the ſcattered water of a jet, a broken caſcade, and the like, when the ſun and the ſpectator are in proper ſituations.

To this claſs of bows may be referred a kind of white or colourleſs rainbows, which Mentzelius, and others, affirm to have ſeen at noon-day. M. Mariotte, in his fourth Eſſai de Phyſique, ſays, theſe bows are formed in miſts, as the others are in ſhowers; and adds, that he has ſeen ſeveral, both after ſun-riſing, and in the night.

The want of colours he attributes to the ſmallneſs of the vapours which compoſe the miſt; but we ſhould rather account for it from the exceeding tenuity of the little veſiculæ of the vapour; which being, in effect, only little watery pellicles bloated with air, the rays of light undergo but little refraction in paſſing out of air into them; too little to ſeparate the differently-coloured rays, &c.

Hence, the rays are reflected from them, compounded as they came, that is, white.

Rohault mentions coloured rainbows on the graſs, formed by the refractions of the ſun's rays in the morning dew. Trait. de Phyſ.

Rainbows have been alſo produced by the reflection of the ſun from a river; and in the Philoſophical Tranſactions, vol. I. p. 294. we have an account of a rainbow, which muſt have been formed by the exhalations from the city of London, when the ſun had been ſet twenty minutes, and conſequently the centre of the bow was above the horizon. The colours were the ſame as in the common rainbow, but fainter.

The beſt way of forming a reſemblance of a rainbow is to faſten a number of ſmall ſolid glaſs balls, or a number of ſmall glaſs bubbles full of water, upon a dark board, and to preſent the board thus furniſhed to the ſun at a proper inclination, which experience eaſily finds, whilſt you turn your back to the ſun, and look at the board.

RAINFELDEN, in *Geography*, a town of Auſtria; 2 miles W. of Hainfelden.

RAINHAM, a townſhip of Norfolk county, in Upper Canada; being the firſt townſhip fronting on lake Erie, weſt of the grand river Lands.

RAINSBRON, a town of Germany, in the margraviate of Anſpach; 3 miles N. of Creglingen.

RAINY LAKE. See *Le* PLUE.

RAJODE, a town of Hindooſtan, in Malwa; 30 miles E. of Tandla.

RAJOORA, a town of Hindooſtan, in Dowlatabad; 18 miles W.N.W. of Kondur.—Alſo, a town of Bengal; 65 miles N. of Dacca.

RAJOUR, a town of Hindooſtan, in Lahore; 36 miles N.W. of Jummoo.

RAJOWLY, a town of Hindooſtan, in Bahar; 30 miles S. of Bahar.

RAJPOOTANA, a country of the Rajpoots, generally denoting *Agimere* (which ſee), and the original country of the founder of the Mahratta ſtate, whoſe rulers, about half a century ago, aſpired at univerſal empire in Hindooſtan; but they have been reduced to their preſent low ſtate, by the depredations of Mahratta detachments, which, being compoſed of light horſe, and accuſtomed to ſeparate into ſmall parties, have, by their deſultory movements, at once ſpread deſolation, and eluded the attacks of the inhabitants. This is the fact with regard to the open parts of Rajpootana; the mountainous parts remaining free from their incurſions.

Rajpootana was divided into three great principalities, under the names of Oudipour, Joodpur, and Ambeer (or Amere), now better known by that of Joinagur, or Jyenagur. (See each reſpectively.) In Acbar's diviſion of the empire, theſe principalities were claſſed as belonging to the ſoubah of Agimere, ſometimes called Marwar. It is not eaſy to aſſign the preciſe limits and dimenſions of theſe principalities, which occupy the ſpace between the weſtern confines of Agra and the north-eaſt part of Guzerat, and between the ſandy deſert (or Regiſtan) and Malwa; that is, an extent of 330 Britiſh miles from N.E. to S.W., and 200 broad in the wideſt part. Jyenagur or Jyepour lies to the N.E., Oudipour to the S.W., and Joodpour to the N.W., bordering angularly on the other two. Père Wendell's MS., cited by Rennell, ſtates the revenues of Oudipour at 10 lacks of rupees, Marwar at 40, and Jyenagur at 40, *per annum*, in the year 1779. The whole revenue of the ſoubah of Agimere, in the time of Acbar, appears to have been only about 75 lacks. Aurungzebe is ſaid to have doubled the land-tax on the Rajpoots, and accordingly in Mr. Fraſer's account, Agimere is ſtated at 163 lacks of rupees. The two former, *viz.* Oudipour and Marwar, are very mountainous, with a ſandy ſoil in the vallies; the latter is the moſt fertile, and was, about the middle of the laſt century, in a high ſtate of improvement, under the government of the celebrated rajah Jyeſing, or Jeſſing, who founded the new capital of Jyepour, whence the name of the province was changed to that of the capital. Jyepour was a place of great wealth and commerce in 1779, being the entrepot of the principal part of the goods that are brought from every quarter of India. The rajah built an obſervatory in his capital; but the confuſions that have ſo long prevailed in this province, muſt have greatly reduced the wealth and importance of the capital. Sindia, as Rennell informs us, received the tribute of all the three Rajpoot provinces, and converted it to his uſe; and he alſo made conſiderable conqueſts in them, particularly in Jyenagur. In early times the whole Rajpootana probably conſtituted one entire kingdom, or empire, under the rana or prince of Oudipour, the head of the Rajpoot ſtates; the antiquity of whoſe houſe may be inferred from the name

Rhannæ

Rhannæ appearing in Ptolemy, nearly in its proper poſition, as a province. See OUDIPOUR.

The province of Agimere in general (ſee AGIMERE) has ever been the country of the Rajpoots; that is, the warrior tribe among the Hindoos, and which are noticed in Arrian and Diodorus; and Cheitore, or Oudipour, (conſidered by Rennell as ſynonimous,) is, in his opinion, reckoned the firſt among the Rajpoot ſtates. (See CHEITORE.) From the Ayin Acbaree we derive ſome new ideas reſpecting the diviſion of the ſoubah of Agimere. It conſiſted at that time of three grand diviſions, Marwar, Meywar, and Hadowty (or Nagore); and theſe contained ſeven circars or ſubdiviſions, Agimere, Cheitore, Rantampour, Joudypour, Sirowy, Nagore, and Beykeener (or Bicaneer). Marwar, as including the circar and fortreſs of Agimere, has become almoſt ſynonimous with Agimere, in common acceptation. The extent of this province, as given by the ſame book, is 168 coſſes, or about 320 Britiſh miles, from E. to W.; and 150 coſſes, or 285 Britiſh miles, from N. to S. Such is the province of the Rajpoots. From the indulgence granted to this tribe throughout India, *viz.* that of feeding on goats' fleſh, it may be inferred, ſays Rennell, that the cuſtom originated in this mountainous country. The grain cultivated there is chiefly of the dry kind. The taxes amounted, in the time of Acbar, to no more than a ſeventh or eighth of the produce of the harveſt. Rennell's Memoir.

RAJPOOTS, the inhabitants of *Rajpootana;* which ſee. They were not confined entirely to the ſoubah of Agimere; as ſome inferior tribes of them are ſettled in Bundelcund, and in Gurry-Mundella. Others, according to Thevenot, are ſettled in Moultan; and indeed he repreſents Moultan as the original country of the Kuttries, from whom the Rajpoots ſprung.

The Kuttries or Catries, who formed a particular ſect of Hindoos at Moultan, were the Catheri of Diodorus, and the Cathei of Arrian, with whom Alexander carried on war, on the borders of the Malli. The Rajpoots are ordinarily divided into two tribes or claſſes, *viz.* thoſe of Rathore, and Chohan or Seeſodya. Marwar, or the N.W. diviſion of Agimere, is the proper country of the former; and Meywar, or Oudipour, of the latter. The Rathore tribe were originally the moſt numerous of the two; and it has been ſaid by colonel Dow, among others, that the Mahratta chiefs had their origin from the Rathore tribe: and in proof of this it has been alleged, that the etymology of the name Mahratta has been deduced from Rathore, prefixing to it "maha," or great. (See MAHRATTA.) The Rajpoots are repreſented by Thevenot as having ſpread from Moultan, their proper country, over all the Indies. Diodorus Siculus diſtinguiſhes them by the cuſtom of their women burning themſelves alive, on the funeral piles of their huſbands; which is indeed a cuſtom among them, as well as ſome other Hindoos, at this day. Rennell.

RAJPOUR, a town of Bengal, on the bank of the Ganges; 10 miles N.N.E. of Curruckdeagh.

RAISE, in the *Manege*, is uſed for working. See RAISING.

RAISE is likewiſe uſed for placing a horſe's head right, and making him carry well, and hindering him to carry low, or to arm himſelf.

RAISE *Tacks and Sheets*, in *Sea Language*, the order to let them go in the article of tacking, that the ſails may be ſet on the contrary tack they were on before.

To RAISE *a ſiege.* See SIEGE.

RAISED AIRS. See AIR.

RAISED *Plan.* See PLAN.

RAISEEN, in *Geography*, a town of Hindooſtan, in Malwa; 15 miles S. of Biſſah. N. lat. 23° 16′. E. long. 77° 49′.

RAISER, in *Building*, a board ſet on edge under the foreſide of a ſtep, a ſtair, &c. See STAIR, &c.

RAISIN, in *Geography*, a river of America, which runs into lake Michigan, N. lat. 43° 12′. W. long. 85° 42′. —Alſo, a river of America, which runs into lake Erie, N. lat. 43° 20′. W. long. 82° 55′.

RAISIN *Iſland*, a ſmall iſland in lake St. Francis. N. lat. 45° 6′. W. long. 74° 27′.

RAISIN, or *Raiſen*, *Market*, a ſmall market-town in the eaſt diviſion of the wapentake of Walſhcroft, parts of Lindſey, and county of Lincoln, England, is ſituated on the banks of the river Raiſen, whence it derives its name, at the diſtance of 15 miles N.E. from Lincoln, and 149 miles N.W. from London. According to the population returns of 1811, it contains 164 houſes, and 964 inhabitants. Here is a weekly market on Thurſday, and there are fairs every alternate Tueſday, after Palm Sunday, and on the 25th of September. The church is an ancient ſtructure, and is remarkable for the peculiar form of the upper windows in its embattled tower. Theſe have a pointed arch, divided into two pointed lights, and a quaterfoil head. Up the centre runs a ſtrong mullion, croſſed by a tranſom, terminating at the impoſts, as happens in the church of Yarborough, near Louth, which renders it probable that both edifices were erected by the ſame architect. The living is a vicarage in the gift of the crown; and by the endowment the vicar is entitled to the unuſual tythe of ale. Beſides the church, there are in Raiſin a Roman Catholic chapel, and a Methodiſt's meeting-houſe; alſo a free-ſchool, and an hoſpital for poor old men.

At a ſhort diſtance from Market-Raiſin, are the villages of Middle and Weſt Raiſin. Middle Raiſin was formerly divided into two pariſhes, called Drax and Tupholm, but theſe are now united. At Tupholm ſtood an abbey of Premonſtratenſian canons, which was founded in the reign of Henry II., by Alan de Neville, and his brother Gilbert. Previous to the diſſolution, it was inhabited by nine monks, whoſe annual income, according to Speed, amounted to 119*l.* 2*s.* 8*d.* The church is a ſmall, but ancient building, conſiſting of a nave and chancel, which are ſeparated by elegant ſcreen work, beneath a pointed arch, ſupported by circular columns. The nave appears to have had ſide-aiſles, as the pillars and pointed arches ſtand in relief from the preſent wall.

The principal ſeats in this vicinity are Willingham-houſe, a ſeat of the Boucherett family; and Thurgundy, the property of lord Middleton. The latter anciently belonged to the Willoughbys. The houſe is ſituated on an eminence, commanding an extenſive view over the vale to Swinhop, and is ſurrounded by pleaſure-grounds, finely varied by wood and lawn. Beauties of England and Wales, vol. ix. by John Britton, 1807.

RAISING, in the *Manege*, one of the three actions of a horſe's legs; the other two being the ſtay, and the tread. The raiſing or lifting up of his legs in caprioles, curves, &c. is eſteemed good, if he perform it hardily, and with eaſe; not croſſing his legs, nor carrying his feet too much out or in; yet bending his knees as much as is needful.

RAISING *the Land*, in *Sea Language*. See *Laying the* LAND.

RAISING *a Purchaſe*, denotes the act of diſpoſing certain inſtruments or machines in ſuch a manner, as that, by their mutual efforts, they may produce a mechanical force ſuffi-

cient to overcome the weight, or reſiſtance, of the object to which the machinery is applied.

RAISING-*Pieces*, or *Reaſon-pieces*, in *Architecture*, are pieces that lie under the beams, and over the poſts or puncheons: thoſe lying on the brick-work are called platbands.

RAISINS, grapes prepared by drying them in the ſun, or in the air; to fit them for keeping, and for ſome medicinal purpoſes.

Of theſe there are various kinds: as, raiſins of Damaſcus, thus called from the capital city of Syria, in the neighbourhood of which they are cultivated. They are much uſed in the compoſition of ptiſans, together with jujubes and dates; they are brought flat, and ſeeded, of the ſize of the thumb; whence it is eaſy judging of the extraordinary bulk of the grape, when freſh. Travellers tell us of bunches weighing twenty-five pounds. Their taſte is faintiſh and diſagreeable.

Raiſins of the ſun are a kind of raiſins brought from Spain, of a reddiſh or blueiſh colour, ſeeded, and very agreeable to eat.

There are various other ſorts, denominated either from the place where they grow, or the kind of grape, &c. as raiſins of Calabria, Muſcadine raiſins, &c.

The fineſt and beſt raiſins are thoſe called iu ſome places Damaſcus and jube raiſins. Theſe are the fruit of the *vitis Damaſcena*, and are diſtinguiſhable from the others by their largeneſs and figure; they are flat, and wrinkled on the ſurface; ſoft and juicy within, near an inch long, and ſemipellucid, when held againſt a good light; they have a ſweet, agreeable, and vinous taſte; and when freſh, and growing on the bunch, are of the ſize and ſhape of the large olive.

The common raiſins are the fruit of ſeveral ſpecies of grape, which are better or worſe, according as they have been more or leſs carefully cured. The raiſins of the ſun, or jar-raiſins, ſo called, becauſe they are imported in jars, are all dried by the heat of the ſun; and theſe are the ſorts uſed in medicine.

The common way for drying grapes for raiſins is to tie two or three bunches of them firmly together, while yet on the vine, and dip them into a hot lixivium of wood-aſhes, with a little olive oil in it. This diſpoſes them to ſhrink and wrinkle; and after this they are left on the vine three or four days, ſeparated on ſticks in an horizontal ſituation, and then dried in the ſun at leiſure, after being cut from the tree. Some raiſins are dried by the heat of an oven; and the difference between theſe and ſuch as are dried in the ſun, is obvious; the latter are ſweet and pleaſant, but the former have a latent acidity with the ſweetneſs, that renders them much leſs agreeable. See CURRANTS.

All the kinds of raiſins have much the ſame virtues; they are nutritive and balſamic, but they are very ſubject to fermentation with juices of any kind; and hence, when eaten immoderately, they often bring on colics. They are allowed to be attenuant, and are given in caſes where the humours are too thick and viſcid, and they are ſaid to be very good in nephritic complaints; they are, however, too familiar in our foods, to be much regarded at preſent as a medicine. They are an ingredient, indeed, in our pectoral decoctions, and in ſome other medicines of that intention; in which caſes, as alſo in others where aſtringency is not required of them, they ſhould have the ſtones carefully taken out. The are uſed in ſome compoſitions rather with an intent of taking off the nauſeous taſte of other ingredients, and for obtunding their acrimony, than of doing any extraordinary ſervice themſelves.

RAISIN-*Brandy*, a name given by our diſtillers to a very clean and pure ſpirit, procured from raiſins fermented only with water. Thus treated, they yield a ſpirit, ſcarce at all diſtinguiſhable from ſome of the wine-ſpirits; for there are as many kinds of wine-ſpirits as there are of grapes. The coarſer the operation of diſtilling is performed in this caſe, the nearer will be the reſemblance of the wine-ſpirit; that is, there will be moſt of this flavour in the ſpirit, when as much as can be of the oil is thrown up with a galloping heat.

The diſtillers are very fond of the wine-ſpirit, with which they hide and diſguiſe the taſte of their nauſeous malt, and other ſpirits; and in defect of that ſpirit, this of raiſins, made in this coarſe manner, will go almoſt as far. It is indeed ſurprizing how extenſive the uſe of theſe flavouring ſpirits is, ten gallons of raiſin-ſpirit, or ſomewhat leſs of the wine-ſpirit, being often ſufficient for a whole pipe of malt-ſpirit, to take off its native flavour, and give it an agreeable vinoſity. It is no wonder, therefore, that the diſtillers, and ordinary rectifiers, are ſo fond of this, as it is a good cloak for their defects, and the imperfection of their proceſſes.

When raiſin-brandy is intended for common uſe, the fire ſhould be kept ſlower and more regular in the diſtillation; and the ſpirit, though it hath leſs of the high flavour of the grape, will be more pleaſant and more pure.

RAISIN-*Wine*. See WINE.

RAIT, in *Rural Economy*, a term uſed to ſignify the proceſs or operation of diſſipating the ſap of vegetables, by expoſure to moiſture, or the influence of the atmoſphere. It is moſtly applied to hemp, flax, or other ſimilar ſubſtances, and ſometimes to hay, when it has been much expoſed to alternations of wet and dry weather.

When the proceſs is performed by means of water, as is moſtly the caſe with hemp, frequently but not always with flax, and occaſionally with other articles of the ſame nature, it is uſually denominated water-raiting, and the article is ſaid to be *water-raited;* but where it is effected by expoſure to the air, upon the ground, when ſpread out, it is generally called ground-raiting, and the ſubſtance is ſaid to be *ground-raited.* In the performance of theſe operations or proceſſes with hemp, flax, and ſuch like ſubſtances, there is great nicety and attention required to ſee that they are carried to a ſufficient length, without going too far, ſo as to injure the textures of the ſubſtances in their cortical parts. This may probably be accompliſhed with the greateſt certainty by the frequent examination of the materials themſelves; keeping them perfectly under the water in the former caſe, and frequently turned with new ſurfaces to the atmoſphere in the latter, never having the graſſy ſurface on which they are ſpread out of too great a length. The effects of heavy rains, when long continued, muſt likewiſe be carefully attended to in this latter inſtance. See FLAX, HEMP, and WATER-*raiting*.

RAITAPOUR, in *Geography*, a town of Hindooſtan, in the circar of Rajamundry; 12 miles N. of Rajamundry.

RAITCH, in *Rural Economy*, a term ſignifying a line or liſt of white, down the face of a horſe. It is a very common mark in the faces of horſes.

RAITENBACH, in *Geography*, a town of Germany, in the principality of Culmbach; 8 miles E.N.E. of Wonſiedel.—Alſo, a town of Bavaria, in the biſhopric of Aichſtadt; 8 miles N. of Aichſtadt.

RAITENBURG, a town of the duchy of Carniola; 3 miles N. of Rudolfswerth.

RAITING, GROUND, in *Rural Economy*, that method of raiting or accompliſhing the ſeparation of the barks or coverings of the ſtems of flax, hemp, and other ſimilar plants, by

by means of ſpreading them out in a thin manner upon cloſe graſſy ſurfaces, inſtead of putting them into ponds or pools of ſtagnant water, in order that they may be expoſed to the atmoſphere. It is occaſionally employed for flax and other ſmall ſtalked plants, but ſeldom or never for hemp and thoſe which have large ones. It is a practice which ſtands in need of conſiderable attention and management. See RAIT.

RAJUAPOUR, in *Geography*, a town of Mocaumpour; 18 miles S. of Bargao.

RAIVATA, in *Hindoo Mythological Hiſtory*, one of the ſaints or ſages included in the denomination of Menus. Raivata is ſaid to have been the ſon of Agni, the regent of fire, alſo called *Pavaka*, (which ſee), and *Menu*.

RAJYA, in *Geography*, a town of Hindooſtan, in Bahar; 20 miles E.S.E. of Bahar.

RAKAPORAH, a town of Hindooſtan, in the circar of Juſhpour; 10 miles N.E. of Odeypour.

RAKAS, a town of Tranſylvania, on the Alaut; 16 miles N.W. of Cronſtadt.

RAKE, in *Agriculture*, a tool of the toothed kind, made uſe of for many purpoſes of huſbandry, as for collecting together hay, corn, ſtubble, roots, leaves, and other ſimilar ſorts of materials. It is a very uſeful and convenient kind of tool in all ſuch intentions. There are many deſcriptions of this ſort of implement.

RAKE, *Bean-Stubble*, a tool of the rake kind, conſtructed for the purpoſe of clearing bean-ſtubbles. It is employed on ſome farms in Eſſex, as by Mr. Ketcher, at Burnham, where it is found to be well adapted to this uſe, and to do its work in a perfect manner. The head, which is ſeven feet eight inches in length, is formed with a very ſlight curve, having teeth ſet in it in rather a cloſe manner, which are one foot and a half in length, bending or curving a little forwards at the points. It is attached by a frame to the axle of the wheels, which is three feet two inches long; and the wheels are two feet ſix inches in their diameter. The hooks and ſhafts for the horſe are four feet in length. This is a very ſimple conſtruction of this nature, and one which is capable of eaſy application. The teeth ſhould be made ſtrong, whether they are of wood or iron. This is an implement which wants to be better known in other diſtricts.

RAKE, *Corn*, a large ſtrong rake, made uſe of in different diſtricts for bringing together the mown grain crops. It is ſometimes conſtructed with wooden teeth, but a better mode is to have them of iron, being a little bent forward, having the length of ſeven or eight inches. As it requires much exertion to perform the work with them, they ſhould always be made as light as poſſible, ſo as to have ſufficient power to perform the work. It has been ſtated by Mr. Somerville, in his Agricultural Survey of the Diſtrict of Eaſt Lothian, that though the common hay-rake is moſtly uſed there, a different kind for grain has been partially tried, and found to anſwer the purpoſe much better. In this, the length of the head is from ten to fifteen feet, the handle about ſeven feet, with a piece of wood acroſs the end of it, by which it is drawn by two men. The teeth are of wood or iron; the laſt are the beſt, as well as the moſt durable, and are a little bent forward at the point, which gives them the power of retaining and carrying the ears along with them, much better than they would otherwiſe do. To make clean work, eſpecially if the ridges are gathered, the field is raked acroſs: in that way, every thing is taken up. But when it is preferred to draw the rake in the direction of the ridges, it may be conſiderably improved, by cutting the head into two or three lengths, and joining them with hinges, which will allow it to bend and accommodate itſelf to the curvature of the ridges. The advantage of this kind of rake has been found conſiderable, even in caſes where every poſſible attention has been paid to the cutting of the crop; but it frequently happens, that, owing to the dampneſs, greenneſs of the ſtraw, or a foul graſſy bottom, it is neceſſary to leave the crop unbound for a day or two, during which, if it be overtaken by a high wind, much of it will be ſcattered and loſt, unleſs conſiderable pains are taken to gather it by hand-raking, or otherwiſe. Where the long rake is uſed for that purpoſe, the expence will in no inſtance, he thinks, exceed four-pence ſterling *per* acre. An experiment made on a field of 30 acres, will convey ſome idea of the benefit that may be derived from the uſe of that inſtrument. The field was in barley, and the rakings, when threſhed, yielded

	£	*s.*	*d.*
7½ bolls, ſold at 28*s. per* boll - -	10	10	0
150 ſtones ſtraw, ſold at 6*d. per* ſtone -	3	15	0
Total produce	14	5	0
Expence of raking 31 acres, at 4*d. per* acre	0	10	4
Bread and beer to the rakers - -	0	1	6
Carting from the field, ſtacking, &c. -	0	2	6
Threſhing - - - - - - -	0	7	6
Total expence	1	1	10

Which deducted from 14*l.* 5*s.*, leaves a profit of 13*l.* 3*s.* 2*d.* ſterling. It is neceſſary to obſerve, that about ten acres of the field were left unbound, and a good deal diſordered by a high wind; but as conſiderable pains were taken in the binding, the proportion obtained from theſe ten acres did not greatly exceed what was got from the reſt of the field, the whole of which was cut with a great deal of care.

But though this mode of working the rake affords conſiderable profit and advantage, they would be a great deal more, by having recourſe to horſes in the draught of them. One horſe in each would do as much labour as ſeveral men, in a given time; and by having ſhafts and low wheels fixed to the tool, it could be readily adapted to this method of being wrought.

RAKE, *Couching*, a large ſort of ſtrong horſe-rake, with long round tines or teeth, crooked or bent forward in a gentle manner, and placed about two inches diſtant from each other; and a ſmall beam in the middle, with ſide pieces, and an apparatus for attaching the horſe to it. It is found very uſeful in bringing together the roots of couch, and other weeds, in order to their being burnt, or carried off the land, and in other ways deſtroyed. See COUCH-*Rake*, QUITCH-*Rake*, and RAKE-*Twitch*.

RAKE, *Dew*, a ſort of large rake, or hand drag, ſo named from being uſed before the dew is off the ground, or other ſort of harveſt work can be begun. It is a powerful convenient ſort of implement for harveſt work.

RAKE, *Garden*, a well-known ſort of tool for raking the ground, as well as for putting in ſeeds, &c. In order to ſuit every kind of gardening work with rakes, there ſhould be three or four different ſizes, from about ſix to eighteen inches long in the head, having handles from ſix to eight feet in length, and the heads toothed with iron teeth two or three inches long, being placed from one to two inches aſunder, according to their reſpective ſizes. The firſt or largeſt rake ſhould have the head about fifteen to eighteen inches long, the teeth three inches, and placed two inches aſunder, which is proper for raking ſtubborn or rough dug ground, and for putting in large kinds of ſeeds, raking off large weeds after hoeing, and many other pur-

poſes in large gardens. The next ſize ſhould have the head twelve inches long, the teeth three inches, being placed one inch and half aſunder, which is proper for all common raking in ordinary light ground, and for raking in moſt kinds of ſmall ſeeds, as well as other purpoſes. A third ſort of ſmall rake ſhould have the head about nine inches long, the teeth two and a half, being placed one inch aſunder; proper for fine-raking beds, borders, &c. and raking in ſome particular fine ſeeds; as well as between rows, &c. of certain plants occaſionally, where larger rakes cannot be introduced. And the ſmalleſt ſort ſhould have the head ſix inches long, the teeth two and a half, and placed one inch aſunder; being very uſeful for raking between ſmall plants in beds and borders, and other ſmall parts, where the plants ſtand cloſe, as well as ſeveral other purpoſes of that kind.

It may be noticed, that all theſe ſorts of rakes are conſtructed both with wooden heads and iron teeth, and with the heads and teeth wholly of iron in both; of which the teeth are generally flattened, the back edge rounded off, and narrowing gradually to the point; the other ſtraight, and placed on the heads edgeways acroſs, with the back edge outward, and with the points all inclining very moderately inward, in a regular manner: the wooden-headed rakes having each end of the head hooped with a thin flat iron ring, to ſecure it from ſplitting. It is very ſeldom that wooden teeth are employed in this way, or for theſe uſes.

Thoſe of the firſt ſort are generally the lighteſt and cheapeſt, being proper for any kind of garden raking; but the latter, or iron-headed rakes, when made neat and as light as poſſible, with the teeth well ſet, in a proper poſition, and firmly faſtened, are equally proper, and in ſome caſes preferable, as in ſome wettiſh or moiſt ſoils, as not being liable to clog ſo much as wooden rakes, and at the ſame time more durable. They are, however, more proper for middling and ſmall rakes than for large ones; as, in ſtrong raking, the teeth are more liable to get looſe than in the wooden-headed rakes. Both the ſorts, in their different ſizes, are ſold at the principal ironmongers' ſhops, both with and without handles.

And rakes having the heads, teeth, and handles, wholly of wood, may ſometimes be uſed for particular purpoſes; ſuch as raking in light kinds of kitchen-garden ſeeds in light ground, and taking off large hoed-up weeds in wide clear ſpaces, raking up ſwarths of mowed ſhort graſs before the ſweepers, alſo fallen leaves of trees in autumn, and clippings of hedges, &c. as well as ſeveral other uſes about the pleaſure-garden.

RAKE, *Hay*, a well-known tool, with ſhort teeth and a long handle, made uſe of in making hay. It is uſually made of willow, or ſome other ſimilar wood, in order that it may be light and handy. The teeth ſhould not be too long, as, when that is the caſe, they are apt to hang and pull among the ſtubs of the graſs in raking with them, and thereby retard the operation, as well as cauſe much fatigue to the labourer.

Different improvements have been made on this implement. A late uſeful alteration is the making the teeth to ſcrew into the head, and faſten with ſcrew nuts, by which the inconvenience of their dropping out in dry ſeaſons is obviated. It has been obſerved, that with the ſpring-toothed rake, the operator is capable of performing much more work than by the common one. They are likewiſe capable of being conveniently made uſe of both for hay and corn. They were originally made and ſold by Mr. Cort, of Leiceſter.

Another improvement is mentioned in Young's Agricultural Report of Norfolk, which is the addition of wheels. It is ſtated, that the "hand wheel-rake" of Fleg is an excellent implement for both hay and corn: it is to anſwer the purpoſe of the common hay-rake, and is about four feet long in the rake; and the two wheels, of nine inches diameter, ſo fixed, that the teeth are kept in any poſture, at the will of the holder.

In ſome parts of Lancaſhire, they make uſe of a large horſe-rake for collecting the hay together, and raking it up from the ground, which is found to be highly convenient and beneficial; as one horſe, in one of theſe rakes, will perform as much labour as a great number of men, in a certain ſpace of time; and beſides the expedition, the work is conſiderably better done, in conſequence of the greater weight of the implement.

The head of the rake has ſomething of a large eaſy half circular form, into which two ſtrong pieces of wood are faſtened, which conſtitute the ſhafts for the horſe. There are two low wheels behind, and the head has long teeth, curving a little forward, fixed into it at two or three inches from one another. The teeth may be made either of wood or iron, and ſhould have conſiderable ſtrength. The whole has no very great weight, though it muſt obviouſly be conſiderably heavier than the common rake; which is found of much advantage in its working, as has been hinted at above.

RAKE, *Horſe*, an implement uſed in Norfolk and Suffolk, on the large and middling-ſized farms, and, from its great utility, extending itſelf into other diſtricts. It is employed for barley and oat crops, being drawn by a horſe. And it has been ſtated by Mr. Young, that one man and a horſe, driven by means of a line or rein, are capable of clearing from twenty to thirty acres, in a moderate day's work; the grain being depoſited in regular rows or lines acroſs the field, by ſimply lifting up the tool, and dropping it from the teeth, without the horſe being ſtopped. It coſt from four to five pounds.

Figures of it may be ſeen in the above Agricultural Reports. Horſes have now been employed for working other ſorts of rakes, and found of great advantage, as has been already ſeen.

RAKE, *Horſe Stubble*, a large heavy kind of horſe-rake, having ſtrong iron teeth, fourteen or fifteen inches in length, placed at five or ſix inches from each other, and a beam four inches ſquare, and eight or ten feet in length. In drawing it, two horſes are moſtly made uſe of, by which it is capable of clearing a conſiderable quantity of ſtubble in a ſhort time. Tools of this ſort are highly uſeful on corn farms, for collecting this uſeful material, and ſhould be much more frequently employed than they are at preſent.

RAKE, *Twitch*, a large horſe-rake, employed in certain caſes for clearing lands from the roots of couch, twitch, or quitch-graſs, as well as thoſe of other ſorts. It is conſtructed in different ways, as with one or two rows of teeth; but the latter is probably the beſt method, as by placing one row oppoſite the intervals of the other, it muſt be rendered a very effective tool.

RAKE *of a Ship*, is ſo much over her hull as overhangs at both ends of her keel.

That part of it which was before, is called the *rake forward-on;* and that part which is at the ſetting on of the ſtern-poſt, is called her *rake-aft*, or *afterward-on*.

When a ſhip hath but a ſmall rake forward-on, but is built with her ſtern too ſtraight up, ſhe is called *bluffe-headed*.

RAKE *of the Rudder*, is the hindermoſt part of it.

RAKE, among *Hunters*. See RAG.

RAKE, in the *Manege*. A horſe rakes, when being ſhoulder-ſplaid, or having ſtrained his fore-quarter, he goes ſo lame, that he drags one of his fore-legs in a ſemicircle;

which is more apparent when he trots, than when he paces.

RAKE, or *Vein*, in *Geology*, the moſt common repoſitory of metallic ores. Theſe veins interſect mountains nearly vertically, or more or leſs inclined from the perpendicular. They are filled with ores, intermixed with the peculiar minerals accompanying each kind of metal. They vary from a few inches to ſome feet or yards in width, and extend to a very conſiderable depth and diſtance. The upper ſide of the vein is provincially called the *hanger*, and the lower ſide the *ledger*; and the inclination from the perpendicular is called the *hade* of the vein. For a particular account of the ſtructure and formation of veins, ſee VEINS, *Metallic*.

RAKEL, in *Geography*, a town of Dobruzzi Tartary, on the Danube; 15 miles W. of Iſakzi.

RAKESBURG, or RAKELSPURG, a town of the duchy of Stiria, ſituated on an iſland in the Muehr; the inhabitants of which carry on a conſiderable trade with Hungary and Croatia; 36 miles S.E. of Gratz. N. lat. 46° 45'. E. long. 15° 36'.

RAKING ſignifies ſloping or winding, as when a wall is not built up right or ſtraight.

RAKING, in *Agriculture*, the operation of performing work with a rake. It is a ſort of work that requires little art or trouble in its execution; but whether performed with the common or horſe-rakes, it ſhould always be done in an effectual manner. In the buſineſs of hay-making, clean raking not only affords a neatneſs in the appearance, but, over a great extent of ſurface, a conſiderable ſaving of hay. See HAY-*Making*.

In raking hay lands, where horſes are employed, ſome degree of care is neceſſary in directing the work, and driving the animals, in order that no inconvenience of delay may be experienced, and that every part of the land may be gone over in the moſt regular manner. Small boys may ſerve to direct the horſes by riding upon them, and ſome ſaving be made in that way.

In raking cut corn crops with horſe-rakes, eſpecially thoſe of oats and barley, it is ſometimes the beſt method to proceed in a croſs direction of the ridges, drawing up the produce into long rows at ſuitable diſtances; the horſes being driven by the men, who know the management of the handles of the rakes, by means of whip reins brought from the horſes to the ſtilts of the implements. It ſeldom happens that ſo good work can be made in going the lengthways of the lands, particularly where they are much rounded, and of a ſmall ſize in breadth, as the tools will not fit well to their rounded form, unleſs where they are conſtructed in ſeparate parts in their heads, ſo as to admit of motion by means of joints. In this mode of raking, the corn may ſometimes be readily tied up into ſheaves.

But in the raking of ſtubbles, it is more uſual to paſs in the direction of the ridges, though the contrary method is not unfrequently had recourſe to. In thoſe caſes, as well as in the others, the ſtrawy grains or ſtubbles are always brought together into lines or rows, in order to be more readily taken up by the carts either bound or unbound.

In the raking of the roots of weeds together upon lands, it is conſtantly the beſt practice to perform the work in both directions; as, by ſuch means, the whole of them may be laid hold of in a more complete and effectual manner than could otherwiſe be done. See RAKE.

RAKING, in *Gardening*, a neceſſary operation in the garden, to break the ſurface of the ſoil ſmall, and render it fine for the reception of particular ſorts of ſmall ſeeds and plants, previous to ſowing and planting, as well as to render it neat and even to the eye. It is alſo employed in raking in ſeeds, as being an expeditious mode of covering them in. In all kinds of ſmall ſeeds, or hardy plants, the ground being dug, &c. and the ſurface remaining rough after the ſpade, the ſeed is ſown, and then raked in with an even hand, once or twice in a place, as a back and a fore ſtroke, or more as may be neceſſary.

And this operation is uſeful alſo among growing plants, that ſtand diſtant enough to admit the rake, particularly where the ſurface is inclinable to bind, or where numerous ſmall ſeed-weeds appear, as it looſens the ſoil, and retards the growth of the weeds, and promotes the growth of the young plants. It is alſo good culture at particular ſeaſons, to annoy ſlugs, eſpecially in kitchen-gardens, to rake between the rows of ſmall plants in autumn and winter, &c. The raking of the beds, borders, and other compartments of pleaſure-grounds, now and then, ſmooth and even, likewiſe gives an air of culture and neatneſs to the whole.

It may be obſerved, that this ſort of work ſhould generally be performed in dry weather, and when the ground is alſo moderately dry; as when done in rainy weather, or when the ground is very moiſt and cloggy, the ſurface is apt to cake and bind hard. This ſhould be well attended to in ſowing ſeeds. Rough dug ground does not rake well, when it is become very dry at top, eſpecially if it was dug wet, and ſuffered to lie till the clods have become very dry and hard; in which caſe it will not rake well, until mellowed or pulverized by a ſhower of rain. But common light garden ground generally rakes beſt when freſh dug, perhaps the ſame day, or day after at the fartheſt, before dried too much by the ſun and wind, or rendered wet by rain, &c. The operation ſhould, however, be performed when the ground is in ſuch order as the clods will readily break and fall to pieces under the rake, without clogging much to it, or the mould become even without running into lumps.

RAKING *of a Horſe*, is the drawing his ordure with the hand out of the fundament, when he is coſtive, and cannot dung. In order to do this, the hand muſt be anointed with ſallad-oil, or butter.

RAKING *a Ship*, is the act of cannonading a ſhip on the ſtern or head, ſo that the balls ſhall ſcour the whole length of her decks, which is one of the moſt dangerous incidents that can happen in a naval action, ſo much ſo, that the men are ordered to lie down at their quarters. This is frequently called raking fore and aft, being the ſame with what is called enfilading by engineers. See ENFILADE.

RAKING-*Knees*. See KNEES.

RAKING-*Table*, or *Raked Table*, among *Architects*, a member hollowed in the ſquare of a pedeſtal, or elſewhere. See CAVETTO, and SCOTIA.

RAKOKIE, in *Geography*. See RACII-KOKE.

RAKONITZ, or RAKOWNITZ, a town of Bohemia, and capital of a circle of the ſame name, which is mountainous and covered with foreſts, but fertile in corn, and affording ſome excellent horſes. It was made a royal town in 1588. It is celebrated for its beer, which is the principal article of its commerce; 22 miles W. of Prague. N. lat. 50° 5'. E. long. 13° 57'.

RAKORA, a town of European Turkey, in Bulgaria; 40 miles S.S.E. of Viddin.

RAKOW, or RACOW, a town of Auſtrian Poland, in the palatinate of Sandomirz, formerly populous; the Socinians had a college and printing-houſe here, but were expelled in 1643; 40 miles W. of Sandomirz. See RACOW.

RAKOWEENA, a harbour on the coaſt of Kamtſchatka, in Awatſka bay, three miles long, and one and a half

half broad, with water from thirteen to three fathoms, and a bar at its entrance: it runs at firſt in a ſouth-eaſt and afterwards in an eaſterly direction; three miles S. of St. Peter and St. Paul.

RAKSHA, in *Hindoo Mythology*, a ſpecies of malignant demon, of whom great uſe is made in their epic machinery and popular tales. They are of various ſhapes and colours, and ſuppoſed to be animated by the ſouls of bad men of earlier exiſtence, receiving puniſhment in theſe forms as enemies to the gods, and obſtructors of their beneficent intentions towards mankind. Another claſs of theſe evil genii comprehends thoſe called Yakſha. Rakſhaſa and Yakſhaſa are the plurals, and Rakſhni and Yakſhni the feminine; for theſe evil doings are not confined to ſex. Ravena, the giant king of Lanka, or Ceylon, who oppoſed Rama, aided by the gods in the invaſion of his kingdom, is ſometimes called the lord of Rakſhaſas. See RAVENA.

RAKULSKOI, in *Geography*, a town of Ruſſia, in the province of Uſting, on the Dwina; 20 miles N. of Kraſnoborſk.

RALEGH, *Sir* WALTER, in *Biography*, a diſtinguiſhed character in the reigns of queen Elizabeth and James I., was ſecond ſon of a gentleman of an ancient family in Devonſhire. Few names, ſays ſir Walter's biographer, Mr. Cayley, vary ſo much in the manner of writing it. By ſir Robert Naunton and lord Bacon it is written *Rawleigh;* in ſome old deeds the orthography is *Rale* or *Ralega;* while king James, Hooker, and other reſpectable writers, adopt the mode of ſpelling which is ſtill common in this country, *viz. Raleigh;* but the original letters of ſir Walter himſelf, wherever the ſignature is preſerved, have *Ralegh*, and on that account we chooſe to adopt it in this work. Sir Walter, of whom we are treating, was born at a farm called Hayes, in that part of Devonſhire that borders on the ſea, in the year 1552. By his mother he was related to thoſe famous knights, ſir John, ſir Humphrey, and ſir Adrian Gilbert. After he had received the uſual ſchool education, he was ſent to Oriel college, Oxford, where he diſtinguiſhed himſelf by a proficiency in learning far beyond his age; but the active diſpoſition and martial ardour with which he was endowed, ſoon put an end to his learned career. About the year 1569, he, in company with many young gentlemen of the beſt families in the country, went into France, as well to inſtruct themſelves in the art of warfare, as to aſſiſt the Proteſtants in that kingdom, who were then grievouſly oppreſſed. In this ſchool he was employed five or ſix years, but by what means he eſcaped the horrible maſſacre of Paris, and the provinces, on the famous St. Bartholomew's day, we have no knowledge. He returned to England in 1575, and it ſhould ſeem he immediately became a reſident in the Middle Temple, whence a commendatory poem of his, prefixed to a work of George Gaſcoigne's, is dated in 1576. That he was not a ſtudent in the law, at this time, he has himſelf declared, and he ſhortly after paſſed into the Netherlands, where he ſerved ſome time againſt the Spaniards. In this, and other tranſactions of the ſame kind, he followed the faſhion of the times. France and the Netherlands were in thoſe days the ſchools of Mars; to which all were obliged to reſort who meant to purſue the fortune of arms. Many young men returned to their native country ruined in their fortunes, their conſtitution, and morals; but Ralegh had made a good uſe of his time, gained a large ſtock of uſeful knowledge, and was ſo completely poliſhed in his manner of addreſs, that he was now conſidered as one of the beſt bred and moſt accompliſhed gentlemen in England.

On his return in 1578, he found his half-brother, ſir Humphrey Gilbert, engaged in a deſign of making diſcoveries in North America, for which he had obtained a patent, and for the furtherance of which he had procured the aſſiſtance of many friends. Ralegh was delighted with the deſign, and embarked in it cordially. This project proved very unfortunate to the adventurers, but it gave young Ralegh an introduction to the ſea ſervice, in which he afterwards ſo much diſtinguiſhed himſelf. From this unlucky adventure, Mr. Ralegh arrived ſafe in England in the ſpring of the year 1579, and very ſoon after he appears to have offered his ſervices to the queen to go to Ireland, to the inhabitants of which, pope Gregory VIII. and the Spaniards had ſent men, money, and other aſſiſtance, to enable them to take arms againſt the eſtabliſhed government. He obtained a captain's commiſſion, and ſerved in Munſter under the earl of Ormond. In this petty warfare he diſplayed ſo much good conduct, vigour, and courage, that he was afterwards made governor of Cork; and as a reward for his ſervices, he received from the crown the grant of a conſiderable eſtate in Ireland. A miſunderſtanding with the lord-deputy Grey put a ſtop to his farther riſe in the army; he returned to England, and was quickly introduced to the queen's notice, and by his own merits attained a large ſhare in her favour. As he was forward to diſtinguiſh himſelf in all public ſervices, ſo on the return of the duke of Anjou into the Netherlands, he was one of thoſe who accompanied him out of England, by the expreſs command of queen Elizabeth, and on his coming to England in 1582, he brought over the prince of Orange's letters to her majeſty. Some months after this he reſided at court, and was honoured with the favour and protection even of contending ſtateſmen, who were proud of ſhewing the true judgment which they had of real merit, by becoming patrons to Ralegh. In 1583 he was concerned in his brother Gilbert's ſecond attempt, and though he did not venture in perſon, yet he built a new ſhip, called the bark Ralegh, and furniſhed it completely for the voyage; "the unſucceſsful end of which," ſays Campbell, "it ſeemed to predict, by its untimely return in leſs than a week to Plymouth, through a contagious diſtemper which ſeized on the ſhip's crew."

While at home Ralegh was not negligent of puſhing his fortune as a courtier. He had a good perſon and addreſs, made an elegant appearance, and put on that air of gallantry which was ſo meritorious in the eyes of Elizabeth. It is ſaid, that he was once attending the queen in a walk, when ſhe came to a ſpot, that by its mire obſtructed her courſe; he immediately took off his rich cloak, and ſpread it on the ground for her to walk on. Pleaſed with this attention, it is obſerved, that the ſacrifice of a *cloak* obtained for him many a *good ſuit*. The enterpriſing ſpirit of Ralegh was ſhewn in the year 1584, in a ſcheme which he formed of making diſcoveries and ſettlements in thoſe parts of North America which had not been ſubjected to any European power. His intereſt at court, and his ability in ſtating and ſetting forth his plans to the beſt advantage, obtained for him an extenſive patent for executing his purpoſe; and, in conſequence, with the help of a ſociety of his friends, he fitted out ſhips under the command of captains Amadas and Barlow, which ſailed from Plymouth in that year, and took poſſeſſion of an iſland near the mouth of Albemarle river, in what is now called North Carolina. From the terms of the patent, it appears, that the great object of theſe adventurers, as it was of all others in that reign, was the ſearch after mines of the precious metals. Ralegh was not himſelf in this expedition: the ſhips returned in the autumn with ſome commodities which ſold ſo well, that the company was encouraged to fit out a fleet of ſeven veſſels for the following year, of which the command was given to ſir Richard

Richard Greenville, Ralegh's relation. During this voyage they took poſſeſſion of that tract of country which has been ſo famous, by the name beſtowed upon it by queen Elizabeth, and not given, as it has been generally ſuppoſed, by Ralegh, of Virginia. After expending a large ſum in repeated attempts to repair the misfortunes that had happened to the newly eſtabliſhed colony, he aſſigned over his patent to a company, reſerving to himſelf only a portion of the expected gold and ſilver ore. This enterpriſe probably made England firſt acquainted with tobacco, and alſo conferred upon it the much greater benefit of introducing the culture of the potatoe, firſt practiſed on Ralegh's eſtate in Ireland.

About this time he was choſen knight of the ſhire for the county of Devon, and very ſoon after the queen conferred upon him the honour of knighthood, an honour which ſhe did not render cheap by proſtituting it. In the year 1585 he fitted out another fleet for Virginia, in which he had good ſucceſs, his ſhips, in their return, taking a prize worth 50,000*l*. He was likewiſe concerned in captain Davis's undertaking for the diſcovery of the north-weſt paſſage, on which account a promontory in Davis's ſtreights was called Mount Ralegh. For theſe public-ſpirited and expenſive projects, the queen was pleaſed to make him ſome profitable grants; particularly two, the firſt giving him authority to licenſe the retailers of wine throughout the kingdom, and the other of a ſeigniory in Ireland, conſiſting of twelve thouſand acres, which he planted at his own expence, and many years after ſold to Richard Boyle, the firſt earl of Cork. In 1586 he was appointed ſeneſchal of the duchies of Cornwall and Exeter, and lord-warden of the ſtannaries; and ſo high did he ſeem riſing in the queen's favour, that the favourite miniſter, the earl of Leiceſter, took the alarm, and brought forward the earl of Eſſex as his competitor. But her majeſty's partiality was fully juſtified; it was, in this inſtance, extended to a man, who at all times purſued whatever appeared to him conducive to the public good, how little ſoever it turned to his private advantage. "With juſtice, therefore," ſays Campbell, "was the wiſe queen Elizabeth liberal to ſuch a man, who, whatever he received from her bounty with one hand, beſtowed it immediately in acts glorious to the nation with the other." In the year preceding the attempt of the famous Spaniſh armada, ſir Walter was captain in the queen's guard, and her lieutenant-general for Cornwall. In the latter capacity he was active in diſciplining the militia of the county; and he was one of the council of war to whom the conſideration of the beſt means of oppoſing the dangers of that momentous period was committed. When the armada appeared in the Channel, he was one of the gallant volunteers who nobly joined the Engliſh fleet with ſhips of their own, and had a ſhare in the defeat of the enemy. In 1589 he was among thoſe who accompanied the expelled king of Portugal in his attempt to reinſtate himſelf. The queen ſhewed her continued approbation of his ſervices, by making him gentleman of her privy-chamber, and augmenting the profits of his other places. This laſt was no ſmall favour in Ralegh's eſtimation, for though in many reſpects of an elevated mind, fond of glory, ſplendid and liberal, he was likewiſe intent upon gain, and neglected no ſource of emolument which his court intereſt placed within his reach. He did not ſcruple, we are told by ſome of his biographers, though the fact is not noticed by Campbell and others, to take direct bribes for the exertion of his influence; and he is ſaid to have received no leſs than ten thouſand pounds for procuring a pardon for Mr. Littleton. See Biog. Brit. article *Littleton*.

On his return from his Portugal voyage he viſited his Iriſh eſtates, and there either formed or renewed his acquaintance with the poet Spencer, who celebrates him under the title of the "Shepherd of the Ocean," and acknowledges the obligation of having firſt made him known to the queen. To his Fairy Queen he likewiſe prefixed a letter to Ralegh, explanatory of its plan and deſign. The patronage of literature was one of the beſt traits in the public characters of an age, in which meanneſs was ſingularly mixed with heroiſm. The naval enterprizes of the reign of Elizabeth were for the moſt part predatory expeditions, ſet on foot by individuals for their private benefit, and encouraged, though but feebly aided, by the crown. In 1592 ſir Walter Ralegh engaged in a conſiderable undertaking of this kind, with a view of attacking Panama, and intercepting the Spaniſh Plate fleet. He fitted out thirteen ſhips, by himſelf and his aſſociates, which were joined by two of the queen's men of war, and he was appointed general of the whole fleet. Scarcely had he ſet ſail when he was recalled by his ſovereign; proceeding, however, to Cape Finiſterre, he divided his fleet into two ſquadrons, with cruizing orders, and then returned. One of the ſquadrons fell in with a rich carrack, the capture of which was the only inſtance of ſucceſs which attended the expedition. His ardour for war was ſhewn by his ſupport in parliament of a motion, that certain ſubſidies granted to the crown ſhould be for the expreſs purpoſe of carrying on a war offenſive and defenſive againſt Spain. To undermine his credit with the queen, Parſons, a Jeſuit, publiſhed a libel againſt him, charging him with Atheiſm; the queen is ſaid to have imbibed ſome prejudice againſt him on this account, but he incurred her heavy diſpleaſure by an intrigue with one of her maids of honour, the daughter of ſir Nicholas Throgmorton. The conſequences of this amour brought a ſcandal upon the court of the virgin queen; and though he made the beſt reparation in his power, by marrying the lady, his offence was puniſhed by an impriſonment in the Tower of ſome months, and a ſubſequent baniſhment from the queen's preſence.

During his impriſonment he projected an expedition for the diſcovery of the empire of Guiana, which had already been viſited by the Spaniards, and the extent and opulence of which had been the ſubject of many marvellous tales. Having obtained ſome preliminary information, from an old navigator whom he diſpatched for the purpoſe, he embarked in perſon, in the month of February 1595, with a ſquadron of ſhips fitted out at a great expence, and ſailed to the iſland of Trinidad, where he made himſelf maſter of the town of St. Joſeph; he then proceeded up the great river Oroonoko, but was obliged by the heat of the weather, and the difficulties of the navigation, to return, with doing nothing more than merely taking poſſeſſion of the country in her majeſty's name. Unwilling to return without appearing to have done ſomething, he publiſhed a work, entitled "Diſcovery of the large, rich, and beautiful Empire of Guiana:" which was evidently the reſult of a fertile imagination rather than of real obſervation, and which Hume ſtigmatizes as a production "full of the groſſeſt and moſt palpable lies that were attempted to be impoſed on the credulity of mankind."

Sir Walter had ſo far regained the good opinion of the queen, that he had a naval command in the expedition againſt Cadiz, in 1596, under the earl of Eſſex and lord Effingham. In the attack he was one of the leaders of the van, and by his valour and prudence contributed a full ſhare to the ſucceſs of the glorious action. In the following year he ſailed as rear-admiral in the expedition of which Eſſex was commander-in-chief, and the purpoſe of which was to intercept the Spaniſh Weſt India fleet. Arriving firſt with

his ſquadron at Fayal, after waiting ſome time for Eſſex, he thought it expedient to make an attack on the place by himſelf, which proved ſucceſsful. The commander-in-chief was mortified with this action, thinking it was deſigned to rob him of the glory due to him, and would have caſhiered Ralegh, if lord Thomas Howard had not interpoſed his ſervices to effect an apparent reconciliation. On their return lord Eſſex publiſhed ſome remarks upon what had happened in the courſe of the voyage, in which he queſtioned every body's conduct but his own. "The queen, however," ſays Campbell, "taking time to inform herſelf, made a right judgment of the whole affair; in conſequence of which ſhe paid a due reſpect to every man's merit, and greater to none than to that of ſir Walter Ralegh."

During the remainder of this reign Ralegh chiefly appears as a member of parliament, and as an aſſertor of the privileges and intereſts of the people in the weſt, over whom his authority extended. That he was completely reſtored to the favour of his royal miſtreſs is evident from the circumſtance, that in 1661 he attended her in a progreſs through part of the kingdom. He was likewiſe appointed by her to receive the duke of Biron on his arrival as ambaſſador from France, and conferred with him on the ſubject of his miſſion. In the queen's laſt parliament ſir Walter was a very active member, and diſtinguiſhed himſelf upon all occaſions, by oppoſing ſuch bills as, under colour of deep policy, were contrived for the oppreſſion of the middle and lower ranks of ſociety. He witneſſed the ruin of his great antagoniſt the earl of Eſſex, whoſe execution he indecently urged upon the miniſter Cecil; and he was even an eye-witneſs of the deed. Campbell, endeavouring to juſtify him in every thing, is evidently, in ſome inſtances, a panegyriſt rather than a faithful hiſtorian. The deceaſe of the queen, which ſoon followed the execution of her former favourite lord Eſſex, and which was probably haſtened by it, gave a final, and to Ralegh a very unexpected, blow to his own proſperity.

When James came to the crown it was a ſort of conteſt between ſir Walter Ralegh and ſir Robert Cecil, who ſhould obtain the confidence of his majeſty; the latter, however, was admitted to the royal councils, to the excluſion of ſir Walter Ralegh. In truth, James had a prepoſſeſſion againſt Ralegh, as having been the enemy of Eſſex, and ſtill more, as having, with ſome others, entertained a deſign of forcing the king to agree to certain limitations with reſpect to the number of his countrymen whom he was to bring with him. Sir Walter's martial and enterpriſing ſpirit was alſo obnoxious to a prince of a pacific diſpoſition. He was, therefore, received, barely with civility, a circumſtance which preyed upon his high ſpirit, and was probably the means of throwing him into the party of the diſcontented. A conſpiracy, for the purpoſe of placing upon the throne lady Arabella Stuart, was at this time formed, in which Ralegh in ſome meaſure participated. He was apprehended, and brought to trial on a charge of high treaſon; but, ſays the hiſtorian, his condemnation, upon the evidence produced, was one of the moſt diſgraceful inſtances on record, of the baſe ſubſervience of an Engliſh jury to the vindictive wiſhes of a court. His only accuſer was lord Cobham, a man of bad character, and one who was deeply implicated in the plot, to whoſe propoſals he had given ear, but probably without entering into, or even approving them. In his defence he diſplayed ſo much eloquence, temper, and force of argument, that ſome, who had been highly prejudiced againſt him, were brought to regard him as an innocent victim, and, it ſhould ſeem, from the teſtimony of contemporary hiſtorians, that all parties were aſhamed of the injuſtice of his condemnation. It is ſaid that even Coke, the attorney-general, who treated Ralegh on his trial with all the abuſe that belonged to his character, and was thought authoriſed by his office, expreſſed ſurprize at the ſentence, and declared that he had charged him with no more than miſpriſion of treaſon. Three were executed for this plot, two were pardoned, and Ralegh was only reprieved and committed to the Tower. His wife, at her own earneſt ſolicitation, was permitted to become his fellow-priſoner, and his youngeſt ſon was born in the Tower.

In Mr. Cayley's life of ſir Walter Ralegh, publiſhed in London in 1806, we have a curious letter of lord Cecil, then ſecretary of ſtate, to ſir Thomas Parry, the Engliſh ambaſſador in France, in which he gives an account of the conſpiracy juſt referred to, and of the motives which led the different perſons to take a part in it. Sir Walter was indicted for conſpiring to deprive the king of his government, to raiſe up ſedition within the realm, to alter the religion and bring in the Roman ſuperſtition, and to procure foreign enemies to invade the kingdom. The principal overt act laid in the indictment was, that ſir Walter had a conference with lord Cobham, as to the beſt means of advancing Arabella Stuart to the crown and throne of this kingdom, and that they ſhould apply to the king of Spain to procure his aſſiſtance in this cauſe. Sir Walter made an able ſtand in his trial againſt the legality of conviction upon the evidence of a ſingle witneſs, but the judge, rendered infamous by his conduct on the trial, over-ruled the objections.

The active mind of ſir Walter Ralegh was now left to exert itſelf within the walls of a priſon, and its employment conduced more to his honour than his liberty perhaps would have done. Here he compoſed the greater part of his works, eſpecially his "Hiſtory of the World." Prince Henry, a youth of moſt amiable qualities, and as unlike his father as poſſible, contracted a generous admiration for the ſplendid talents of Ralegh, and cheered him in his ſolitary confinement by his friendſhip and correſpondence. "No king," ſaid the royal youth, "but my father would keep ſuch a bird in a cage." Henry, however, died, and with him the hopes of deliverance vaniſhed from the mind of the ſtate priſoner. At length, however, after twelve years' confinement, ſir Walter obtained his liberation, but probably not without the uſe of bribes, applied to the new favourite Villiers. For the purpoſe of repairing his fortunes, he planned a new expedition to Guiana, and his report of a rich gold mine exiſting in that country was a ſufficient inducement for a number of adventurers to engage in the ſcheme. He obtained a patent under the great ſeal from the king, for making a ſettlement in Guiana. James, however, in order to retain his hold upon him, did not grant him a pardon of the treaſons of which he had been convicted. There is no doubt but ſir Walter might have *purchaſed* a pardon, and, at one time, had thoughts of doing ſo. He even conſulted ſir Francis Bacon, whether it would not be adviſeable for him to give a round ſum of money for a pardon in common form; to which the learned lawyer anſwered; "Sir, the knee timber of your voyage is money; ſpare your purſe in this particular, for, upon my life, you have ſufficient pardon for all that is paſt already, the king having under his broad ſeal made you admiral of your fleet, and given you power of the martial law over your officers and ſoldiers." Ralegh having employed all his reſources in fitting out the expedition, ſailed for Guiana with twelve armed veſſels in July 1617. He had not ſet ſail long before he was obliged to put into the harbour of Cork, by ſtreſs of weather, where he remained till the 19th of Auguſt. In November he arrived at Guiana,

Guiana, where he was received with the utmoſt joy by the Indians, who not only rendered him all the ſervice in their power, but endeavoured to perſuade him to end all his labours there, and take upon himſelf the ſovereignty of the country, which, however, he ſteadily refuſed. A violent and long continued ſickneſs prevented him from undertaking the diſcovery of the mine in perſon. This important affair he entruſted to one of his captains, Keymis: the ſcheme, however, proved abortive, the Spaniards having been before hand with him in the ſearch of gold. Hume, for the purpoſe of exculpating James, endeavours to ſhew that the real intention of ſir Walter Ralegh was to plunder the Spaniſh ſettlements, and neither to colonize, nor to work the mines. He aſſumes that Ralegh was a wilful deceiver in the expectations he had raiſed of vaſt ſubterraneous riches; but conſidering his character, it is ſurely more reaſonable to believe that he was carried away by ſome vague ideas of this kind, and Hume admits that the Spaniards were at the very time working ſome mines. It will be readily admitted, that James did not imagine he was giving Ralegh a commiſſion of hoſtilities againſt Spain, yet he muſt have known that the excluſive claims of that crown in South America rendered every interference with its dominion hoſtile in its eyes. The fact ſeems to be, that the expedition was undertaken with an intention to make the moſt of it, by any means within the power of the armament, and that the commander truſted to its ſucceſs for juſtification before a court where bribery to favourites was omnipotent.

In this expedition Ralegh's eldeſt ſon loſt his life, of which, and of the unfortunate iſſue of Keymis's undertaking, he reproached his captain very ſeverely, who, without heſitation, put an end to his own life. Ralegh, with a heavy heart, ſteered homewards. In July 1618 he arrived at Plymouth, and in his journey to London he was arreſted, and carried back to Plymouth. Twice he attempted to eſcape, but was ſecured and committed a priſoner to the Tower. James was exaſperated at the injury which had been inflicted on Spain, a power then in amity with England, and which had been complained of by the Spaniſh court in very ſtrong terms. He was, moreover, about to enter into a more intimate connection with that court, and therefore, without heſitation, determined to ſacrifice Ralegh to its reſentment. Though his death had been determined on, it was difficult to take away his life. His conduct in the late expedition, though the want of ſucceſs had rendered it criminal in the eyes of the court, was far from being ſo in the ſight of the nation; and though judges might have been found who would pronounce it treaſon, yet even in thoſe days it was not eaſy to find a jury who would, without evidence, have found him guilty. The commiſſioners therefore, who had been appointed to enquire into the matter, and who had frequently examined him, finally reported, that no ground of legal judgment could be drawn from what had paſſed in the expedition. Upon this, it was reſolved to call him down to judgment upon his former ſentence, which, ſays Campbell, was done, with all the circumſtances of iniquity and brutality that can well be conceived. Being brought before the court of king's bench, his plea of an implied pardon, by his having acted under the king's commiſſion ſince ſentence had been pronounced, was over-ruled, and he was not permitted to enter into a vindication of his conduct in the late voyage. Execution was accordingly awarded, and the king's warrant for it produced, which had been ſigned and ſealed before-hand.

"That this judgment was illegal," obſerves Dr. Campbell, "and that ſir Walter was really murdered, has often been ſaid, and, I believe, ſeldom doubted; but I think it has not been made ſo plain as it might be, and, therefore, in reſpect to his memory, I will attempt it, by ſhewing that the judgment was abſolutely illegal, as well as manifeſtly iniquitous.

"It is a maxim in our law that the king can do no wrong; and moſt certain it is, that no king can do legal wrong, that is to ſay, can employ the law to unjuſt purpoſes. Sir Walter Ralegh, after his conviction, was dead in law, and, therefore, if king James's commiſſion to him had not the virtue of a pardon, what was it? Did it empower a dead man to act, and not only to act, but to have a power over the lives and eſtates of the living? It either conveyed authority, or it did not. If it did convey authority, then ſir Walter was capable of receiving it; that is, he was no longer dead in law: or, in other words, he was pardoned. If it conveyed no authority, then this was an act of legal wrong. I cannot help the blunder; the abſurdity is in the thing, and not in my expreſſion. A commiſſion under the privy ſeal, if not under the great ſeal, granted by the king, with the advice of his council, to a dead man; or, to put it otherwiſe, a lawful commiſſion given to a man dead in law, is nonſenſe not to be endured; and, therefore, to avoid this, we muſt conceive, as ſir Francis Bacon, and every other lawyer did, that the commiſſion included, or rather conveyed, a pardon. Indeed, the ſame thing may be made out in much fewer words. Grace is not ſo ſtrong a mark of royal favour as truſt; and, therefore, where the latter appears, the law ought, and, indeed, does, preſume the former. This judgment, therefore, did not only murder ſir Walter Ralegh, but, in this inſtance, ſubverted the conſtitution, and ought to be looked upon, not only as an act of the baſeſt proſtitution, but as the moſt flagrant violation of juſtice that ever was committed."

The ſentence of death was pronounced on him one day, and put in execution on the following, Oct. 29, 1618, in Old Palace Yard. His behaviour on the ſcaffold was calm and manly. He addreſſed the people at ſome length: he ſaid he never feared death, and much leſs at that time; that as to the manner of it, though to others it might ſeem grievous, yet for himſelf, he had rather die in this way than in a burning fever. He deſired to ſee the axe, and feeling the edge of it, ſaid to the ſheriff, "this is a ſharp medicine, but a ſure remedy for all evils." Being aſked which way he choſe to place himſelf on the block, he replied, "ſo the heart be right, it is no matter which way the head lies," and giving the ſignal, he received the ſtroke with the moſt perfect compoſure. Such was the end of the illuſtrious ſir Walter Ralegh, in the 66th year of his age, by a ſentence which was regarded as one of the moſt diſhonourable meaſures of an odious adminiſtration. The panegyric upon his character by Dr. Campbell is much too highly coloured: ſir Walter Ralegh was not faultleſs, though in extent of capacity and vigour of mind he had few equals in an age that abounded with great men. His impriſonment was the occaſion of his obtaining a high reputation as an author. His writings were on various topics, and are claſſed as poetical, geographical, political, philoſophical, and hiſtorical. They are now but little known. His "Hiſtory of the World," though not much read, is regarded with reſpect, as one of the beſt ſpecimens of the Engliſh language of that time: the ſtyle is pure, nervous, and without pedantry. It is the ſtyle of a man of buſineſs as well as of a ſcholar. It has been many times reprinted, but the beſt edition is that of Oldys, in 1736. He brought down his hiſtory no farther than the overthrow of the Macedonian empire. Of his miſcellaneous works, a collection in two volumes 8vo. was printed in 1748. Biog. Brit. Hume. Campbell. Cayley.

RALEIGH, or RAYLEIGH, in *Geography*, a market-town

and pariſh in the hundred of Rochford, and county of Eſſex, England, is ſituated at the diſtance of 14 miles S.E. by S. from Chelmsford, and 34 miles E. by N. from London. This place appears to have been anciently of conſiderable note. It was the head of the barony of Swene, and had a caſtle adjoining to it, of which ſome fragments and earth-works ſtill remain. Theſe conſiſt of a mount, with an oval-ſhaped baſe, ſurrounded by a double ditch and rampart, and ſeveral outworks, particularly on the eaſt ſide. The ſummit of the mount is divided; the weſtern diviſion being of a circular form, and 100 feet high; and the eaſtern one of an oval form, and lower: the principal ditch varies in width from 36 to 50 feet, and the interior vallum is 50 feet high. The church here is an acient edifice, and contains an old tomb, greatly mutilated, but diſplaying the remains of very beautiful workmanſhip in the pointed ſtyle. The perſon whoſe memory it was intended to preſerve is now unknown; the upper part, to which the inſcription was probably affixed, being totally deſtroyed. The market at Raleigh is held on Sadurday, weekly; and there is an annual fair on Trinity Monday. Hearne, in his edition of Leland's Itinerary (vol. iii. p. 8.), informs us that a cuſtom-court is kept here, yearly, the Wedneſday next after Michael's day. "The court," ſays that author, "is kept in the night, and without light, but as the ſkye gives, att a little hill without the town, called the King's hill, where the ſteward writes only with coales, and not with incke; and many men and mannors of great worth hold of the ſame; and do ſuite unto this ſtrange court, where the ſteward calls them with as low a voice as poſſible he may; giving no notice when he goes to the hill to keepe the ſame court; and he that attends not is deeply amerced, if the ſteward will. 'Tis commonly called *Lawleſs-Court.*" Weever, in his "Funeral Monuments," adds, reſpecting this cuſtom, that he was informed, "that this vile attendance was impoſed at the firſt upon certaine tenants of divers mannors hereabouts, for conſpiring in this place, at ſuch an unſeaſonable time, to raiſe a commotion." According to the parliamentary returns of 1811, Raleigh pariſh contains 162 houſes, and 1131 inhabitants. Beauties of England and Wales, vol. v. By E. W. Brayley and John Britton, F.S.A. 1810.

Raleigh, a townſhip of Eſſex county, in Upper Canada, W. of Harwich, bounded on the N. by the Thames, and S. by lake Erie.

Raleigh, a town of America, in Wake county, North Carolina, the preſent feat of government, about ten miles from Wake court-houſe. The general aſſembly of the ſtate in December 1791, appropriated 10,000*l.* towards erecting public buildings, and named it after the celebrated ſir Walter Raleigh, under whoſe direction the firſt ſettlement in North America was made at Roanoke iſle and in Albemarle ſound. The ſtate-houſe is a large handſome building, and coſt 6000*l.* The plan of the town is regular; the ſtreets interſecting each other at right angles. It is, however, ſubject to the diſadvantage of being remote from navigation; 61 miles N.E. of Fayetteville, 147 from Peterſburg in Virginia, and 448 S.W. of Philadelphia.

RALEMO, a river of Chili, which runs into the Pacific ocean, S. lat. 37° 55′.

RALENDORF, a town of the duchy of Carinthia; 12 miles S. of Saxenburg.

RALESTEDE, a town of the duchy of Holſtein; 8 miles E. of Hamburg.

RALICOTTA, a town of Hindooſtan, in Viſiapour; 31 miles N. of Anamſagar.

RALLENTANDO, Ital., a muſical term of late invention, for relaxing the meaſure at particular parts of a compoſition, which, when done by a great maſter, manifeſts feeling and intelligence; but when attempted by mean performers, it has no other effect upon an audience than that of breaking time: and we think that this refinement is often abuſed. It has been chiefly practiſed in France, and ſavours of affectation, and that *overcharged tenderneſs* which renders the national *airs tendres* ſo diſagreeable, or ſo ridiculous, to the natives of all other countries.

RALLUS, the *Rail*, in *Ornithology*, a genus of birds of the order Grallæ: the generic character is, that the bill is thickiſh at the baſe, attenuated on the back towards the tip, compreſſed, a little incurved, pointed; the tongue is rough at the tip; the body is compreſſed; the tail is ſhort; the feet have four cleft toes. There are ſeventeen

Species.

* Crex; land rail, crake, corn crake, daker hen, &c. Of this ſpecies the wings are of a ruſty red; the bill and legs of a browniſh-aſh; the irides are of a hazel colour; the feathers of the body are of a reddiſh-brown; the upper ones are black in the middle; the chin is very pale, and the belly is of a whitiſh-yellow. It is about nine or ten inches long, and inhabits the ſedgy parts of Europe and Aſia. From the circumſtance of its appearing at the ſame time with the quail, and frequenting the ſame places, it has been denominated the king of the quails. Its well-known cry is firſt heard as ſoon as the graſs becomes long enough to ſhelter it, and continues till the graſs is cut. The bird, however, is ſeldom ſeen, as it ſkulks in the thickeſt parts of the herbage, and runs ſo nimbly through it, winding and doubling in every direction, that it is difficult to come near it. When it is hard puſhed by the dogs, it ſometimes ſtops ſhort and ſquats down, by which means its too eager purſuer overſhoots the ſpot and loſes the trace. It ſeldom ſprings but when driven to extremities, and generally flies with its legs hanging down, but never to a great diſtance. As ſoon as it alights, it runs off, and before the fowler has reached the ſpot, the bird is at a conſiderable diſtance. It emigrates, appearing with us about the latter end of April, and departing in October. On its firſt appearance, and till the female begins to ſit, the male is frequently heard to make a ſingular kind of noiſe, much reſembling that of a comb when the finger is drawn along the teeth of it, and which has been uſed as a decoy. When they firſt arrive, they are very lean, but before their departure, they become exceſſively fat, and are much ſought after for the delicacy of their fleſh. They lay from twelve to ſixteen eggs in the graſs, of a dirty whitiſh colour, with a few yellow ſpots: the fleſh is excellent. There are two varieties, thus deſcribed: 1. Ruſous brown, beneath paler; wings and tail deeper; the chin and vent are white; the legs are duſky red. This is found in the iſland of Jamaica. The bill is larger and black. 2. Reddiſh-grey beneath, and wing-coverts ruſty brown. This ſpecies inhabits China; the legs are of a duſky colour.

Aquaticus; Water Rail. Wings grey ſpotted with brown; flanks ſpotted with white; bill orange beneath, but black and reddiſh at the baſe; the irides are red; the feathers of the upper part of the body are of an olive-brown, and black in the middle; the lower ones are cinereous; thoſe of the lower part of the belly and vent are edged with rufous; quill-feathers duſk; the lower tail-coverts are white; the tail-feathers are ſhort and black; the two middle ones at the tip, and the others, are edged with ferruginous; the legs are of a duſky red. It is about twelve inches long, but does not weigh more than four ounces. It is found in the watery places in Europe and Aſia. It is ſometimes, but not in any

any great numbers, met with in various parts of Great Britain, in low ſituations, about water courſes and rivulets, where it ſeeks ſhelter among ſedge, ruſhes, and reeds, and is ſeldom put to flight, depending on its legs for ſafety. When rouſed it flies only to ſmall diſtances, and in a heavy and very awkward manner, with its legs hanging down. It runs nimbly, and frequently flirts up its tail. The neſt is made of ſedge and coarſe graſs, among the thickeſt aquatic plants, or in willow beds. The female lays ſix or more eggs, rather larger than thoſe of a blackbird, of a pure white colour. This bird continues with us all the year, and by many it is erroneouſly believed to be the land rail metamorphoſed in the autumn; but the different bills which the two birds have conſtitute an eſſential diſtinction.

* Porzana; ſpotted gallinule, or ſpotted water hen. This ſpecies has the two middle tail-feathers edged with white; the bill and legs are of a pale olive. It inhabits Europe and North America, and is generally found on the ſides of ſmall ſtreams, hiding itſelf among the buſhes; it is nine inches long. This bird is deſcribed as having a greeniſh-yellow bill; its irides are hazel, and head brown, ſpotted with black. The line over the eyes is of a pale grey; the neck above and flanks are of a brown-aſh, with ſmall white ſpots; the back and wing-coverts are olive, with black ſtripes, and near the edges of the feathers with white ſpots, the greater with white ſtripes and lines; the cheeks, chin, and throat, are of a pale grey, with brown ſpots; the breaſt is brown, with white ſpots; the belly is varied with cinereous and white; the vent is of an ochre-yellow. This bird is extremely timid and ſequeſtered, and is but ſeldom ſeen in Great Britain, eluding obſervation by its perpetual vigilance and lurking habits. Its neſt is formed, with ſingular care, of matted ruſhes, and materials which will float on the water, on which it remains tied, by ſome filaments, to the ſtalks of reeds, by which it is prevented from being carried away by the tide or current. The bird is in great eſteem for the table.

Crepitans; Clapper Rallus. Bill and legs brown; body above olive, the feathers aſhy at the edges; chin white, throat and breaſt yellowiſh-brown. This ſpecies inhabits New York, and is from fourteen to ſixteen inches long.

Fuscus; Brown Rallus. This is brown, as its ſpecific name imports; its vent is waved with white; the legs are yellow. It inhabits the Philippine iſles, and is ſeven inches long. The body beneath is light chefnut, on the belly it is inclining to grey; the tail is barred with white and black.

Striatus; Streaked Rallus. Blackiſh, waved with white; chin reddiſh. The bill of this ſpecies is of a horn colour; the crown is varied with duſky and bay; the nape is bay; neck, back, ſhoulders, and rump, brown, with whitiſh ſpots; the wing-coverts are marked with a few tranſverſe whitiſh ſtreaks; the chin is of a reddiſh-white; the cheeks, throat, breaſt, and upper part of the belly, cinereous, with a tinge of olive; the lower part is barred with duſky and white; quill-feathers brown, the outer bands reddiſh-white, the inner are white; the tail is brown with white lines; the legs are of a greyiſh-brown. It inhabits the Philippine iſlands, is eight inches long, and is probably a variety of the philippenſis.

Torquatus; Banded Rallus. Brown, beneath waved with white; it has a white line below the eyes. This alſo is found in the Philippine iſles, and is twelve inches long. The bill and legs are grey-brown; cheeks and chin black. The body beneath is tranſverſely ſtreaked with black and white; the collar is of a bay colour; the quill-feathers on the outer edge paler; bands within on the firſt three white, the ſix next reddiſh-bay.

Philippensis; Philippine Rallus. The ſpecific character of this bird is brown, but beneath it is barred with grey; the eye-brows are white, and the neck beneath has a reddiſh caſt. There are three other varieties, thus deſcribed: 1. Red-brown, ſpotted and ſtreaked with black and white; head chefnut; body beneath and eye-brows cinereous; this, notwithſtanding its name, is found at Otaheite. 2. Brown, ſpotted and ſtreaked with white, beneath white; eye-brows grey; the tail is barred with brown and white: this inhabits Tongataboo. 3. Above brown, beneath aſhy; back and wings lined with white ſpots; the belly beneath is white, with blackiſh bars. This is about eleven inches long, and is found in the Philippine iſlands.

Ecaudatus; Tailleſs Rallus. Olive; beneath blueiſh; body tranſverſely waved with black; eye-brows white. It inhabits Otaheite. The bill is blackiſh, and the upper part of the head is of a pale brown; the orbits are black; over the eyes, on each ſide the head, it has a broad white line; the body above is of a deep gloſſy olive, with a tinge of olive on the ſhoulders; the vent is of a pale yellow; the tail is ſo ſhort as to be ſcarcely perceptible; the coverts are of a pale blue.

Carolinus; Soree. This bird is brown; the frontlet is black; the breaſt is of a lead colour; the bill is yellow; the legs are greeniſh. It inhabits Virginia, and is from ſeven to eight inches long: this is a capital bird for the table. The irides of this bird are red; the crown and body above are brown, marked with black ſpots; the face and chin are black; but the reſt of the neck, temples, and breaſt, are of a blueiſh-aſh; the belly and outer edge of the wings are white; the wings and tail are brown.

Phœnicurus; Red-tailed Rallus. This ſpecies is black but beneath it is white; the bill and legs are greeniſh; the front is naked and of a fleſh colour; the vent and tail of a ruſty red. It is found in the iſland of Ceylon, and is about nine inches long. The bill and legs are tinged with red; the crown and cheeks are pure white; the quill-feathers are ſpotted with blue. There are two varieties. 1. Above cinereous, beneath white; the belly and vent are red. This is an inhabitant of China, and is fifteen inches long. 2. The front of this is white; the vent is red, and the legs are yellow. It is found in Madagaſcar, and is longer than the laſt.

Virginianus; Virginian Rallus. Brown, without ſpots; the bill and legs are brown. It inhabits Virginia, and is probably a variety of the R. aquaticus.

Ferrugineus; Red-breaſted Rallus. This bird is duſky above, and cinereous beneath; the neck and breaſt are ferruginous; the bill is pale, and the legs yellow. It is nine inches long; the eye-brows are pale, and the flanks are marked with tranſverſe, narrow, white lines.

Capensis; Cape Rallus. This ſpecies is of a ferruginous colour; but the lower part of the breaſt, belly, vent, wings, and tail, are waved with black and white; the bill is black, and the legs are of a blood-red. It inhabits the Cape of Good Hope and Ceylon, and is of the ſize of the R. crex. The two middle tail-feathers are ferruginous.

Cæruleus; Blue-necked Rallus. This is of a bay colour above, but blueiſh beneath; the bill and legs are red; the vent is white, and the belly is marked with tranſverſe black ſtreaks. It inhabits the Cape of Good Hope; it is ſeven and a half inches long.

Zeylanicus; Ceylon Rallus. The head of this bird is duſky; the body above is ferruginous, beneath it is reddiſh, waved with brown; the firſt quill-feathers are black; the

bill and legs are red. It is found, as its name imports, at Ceylon; it is larger than the R. aquaticus, and has a long tail.

Australis; Troglodyte Rallus. Ruſty aſh; wings and tail deep brown; the feathers are barred with black. It inhabits New Zealand, and is ſeventeen inches long. The bill and legs are yellowiſh; the body above is of a ruſty brown, beneath ruſty aſh; quill and tail-feathers are waved with black.

Pacificus; Pacific Rallus. Black, ſpeckled with white; wings barred; body beneath whitiſh; the head is brown, the breaſt is of a blueiſh-aſh. It is found in Otaheite, and the neighbouring iſles. Bill red, the legs are of a fleſh colour; the chin and eye-brows are white; the nape of the neck is ruſty.

Tabuensis; Tabuan Rallus. Browniſh-black; beneath it is of a duſky colour; the bill is black, and the legs are bay. A variety has its vent ſtreaked with black and white; the legs are red. It inhabits the South-ſea iſlands, and is ſix inches and a half long. The eye-lids and irides are red.

Niger; Black Rallus. Black; bill red at the baſe, brown at the tip; the legs are brown or red. This is an African bird, and is nine inches long.

Sanduicensis; Sandwich Rallus. This is of a pale ferruginous colour; but the bill is of a duſky aſh; the legs are of a dull fleſh colour. A variety has a yellowiſh bill and legs. It inhabits the Sandwich iſlands; and another variety is very ſmall, and found in the Tanna iſles.

Taitiensis; Otaheite Rallus. Cinereous; body above red-brown; the bill, rounded tail, and claws, are black. This inhabits Otaheite and the Friendly iſles, and is about ſix inches long. The quill-feathers are duſky and edged with white; the legs are yellow.

Obscurus; Duſky Rallus. This is brown ſtreaked with black, beneath it is of a ruſty brown; the bill is black, and the legs are of a red-brown. It inhabits the Sandwich iſlands, and is ſix inches long; the edge of the mandibles is yellowiſh.

Longirostris; Long-billed Rallus. The upper part of this ſpecies is cinereous, ſpotted with brown, beneath it is ruſty white; the flanks are tranſverſely waved with white, the bill is long and of a ferruginous colour. It inhabits Cayenne, and is from nine to twelve inches long. The bill is tipt with brown; the legs are yellowiſh, and the chin whitiſh.

Variegatus; Variegated Rallus. This bird is ſtreaked and ſpotted with white and black; the hind-head is duſky; the bill is yellowiſh; the chin is white; and the legs are yellow. It inhabits Cayenne, and is eleven inches long. The wings are brown, the coverts are ſpotted with white; ſome of the middle tail-feathers are edged with white.

Cayennensis; Cayenne Rallus. The crown of this bird is rufous; the body above is of an olive-brown; beneath it is rufous; the ocular band is blackiſh; the quill-feathers are black; the bill is brown, and the legs bay. There is a variety having its crown bay; chin and vent reddiſh-white. It inhabits Cayenne and Guiana; it is eight inches long: in the evening it is noiſy and gregarious, by day it is ſolitary; it builds in the forked branch of a ſhrub, near the ground. The vent is pale.

Jamaicensis; Jamaica Rallus. Above reddiſh-brown with black ſtreaks; the bill and chin are black; the throat and breaſt are of a blueiſh-aſh; the belly is marked with white and brown lines. It, as its name imports, inhabits Jamaica, and is ſix inches long. The bill is reddiſh at the baſe; wing-coverts brown, ſpotted with white; the quill-feathers are of a reddiſh-brown, with black lines, the ſecondaries and tail-feathers are ſpotted with white, and the legs brown.

Minutus; the Little Rallus. This is brown, but beneath it is yellowiſh; eye-brows, ſtreaks on the back, and ſpots on the wing-coverts, white; tail barred black and white. A variety has the middle of the neck above rufous; the belly and vent are waved with black and white. It inhabits Cayenne and Jamaica, and is five inches long. The bill is brown; the wing-coverts are black; the chin is whitiſh, and the legs are yellow.

Pusillus; Dwarf Rallus. Striped with ferruginous and black; the body beneath is blackiſh, with narrow white bands; the throat and breaſt are blueiſh. This is found near ſalt lakes of Dauria, and is of the ſize of a lark. The face, neck beneath, and middle of the breaſt longitudinally, are blueiſh; the middle of the chin is whitiſh; the longitudinal band through the eyes of a pale ruſty colour; the back is ſcattered with white longitudinal lines; the legs are greeniſh.

Barbaricus; Barbary Rallus. This is of a ferruginous colour; the bill is black; the wings are ſpotted with white; the rump is ſtreaked above with white and black, and beneath with white; the legs are of a duſky brown. This, as its name imports, is an inhabitant of Barbary, and is the ſize of a plover.

Dubius; Doubtful Rallus. Striped with brown and ferruginous; the belly is white; the flanks are barred with brown and ruſty aſh; the firſt quill-feathers without are longitudinally white. It is the ſize of the common gallinule. The face is of a pale ruſty colour; the chin is of a dirty white, ſurrounded with a broad brown collar; the ſides are brown; the bill and legs greeniſh-black.

RALLYING, in *War*, the reaſſembling, or calling together of troops, broken, routed, and put to flight.

RALPH, James, in *Biography*, a miſcellaneous writer, deſcended probably from mean parentage, was the intimate friend of Dr. Franklin, who ſpeaks of him as ingenious and ſhrewd, genteel in his addreſs, and extremely eloquent. Franklin knew him in America, and though he does not mention what Ralph's ſituation then was, yet as he wrote a fine hand, and was well verſed in accounts, it is imagined he was a ſchoolmaſter. In 1725 Ralph accompanied Franklin to England, with a reſolution of not returning to America, where he left his wife, with whom, and with whoſe family, he had lived on ill terms. In London he was, for a conſiderable time, ſupported by his friend Franklin, till their intimacy was diſſolved, when Ralph conſidered the quarrel as a complete diſcharge of the debt which he owed his benefactor. Ralph changed his name to that of Franklin, which he thought neceſſary, having formed a new female connection, and ſettled as a ſchoolmaſter in a village in Berkſhire. From this time there is no regular narrative of his life, which was probably paſſed as a hired party writer. He is ſpoken of with much contempt in the Dunciad, as the author of a poem called Night:—

> "Silence, ye wolves! while Ralph to Cynthia howls,
> And makes night hideous—Anſwer him, ye owls."

In a note, it is ſaid he wrote a ſwearing piece, entitled "Sawney," very abuſive of Swift, Gay, and Pope; that he panegyriſed his own works in the journals, was wholly illiterate, wrote plays, and was employed in a political newſpaper. The ſatire of Pope muſt be taken with much limitation, it being inſpired by party motives: Ralph having recommended himſelf to perſons in power at the beginning of George II.'s reign, would for that reaſon be obnoxious to Pope and his friends. He became an able

writer in profe, and was author of many political pamphlets, which were much applauded in their time; but his chief work was "The Hiftory of England during the Reigns of William, Anne, and George I., with an introductory Review of the Reigns of the Brothers Charles II. and James II., in which are to be found the Seeds of the Revolution. By a Lover of Truth and Liberty," 2 vols. fol. 1774—6. This work obtained the plaudits of Mr. Fox, who, in his poſthumous hiſtorical fragment, ſpeaks of the author as an hiſtorian of great acuteneſs as well as diligence. The laſt publication of this author was entitled "The Caſe of Authors by Profeſſion or Trade, ſtated with regard to Bookſellers, the Stage, and the Public," which is ſaid to contain much good ſenſe and lively ſatire. Mr. Ralph died at Chiſwick, in the year 1762. Gen. Biog.

RAM, in *Geography*, a town of European Turkey, in Servia, on the S. ſide of the Danube; 10 miles E. of Paſſarowitz.

RAM, in *Agriculture*, the male of the ſheep kind. It may be obſerved, that the rams of different breeds of ſheep vary greatly in their forms, wools, and fleeces, and other properties; but the following deſcription by that excellent ſtock-farmer, Mr. Culley, deſerves the attention of the breeder and grazier. According to him, his head ſhould be fine and ſmall, his noſtrils wide and expanded, his eyes prominent, and rather bold or daring, ears thin, his collar full from his breaſt and ſhoulders, but tapering gradually all the way to where the neck and head join, which ſnould be very fine and graceful, being perfectly free from any coarſe leather hanging down; the ſhoulders broad and full, which muſt at the ſame time join ſo eaſy to the collar forward, and chine backward, as to leave not the leaſt hollow in either place; the mutton upon his arm or fore-thigh muſt come quite to the knee; his legs upright, with a clean fine bone, being equally clear from ſuperfluous ſkin and coarſe hairy wool from the knee and hough downwards: the breaſt broad and well forward, which will keep his fore-legs at a proper wideneſs; his girth or cheſt full and deep, and inſtead of a hollow behind the ſhoulders, that part by ſome called the fore-flank ſhould be quite full; the back and loins broad, flat, and ſtraight, from which the ribs muſt riſe with a fine circular arch; his belly ſtraight; the quarters long and full, with the mutton quite down to the hough, which ſhould neither ſtand in nor out; his twiſt, or junction of the inſide of the thighs, deep, wide, and full, which, with the broad breaſt, will keep his fore-legs open and upright; the whole body covered with a thin pelt, and that with fine, bright, ſoft wool. It is obſerved, that the nearer any breed of ſheep comes up to the above deſcription, the nearer they approach towards excellence of form.

But though this is a very correct, appropriate, and admirable deſcription of a finely-formed ram, objections have been made by ſome to a few of the properties which are laid down. Width and expanſion of the noſtrils in ſheep, it is ſuppoſed, are liable to cauſe the lower parts of the noſes to be too thick and large; while in naturally good and improved forms, the lower parts of the noſes and mouths are for the moſt part ſmall. Nor is the prominent and bold daring eye held in more eſtimation, as it is thought not to ſhew a good diſpoſition; but, on the contrary, to diſplay too much quickneſs and activity, or wildneſs of nature in the animal. Opinions, however, differ much on this point among ſheep-farmers; and a lively quick eye is almoſt always conſidered as favourable to a good diſpoſition.

Rams naturally poſſeſs more boldneſs and courage than either wethers or ewes; and they are very apt, unleſs great care is taken, to acquire miſchievous habits of attacking perſons or animals that may by accident approach them.

In ſome ſheep-diſtricts the breeders are greatly in favour of large rams, but in others thoſe of a ſmaller ſize are preferred; the choice of the ſize of the rams ſhould, however, in every inſtance, be regulated by the nature and abundance of the keep, or the quality of the lands, as it is utterly impoſſible that the inferior ſorts of paſtures can keep ſheep-ſtock of the large ſize, as in thoſe of the better kinds; and it would be highly diſadvantageous in the beſt rich ſorts to have a ſmall-ſized ſtock when they could ſupport a large one in an equally perfect manner. Middle-ſized rams are, upon the whole, the moſt ſuitable and proper for lands in general, and for all the purpoſes of the breeder.

The growth and conſtitutions of young rams ſhould never be ſuffered to be endangered by their having too great a number of ewes, as is too frequently the practice with ſheep-breeders.

It is a very improper cuſtom, but one which prevails with the graziers in ſome ſheep-diſtricts, to keep all their rams, perhaps to the amount of from twenty to fifty or more of all kinds, in one field or paſture; as their contentions are often ſo violent, eſpecially about the riding time, as to cauſe the loſs of one or two rams to each in all ſuch caſes. This practice is the moſt common in the ſheep-diſtricts towards the ſouthern part of the iſland, being ſeldom met with in thoſe of the midland or more northern parts. It ought to be every where done away with.

The old rams are now almoſt always got quit of by being fattened as rams, and ſold at the neighbouring markets, or to butchers, at a very inferior price, there being often much competition for this ſort of low-priced meat in ſome ſituations. It was formerly, however, the cuſtom in ſome places to *knit* them before they were fattened and ſold to the butchers or otherways, but much injury and loſs being found to be ſuſtained by that method, it has been left off; it being now concluded, on the whole, that the loſs by knitting the rams is greater than that which is ſuffered in the reduction of the price of ram mutton.

The practice of letting out rams in the midland diſtricts for the purpoſe of improving the breeds of ſheep, having produced ſuch beneficial effects, the riſe, nature, and progreſs of it may deſerve the attention of the ſtock-farmer. It has been ably and accurately delineated, in the following manner, by Mr. Marſhall, in his Rural Economy of that part of the kingdom.

It is ſtated, that in this diſtrict, in general, the management reſpecting rams is ſimilar to that of other parts of the iſland; the breeders *rearing* or *purchaſing* them. But that it is obſervable, however, that the advocates of the old breeds, though they will not adopt the modern ſtock, have fallen, in ſome degree, into the modern practice of *letting* by the *ſeaſon*. But that the rams of the *modern* breed are never *ſold;* but are paſſed from breeder to breeder, by the *ſeaſon* only. And that for the purpoſe of promoting this intercourſe, each principal breeder has his *ſhow* of rams; commencing, by common conſent, the 8th of June, and laſting until Michaelmas, or until the ſeaſon of letting be paſt. That during a few weeks after the ſhows commence, every ram-breeder may be ſaid to keep open houſe. Breeders and others, from all quarters of the kingdom, as well as the promoters of the breed who reſide in the neighbourhood, attend theſe ſhows; going, in parties, from one to another: ſome to take, others to ſee and paſs their judgment. And that theſe private exhibitions cloſe with a *public ſhow*, at Leiceſter, the 10th of October; when rams of every deſcription, but moſtly an inferior ſort of the improved

proved breed, are collected; being brought in waggons; many of them from a conſiderable diſtance; ſome to be *ſold*, but chiefly to be *let* for the ſeaſon. That this ſhow has been held, he believes, time immemorial; not, however, for the purpoſe of *letting*, but for that of *ſale*. But the letting of rams by the ſeaſon, has long, he underſtands, been a practice in Lincolnſhire. However, the origin, in the midland diſtricts, may be traced—to a ram let by Mr. Bakewell, at Leiceſter fair, about forty years ago, at the low price of ſixteen ſhillings. But humble, however, as was this beginning, it proved, Mr. Marſhall ſays, to be the firſt ſtone of the foundation of a department of rural buſineſs, that has already riſen to an aſtoniſhing height, and may, for ſome length of time, continue to bring in a copious ſource of wealth to the country. In the management of this buſineſs, the principal ram-breeders ſave annually, twenty, thirty, or perhaps forty ram-lambs; caſtration being ſeldom applied, in the firſt inſtance, to the produce of a valuable ram. For, in the choice of theſe lambs, they are led more by blood, or parentage, than by form; on which, at an early age, little dependance can be placed. He adds, that their treatment, from the time they are weaned, in July or Auguſt, until the time of ſhearing, the firſt week in June, conſiſts in giving them every indulgence of keep; in order to puſh them forward for the ſhow: it being the common practice to let ſuch as are fit to be let the firſt ſeaſon; while they are yet yearlings—provincially *ſharhogs*. Their firſt paſture, after weaning, is pretty generally, he believes, clover that has been mown early, and has got a ſecond time into head: the heads of clover being conſidered as a moſt forcing food for ſheep. After this goes off, turnips, cabbages, colewort, with hay, and report ſays, with corn. But the uſe of this the breeders ſeverally deny, though, collectively, they may be liable to the charge. However this may be, ſomething conſiderable depends on the *art* of making *up*,—not lambs only, but rams of all ages. Fat, like charity, covers a multitude of faults; and, beſide, is the beſt evidence their owners can produce, of their *fatting quality*, —their natural propenſity to a ſtate of fatneſs; while in the fatneſs of the ſharhogs is ſeen their degree of inclination to fat at an *early* age. And that the fatting quality being the one thing needful in grazing ſtock: and being found, in ſome conſiderable degree at leaſt, to be hereditary,—the *fatteſt* rams are of courſe the *beſt*; though other attachments, well or ill placed, as to form, or faſhionable points, will perhaps have equal or greater weight in the minds of ſome men, even in this enlightened age and diſtrict. And the ſhearlings, which will not make up ſufficiently, as to form and fatneſs, are either kept on to another year, to give them a fair chance, or are caſtrated, or butchered, while ſharhogs.

With regard to the ſhowing, it is remarked, that the ſhows of the principal breeders conſiſt, by common conſent, of forty rams each, moſtly from one to five years old, they being ſeldom found efficient after that age; ſome, however, will continue in vigour to the ſixth or ſeventh year. And that, during the ſhow, they are moſtly kept in ſmall incloſures, of two, three, or four acres; with three, four, or more rams in each, according to their ages, and the advancement of the ſeaſon. And in a corner, or other convenient part of each paddock, a ſmall pen, made with hurdles, is placed; for the purpoſe of handling them. Into theſe pens they go, through cuſtom, as tractably as worked oxen to their ſtalls. Indeed, the old rams, from the unwieldineſs of their frame, and the load of fat they have to carry at this ſeaſon, as well as from habit, will ſuffer themſelves to be handled abroad; and even appear to take pleaſure in the reſpect which they have ſhewn them. But it is obſerved, that of late a new method of ſhowing has been ſtruck out by the leading breeder, and adopted by *one* at leaſt of his followers. Inſtead of ſhowing them abroad, and driving three or four of them up together in a pen, they are ſhut up in hovels, and brought out ſeparately, being *never ſeen* together. He thinks, that among accurate judges, this mode of ſhowing may be well enough; but to thoſe who have had leſs experience it gives offence, as it deprives them of their beſt guide, compariſon; and he can ſee no fair advantage accruing from it to the latter.

It is remarked, that though the deſirable *points* of a ram are ſuch as have been noticed, the choice of the hirer is determined, in ſome meaſure, by the intention for which he is about to hire: as whether it be that of getting wedders, or mere grazing ſtock: or rams for the purpoſe of letting. Hence the grazier and the ram-breeder chooſe different ſheep, ſo as to ſuit their different purpoſes. He adds, that the characteriſtic difference between what is termed a *ram-getter* and a *wedder-getter*, or a good grazier's ſheep, is that of the former being every where cleaner and finer, the head ſmall, the bone and offal light, the fleſh good, and the form beautiful. The mere grazier likes a ram no worſe for having a ſtrength of frame, and is leſs ſcrupulous about his form than the ram-breeder, whoſe great object is fineneſs: his ewes, and the natural tendency of the breed, ſerve to give his offspring ſize and ſubſtance when it is wanted.

In reſpect to the practice of letting, it is obſerved, that a novel circumſtance has likewiſe taken place lately in the buſineſs of letting. The long eſtabliſhed cuſtom of ſetting a price was exploded, at leaſt by the late Mr. Bakewell, and one of his diſciples; whoſe cuſtomers were left to make their own valuations, and bid what they pleaſed. But this, as well as ſhewing them ſeparately, it is obſerved, gives great offence, eſpecially to ſtrangers, who cannot brook the idea of being both buyers and ſellers. The latter, however, has more than one advantage in reſerving the price, provided he do not thereby drive away his cuſtomers: he is, in effect, letting to the beſt bidder. Beſide, he is, through this mean, enabled to *regulate* his *prices* to his cuſtomers, without giving any of them pointed offence: for as the principal breeders are, in the nature of their buſineſs, competitors, it is no more than common good policy, in the leader at leaſt, to advance himſelf, and keep back thoſe who prefs upon him cloſeſt. It is, therefore, good management, Mr. Marſhall thinks, in him to let a ſuperior ram to an inferior breeder, whoſe ewes are yet of baſe blood, at a lower price than to one who is farther advanced, and whoſe ewes perhaps are nearly equal to his own: for if the hirer may not thereby be able to get the lead from him, he may run away with part of the beſt prices; and the only line the leader has to tread is, either to refuſe him, or to make him pay in the firſt inſtance. And again: ſometimes two or three capital breeders will join in the hiring of one ſuperior ram; and, in this caſe, the blood being more widely diſperſed, the price ought to be, and always is advanced, in proportion to the number of partners there may be in the buſineſs. Hence, in the leader, a reſervation of price may be allowable, eſpecially in the letting of firſt-rate rams.

He obſerves, in regard to the conditions of letting, that notwithſtanding the number of years the letting of rams has now been in uſe, and the extraordinary height to which the prices have riſen, the tranſaction does not appear to have yet received any ſettled form; nor to have been rendered *legally* binding, by any written articles, or conditions of letting; much being ſtill left to the *honour* of the parties. It is, however, generally underſtood, that the price agreed upon

upon ſhall not be paid, unleſs the ram in contract, *or another as good*, impregnate the ſtipulated number of ewes. If, through accident or inability, part only be impregnated, a proportional part of the price is abated. If he die while at ride, the loſs falls on the letter, whether his death happens through accident or neglect; no *caſe*, he underſtands, having yet been otherwiſe determined. It is likewiſe underſtood, that the hirer ſhall not ſuffer him to ſerve any other than his own ewes; and of theſe, no more than a ſtipulated number, which is proportioned to the age or ability of the ram, and the mode of uſing him. And further, that if a grazier hire a valuable ram, at a wedder-getter's price, (which is not unuſual at the wane of a ſeaſon, when valuable rams happen to be unlet,) it is underſtood, or rather agreed, that he ſhall not rear rams from him; a condition which may frequently be advantageous to both parties. The letter pockets five or ten guineas, which otherwiſe he might not have had; and the hirer, by ſuffering himſelf to be "tied down," as it is termed, gets a greater improvement in his ſtock than otherwiſe he could have got for the ſame money. He adds, that the time of paying the money is, he underſtands, unfixed; ſeldom, he believes, until after the ewes have brought proofs of the ram's efficiency, or after the lambing ſeaſon.

It is obſerved, that with regard to the prices for letting rams by the ſeaſon, that from the firſt letting to the year 1780, the prices kept gradually riſing from *ſixteen ſhillings* to a *guinea*, and from one guinea to *ten*. In 1780, Mr. Bakewell let ſeveral at *ten guineas* each; and what is *rather* inexplicable, Mr. Parkinſon of Quarendon let one, the ſame year, for *twenty-five guineas*, a price which then aſtoniſhed the whole country. That from that time to 1786, Mr. Bakewell's ſtock roſe rapidly, from ten to a *hundred guineas*; and that year he let two-thirds of one ram (reſerving one-third of the uſual number of ewes to himſelf) to two principal breeders, for an hundred guineas each; the entire ſervices of the ram being rated at *three hundred guineas*. This excellent breeder making that year, by letting twenty rams only, more than a thouſand pounds! and that, ſince that time, the prices have been ſtill riſing. *Four hundred guineas* have been repeatedly given. The above breeder, this year (1789), makes, he underſtands, twelve hundred guineas by three rams, (brothers he believes,) two thouſand of ſeven, and of his whole letting full three thouſand guineas! And that he now lets nothing under twenty guineas; a well-judged regulation, which Mr. Marſhall thinks will probably be beneficial both to himſelf and his cuſtomers.

It is added, that, beſide this extraordinary ſum made by Mr. Bakewell, there are ſix or ſeven other breeders who make from five hundred to a thouſand guineas each. The whole amount of monies produced this year, in the midland counties, by letting rams of the modern breed for one ſeaſon only, is eſtimated, by thoſe who are adequate to the ſubject, Mr. Marſhall ſays, at the almoſt incredible ſum of *ten thouſand pounds*. He knows that it is a popular idea, eſpecially of thoſe who, living at a diſtance, have only heard of theſe extraordinary things, without having an opportunity of coming at facts, that the extravagant prices which are talked of are merely nominal; the principal part of the money being returned, the actual prices given being ſmall, in proportion to thoſe held out. This, however, is, he believes, and on the beſt authority, an erroneous idea. At the firſt ſetting out of the high prices, there might be ſome tranſactions of that nature; but if ever they exiſted, they have ceaſed long ago. Mr. Bakewell at preſent has the name, at leaſt, of being parſimonious, even to the ſhepherds of the flocks on which his rams are employed. His higheſt preſent, he underſtands, is five ſhillings; if the price be under fifty guineas, only half-a-crown. But the enormouſneſs of theſe prices may be explained, he thinks, on other grounds. The *high* prices are not given, he ſays, by graziers, for the purpoſe of getting wedders, as grazing ſtock; but by ram-breeders, for the purpoſe of getting rams, to be let to graziers: the *higheſt* being given by the principal breeders only, not for the purpoſe of getting rams to let to graziers as wedder-getters, but for that of getting rams, to be let out again to inferior tup-men, as ram-getters.

It is further ſtated, that the graziers' prices run, even now, from one to ten guineas. He has not heard of more than ten guineas being given, by a mere grazier, for a ram, for the ſole purpoſe of getting grazing ſtock: five or ſix guineas is the common price. And ſuppoſing he gives the higheſt price, ten guineas, and that the ram ſerves a hundred ewes, (ſome ſingle, ſome double,) the expence of getting amounts to no more than two ſhillings a head; which is inconſiderable, compared with the difference between a well and an ill grazing ſheep, between a ſheep that will get as fat at two years old as another will at three; or, in other words, which will, at two years and a half old, fetch ten or fifteen ſhillings more than his comrades of another breed, but of the ſame natural ſize, and going in the ſame paſture, or feeding on the ſame ſort of food. In reſpect to the *middle* prices, as thoſe from twenty to fifty guineas, they are, under the preſent circumſtances, equally reconcileable, he thinks, to common ſenſe. If a breeder, who gives fifty guineas, rear ten tolerable rams fit for the grazier's uſe, and let them at five guineas each, he brings himſelf home, even the firſt ſeaſon of letting, beſide having the rams for another and another ſeaſon, and beſide a general improvement in his ſtock for the future. And thoſe who give the higher prices, as one to two hundred guineas, have, or ought to have, proper baſes to build upon, ſufficient ſtocks of well-bred ewes; in which caſe, they have a fair chance of producing ram-getters, worth, while the preſent ſpirit of improvement laſts, twenty to fifty guineas a ſeaſon. And that with reſpect to the *very high* prices, they are given by a few firſt-rate breeders, who are playing a high game, running a hard race, for the pride and profit of being a leader, when Mr. Bakewell is not; a contention which may laſt as long as Mr. Bakewell, and be at once an honour to his genius, and a reward of his ſervices.

In reſpect to the treatment of rams after letting, it is remarked that the breeders of rams, as well as of bulls, find it expedient to reduce them from the cumbrous ſtate in which they are ſhewn, previouſly to the ſeaſon of employment; the old rams, in particular, being frequently returned upon their hand, non-efficient. Hence, as they are let, they are transferred to private paſtures, and moderate keep; it being a pretty general rule not to ſhew a ram after he is let, or contracted for to a perſon.

In the ſending out let rams, the uſual time of beginning is the middle of September: the means of conveyance, carriages of two wheels with ſprings, or hung in ſlings; ſome of them being large enough to hold four rams. In theſe they travel from twenty to thirty miles a day; being ſometimes ſent, in this way, two or three hundred miles, and ſometimes more.

It has been obſerved by the ſame writer, that the manner of uſing theſe rams has lately received a very great improvement. Inſtead of turning them looſe among the ewes at large, as heretofore, and agreeably to the univerſal practice of the iſland, they are kept apart, in a ſeparate paddock or

ſmall

ſmall incloſure, with a couple of ewes only each, to make them reſt quietly; having the ewes of the flock brought to them ſingly, and leaping each only once. He thinks, by this judicious and accurate regulation, a ram is enabled to impregnate near twice the number of ewes he would do, if turned looſe among them, eſpecially a young ram. And he adds, that, in the old practice, ſixty or eighty ewes were eſteemed the full number for a ram: in the new, from a hundred to a hundred and twenty are allowed. Seven ſcore have been ſerved by one ram in a ſeaſon: this is, however, much too great a number.

And while at ride, the treatment of the ram is merely that of keeping him well, and free from diſorders; ſuffering him to ſerve no other than the hirer's own ewes, and of theſe the limited number only, and to return him ſafe when he has done; generally the beginning of December: or, if the hirer nas met him on the road, (which is cuſtomary,) the latter, in return, meets him on his journey home. And the after treatment conſiſts in ſtriving, by every deviſeable means, to reload his carcaſe, and make him fat and handſome for the enſuing ſhow, in order that he may be let again with advantage.

This is the whole of the plan that was purſued in that diſtrict, which has led the way to ſo much improvement in the breeding of ſheep ſtock; and from which the country has derived ſuch vaſt benefits, and ſuch a number of advantages. But though the above practices have not been lately carried on to their former extent, they are ſtill very conſiderable. See SHEEP.

It is remarked, that the practice of hiring rams in Romney Marſh is not carried on with the ſame degree of ſpirit as it is in Leiceſterſhire, and that rams were of more value for the hiring ſeaſon ſome time ago than they are at preſent, eſpecially when the croſs of the above county took place, as then from twenty to one hundred guineas were frequently given. One grazier ſome time ſince let rams to the amount of twelve hundred guineas; but the rage is now over, the people not being ſo fooliſh as to be duped out of their money, without the proſpect of being repaid. It is here the practice with ſome to ride their ram lambs; but they are ſaid always to be injured in their growth, if not in their conſtitutions and diſpoſitions, by it. When a ram dies while at ride, the loſs falls on the owner, and, beſide, he is not paid for the riding. The time of paying is when the rams are removed from the ewes. This is done by carrying them away in carts, or leading them by ropes. The ram lambs are here now moſtly ſelected and ſaved, in ſuch numbers as are proper for the hirers.

Some time before the riding ſeaſon, the graziers call and agree for the hiring or purchaſing of rams, the general price uſually from three to five guineas; but a ſuperior one will bring ten in particular caſes, though many good uſeful ones let at three guineas. Some purchaſe them to ride, and immediately afterwards ſell them in the markets. The rams, which are to be hired, are here ſhewn all together in paſture fields, which is a diſadvantageous method.

In Suſſex, until lately, ten guineas were the higheſt price that was heard of for the ſale of any ram. Now ſome let many of their three-years old rams for fifty; and inferior ones at thirty, twenty, and ten guineas. Some have even been let ſo high as one hundred guineas.

RAM is alſo a term uſed to ſignify any thing which has a ſtrong ſmell or taſte.

RAM, in *Aſtronomy*. See ARIES.

RAM *of M. Montgolfier*, *Hydraulic*, in *Mechanics*, a machine for raiſing water to any given height, which has lately attracted much attention in France. The firſt perſon who employed this method was Mr. Whitehurſt, and it was afterwards improved by Mr. Boulton. Its conſtruction and uſe may be ſufficiently underſtood by the following ſtatement. It ſerves to raiſe water by means of the momentum of a ſtream of water flowing through a long pipe. The paſſage of the pipe being ſtopped by a valve, which is raiſed by the ſtream, as ſoon as its motion becomes ſufficiently rapid, the whole column of fluid muſt neceſſarily concentrate its action almoſt inſtantaneouſly on the valve, and in this manner it loſes the characteriſtic property of hydraulic preſſure, and acts as if it were a ſingle ſolid; ſo that, ſuppoſing the pipe to be perfectly elaſtic and inextenſible, the impulſe muſt overcome any preſſure, however great, that might be oppoſed to it; and if the valve open into a pipe leading to an air-veſſel, a certain quantity of the water will be forced in, ſo as to condenſe the air, more or leſs rapidly, to the degree that may be required, for raiſing a portion of the water contained in it to any given height. Young's Courſe of Lectures on Nat. Philoſ. vol. i.

RAM, in *Mythology*, the name of the higheſt god among the Gentoos. When a widow offered herſelf to be burnt on the funeral pile of her huſband, ſhe was encouraged by the preſence of a number of attendants, who formed a circle around her, and offered her freſh betel, intreating that, as ſhe would in a ſhort time appear with her huſband in the preſence of Ram, or their higheſt god, ſhe would ſupplicate for various favours for them; and above all, that ſhe would ſalute their deceaſed friends, whom ſhe might meet in the celeſtial abodes, in their names.

RAM, *Battering*. See ARIES.

RAM's-*Horns*, in *Fortification*, a name given by M. Belidor to the tenailles.

RAM-*Head*, on board a *Ship*, the name of a great block belonging to the fore and main halliards. It hath in it three ſhivers, into which the halliards are put, and at its head the tyes are reeved into a hole made there for that purpoſe.

RAM-*Head*, in *Geography*, a cape on the S. coaſt of Ireland, and county of Waterford; four miles E. of Youghal bay. N. lat. 51° 56′. W. long. 7° 44′.—Alſo, a cape on the S.E. coaſt of New Holland. S. lat. 36° 56°. E. long. 149° 35′.—Alſo, a cape of England, on the S. coaſt of Cornwall, in the Engliſh Channel, between Whitefand bay and Plymouth ſound. N. lat. 50° 19′. W. long. 4° 12′.

RAM-*Hormuz*, a town of Perſia, in Chuſiſtan; 65 miles S.E. of Suſter or Shuſter.—Alſo, one of the moſt romantic vallies in Perſia, which has been lately placed under the beglerbeg of Bebahan. It is fifteen furſungs in length (the furſung being eſtimated at $3\frac{3}{4}$ Engliſh miles), and from ſix to eight miles in breadth. The river Jeraki, entering at the eaſtern extremity, flows through the centre of it, when meeting the Kkoorkhankende, which deſcends from the mountains ſix miles E. of the town of Ram-Hormuz, they together force a paſſage through a low ridge of hills, which ſkirt the valley to the ſouth. This fertile ſpot is, at preſent, in the hands of five hoſtile chiefs; the firſt of whom is an Arab, who reſides in a mean village, ſituated at the W. end of the valley, and built amidſt the ruins of the ancient city of Ram-Hormuz. The remaining four are Perſians, and brothers, who have each a caſtle, or fortified village; from which they make frequent ſallies, and carry off the corn and cattle of their rivals. A great battle was fought in this valley, between Artaxerxes Babegan, and Artabanes, in which the former was victorious, and firſt aſſumed the title of "Shah en Shah," or king of kings. Kinneir's Perſ. Emp. 1813.

RAM's *Iſland*, an iſland in lough Neagh, Ireland, about two miles from the ſhore, and containing about ſix acres,

acres. It is in the weſtern part of the lough, in what is called Sandy bay, and is the only iſland. One of the round towers, ſo frequent in Ireland, is found here, and renders it an intereſting object from the neighbouring grounds. Dubourdieu's Antrim.

RAMA, or RAMLA, a town of Paleſtine, which was formerly large, and defended with ſtrong walls; celebrated as the place where St. Paul cured Æneas. The Muſſulmen reverence here the tomb of Locman the wife, and the ſepulchres of ſeventy prophets, ſaid to have been buried here. The church of St. George is the only object now worthy of notice. The place has a kind of market for gall-nuts, ſena, and gum arabic, which the Arabs bring hither for ſale; 20 miles N.W. of Jeruſalem.

RAMA, a town of Dalmatia; 20 miles S.W. of Moſtar.

RAMA, or *Ramah*, ſignifying an eminence, in *Scripture Geography*, a town of Judea, in the tribe of Benjamin, according to the book of Joſhua, ch. xviii. v. 20. It was ſituated towards the mountain of Ephraim, between Gaba and Babel, about ſeven miles from Jeruſalem, according to St. Jerom. This city lay on the road from Samaria to Jeruſalem; for which reaſon Baaſha, king of Iſrael, cauſed it to be fortified, to obſtruct the paſſage from the land of Judah into that of Iſrael. This is the Ramatha, or *Ramathaim-Zophim*, the country of the prophet Samuel. 1 Sam. i. 1—19. and ii. 11. &c. It was on the frontiers of Ephraim and Benjamin; and frontier cities were inhabited by both tribes. Jeremiah probably ſpeaks of this Ramah. Jer. xl. 1, 2, 3. See alſo ch. xxxi. 15, 16, 17.

RAMA, a city of Naphtali (Joſh. xix. 36.), on the frontier of Aſher (Joſh. xix. 29.)

RAMA, in *Hindoo Mythology*, is the name of a diſtinguiſhed mortal, in whom their deity Viſhnu was incarnated for the purpoſe of relieving mankind from the tyranny and oppreſſion of Ravena, the malignant king of Lanka, or Ceylon. This incarnation is one of the ten avataras, or deſcents of Viſhnu, and is, in its ſuppoſed importance, ſecond only to that of Kriſhna. It is ſimilarly a popular hiſtory, and alluſions to it perpetually occur in the writings and converſation of the Hindoos. The invaſion and conqueſt of Lanka is the ſubject of one of their fineſt poems, entitled the Ramayana; it furniſhed ſubjects for the drama, for itinerant bards, and for every purpoſe of poetry, being replete with magnificent imagery, and abounding in ſtriking incidents. (See RAMAYANA.) The mortal parents of this divine hero were Raja Daſaratha, king of Ayodetra (Oude), and his firſt wife Kahunſilya. Hence this Rama is ſometimes ſtiled Daſrat Rama, to diſtinguiſh him from other heroic Ramas; and ſometimes Rama Chandra, meaning of lunar deſcent.

There are three perſons of the name of Rama, recorded as incarnations of Viſhnu. One is Bala Rama, the elder brother, by the ſame parents, of Kriſhna; the ſecond, Paraſu Rama; and the third, Rama Chandra, the ſubject more immediately of this article. But it has been made a queſtion, whether they be not three repreſentations of one perſon, or three different ways of relating the ſame hiſtory; and whether any or all of them mean Rama the ſon of Cuſh, ſir W. Jones (Aſ. Reſ. vol. i.) ſays he leaves others to determine. He deems Rama to be the ſame as the Grecian Dionyſos, who is ſaid to have conquered India with an army of ſatyrs, commanded by Pan; and Rama was alſo a mighty conqueror, and had an army of large monkeys or ſatyrs, commanded by Maruty, ſon of Pavan. (See MARUTY.) Rama is alſo found, in other points, to reſemble the Indian Bacchus: he is, notwithſtanding his lunar appellation above noticed, fabled to be a deſcendant of the ſun, his wife's name is Sita; and it is very remarkable that the Peruvians, whoſe Incas boaſted of the ſame deſcent, ſtiled their great feſtival Ramaſitoa.

In a charge delivered by Dr. Watſon, afterwards biſhop of Landaff, to the clergy of the archdeaconry of Ely in May 1780, are many curious and ſhrewd obſervations on oriental uſages. He notices a "ſtring of cuſtoms wholly the ſame amongſt people ſo far removed from each other as the Egyptians and Peruvians. The Egyptian women, he ſays, made ſacred cakes of flour, which they offered to the queen of heaven, at their principal ſolar feſtivals called Raymi and Citua: the Peruvian women did the ſame." Almoſt all the cuſtoms deſcribed as common to theſe diſtant people, the Egyptians and Peruvians, as well as that quoted, are Hindoo cuſtoms, ancient and exiſting.

All the Ramas are famed as great warriors and as youths of perfect beauty. In the Gita, an epiſode of the Mahabarat, Kriſhna, deſcribing himſelf to Arjun as pre-eminent among all things and perſons, ſays, "Among thoſe who carry arms, I am Rama." It is Rama Chandra, however, and his lovely Sita, who are the favourite ſubjects of heroic and amatory poetics: he is deſcribed in the Ramayana "of ample ſhoulders; brawny arms, extending to the knee; neck ſhell-formed; cheſt circular and full, with auſpicious marks; body hyacinthine; with eyes and lips of ſanguine hue; the lord of the world; a moiety of Viſhnu himſelf; the ſource of joy to Ikſhwaku's race." He is ſuitably mated in his faithful Sita, one of the moſt intereſting females in Hindoo poetry. (See under her name for ſome account of her, and a deſcription of her perſon.) Rama is alſo called *Raghuva*, or ſon of *Raghu*, (ſee theſe articles,) like Ikſhwaku, one of his mortal anceſtry. Kaka-pakſha-dara, or crow-winged, is an epithet given to the Ramas, and to other warriors, from a certain mode of ſhaving the head, leaving the hair over the ears only, reſembling crow's wings, as is fancied. Shyamula, or blue-bodied, is an appellation of Rama, as well as of Kriſhna, and of their common prototype, Viſhnu; all being repreſented of hyacinthine hue. It may be here remarked, that ſeveral incidents in the Sri-Bhagavat, (a hiſtory of Kriſhna,) and in the Ramayana, told ſimilarly of their ſeveral heroes, ſeem to mix or approximate, though perhaps ſcarcely to identify, the characters of Kriſhna and Rama. Each won a wife by bending an unyielding bow, not very unlike the ſtory of Ulyſſes. Each is deſcribed as overcoming the demon Kumbakarna, and others. Kriſhna deſcended into hell; ſo did Sita, the ſakti, or energy of Rama. Both have adventures with the bear Jamba. See JAMBA, &c.

All ſects and tribes, who, under the denomination of *Vaiſhnavas* (which ſee), worſhip Viſhnu, (bating ſuch deiſtical philoſophers as ſceptically deny the perſonal exiſtence of inferior deities, attributes, or avataras, of whom ſee under JAIMINI,) agree in ſtating, that, with the exception of Kriſhna, the potentiality of the preſerving power was never exhibited in ſuch plenitude as in the avatara of Rama. In popularity, and in dramatic, hiſtoric, and poetic ſhapes, it rivals that of Kriſhna. And as one or more ſects adore Kriſhna as the deity himſelf, and draw rules for their religious and moral conduct from the Sri-Bhagavat; ſo the ſect called Ramanuj ſimilarly clothe Rama in almighty attributes, and deem the Ramayana a complete body of ethics and morality. See RAMANUJ.

In the ſeries of incarnations of Viſhnu, called *das-avatara*, or the *ten deſcents*, to diſtinguiſh them from others of leſs importance, the avataras of Paraſu Rama and Rama Chandra are uſually placed ſixth and ſeventh, as given under VISHNU. Sometimes Kriſhna is altogether omitted; in which caſe,

Bala Rama ranks as the eighth. *Muſali* is a name of the third Rama, under which word ſome notice is taken of him. And of *Paruſa* or *Paruſha Rama*, ſee under that article. The name of Rama, or perhaps more correctly of Rami, is one of the many names of Parvati, conſort of Siva. The name is alſo uſed, beyond the pale of his own ſectaries, in ſupplication and praiſe. Ram-Ram is a uſual ſalutation, like our good morrow, between friends at meeting or parting, and is uſed by both Vaiſhnavas and Saivas; and it is reverently reiterated in times, and in aid, of abſtraction (ſee JAP); and under the operation of feelings of enthuſiaſm or diſtreſs.

The hiſtory of the Ramas mixes itſelf with that of ſo many others of Hindoo mythological perſons, that in many of our accounts of ſuch perſons, &c. particulars occur reſpecting them. Thoſe deſirous of farther notice of the Ramas are, therefore, referred, in addition, to the following articles: CEYLON, JAYA, KAHUNSILYA, LAKSHIMAN, LANKA, MARUTY, RAVENA, RAMAYANA, RUNEKA, SITA, &c. from which other references point to articles on ſubjects connected herewith.

RAMADA, or *Nem Salamanca*, in *Geography*, a town of South America, in the province of St. Martha; 90 miles E. of St. Martha. N. lat. 11° 10′. W. long. 72° 20′.

RAMADAN, a faſt of lent obſerved by the Mahometans, in obedience to the expreſs command of the Koran, during which they faſt the whole day, from the time the new moon firſt appears, till the appearance of the next new moon, with ſuch extreme ſuperſtition, that they not only abſtain from eating, drinking, and women, but dare not waſh their mouth, nor even ſwallow their ſpittle, from day-break till night, or ſun-ſet.

The men, indeed, are allowed to bathe themſelves; but it is on condition they do not plunge the head under water, leſt ſome drops enter by the mouth or ears, &c. But as for the women they are ſtrictly forbidden bathing. Some are ſo cautious, that they will not open their mouth, to ſpeak, leſt they ſhould breathe the air too freely. The faſt is alſo deemed void if they kiſs or touch a woman. To make amends, they feaſt all night till day-break; though the more rigid begin the faſt again at midnight; and uſually ſpend more in this month than in ſix others.

The Ramadan happens at different ſeaſons of the year; and when it is in the ſummer it is very hard on the labourers. This month once in thirty-three years is in every ſeaſon of the year, the Turkiſh month being lunar, and they beginning at the day they can ſee the moon; whereas the Jews begin their account from the day the moon makes, which is a day before the Turks.

The reaſon given why the month of Ramadan was fixed upon for this purpoſe is, that on this month the Koran was ſent down from heaven. From this faſt of Ramadan none are excuſed, except travellers and ſick perſons, under which latter denomination are included all thoſe whoſe health would be manifeſtly injured by keeping the faſt; but then they are obliged, ſo ſoon as the impediment is removed, to faſt an equal number of other days; and breaking of the faſt is ordered to be expiated by giving alms to the poor.

RAMAG, a word uſed by ſome of the chemical writers to expreſs aſhes.

RAMAGE, a term uſed for the boughs or branches of trees. Hence,

RAMAGE-*Hawk*, or *Falcon*, one that is wild and coy, as having been long among the boughs, preying for itſelf. All falcons retain this name till they have left the aery; being ſo called in May, June, July, and Auguſt. Theſe are very rarely reclaimed. See BRANCHER, FALCON, and HAWKING.

RAMAGE *Velvet*. See VELVET.

RAMAGURRY, in *Geography*, a town of Hindooſtan, in the Carnatic; 30 miles W. of Tritchinopoly.

RAMAH, a town of Arabia, in the province of Nedsjed; 120 miles N.W. of Jamama.

RAMAH, or *Ramalla*, *Ramola*, *Ramula*, *Ramba*, *Ruma*, or *Remphtis*, a city W. of Jeruſalem, between Lydda and Joppa, according to St. Jerom; or between Joppa and Jeruſalem, as modern travellers deſcribe it. This is the place which Euſebius and St. Jerom took for Arimathea, the country of Joſeph. Matt. xxvii. 57.

RAMAI, in *Natural Hiſtory*, a name given by many old writers to bole armenic.

RAMAK, in *Ichthyology*, a ſpecies of *Sciæna*; which ſee.

RAMALINGA, in *Geography*, a town of Hindooſtan, in Coimbetore; 16 miles S.S.W. of Erroad.

RAMALIS VENA, a name given by ſome anatomical authors to the vena portæ.

RAMANUJ, the name of a religious ſect of Hindoos, of the great ſubdiviſion of Vaiſhnava, who worſhip Viſhnu, the perſonification of the preſerving power of the deity, in his incarnation of Rama. Of this ſect ſome worſhip Rama only, ſome his ſpouſe Sita, and ſome both Rama and Sita conjointly. (See RAMA.) Among the Ramanuj none are addicted to the indecent, or left-handed, mode of worſhip noticed under the article RADHA as diſgracing her votaries. (See farther under SAKTA, and SECTS *of Hindoos*.) The different ſects of Hindoos are diſtinguiſhable by a variety of marks on their foreheads; of which a great many are repreſented in the ſecond plate, with copious explanations in page 404, of the Hindu Pantheon. The ſect of Ramanuj are known by a double upright white line on the forehead, with a red line between, or ſometimes a circlet or dot. Sometimes the lines are red and the circlet black.

RAMAS, CAPE, in *Geography*, a cape on the W. coaſt of Hindooſtan; 21 miles S. of Goa.

RAMASSERAM, a town of Hindooſtan, in the circar of Rajamundry; 35 miles S.S.E. of Rajamundry.

RAMAYANA, the title of a poem in the Sanſcrit language, of great celebrity in India, and regarded as ſacred by ſome ſects of Hindoos, and greatly venerated by all. Its ſubject is the exploits of three perſons named Rama; but more eſpecially the wars conducted by one of them, named Rama Chandra, for the conqueſt of Lanka or Ceylon, from its powerful ſovereign Ravena, or rather, indeed, for the reſcue of his wife from the hands of that tyrant. It is compriſed in ſeven kandas, or books, containing 24,000 ſhlokas, or metrical ſtanzas; named thus: 1. Adi-kanda, containing 64 ſections, and 2850 ſtanzas; 2. Ayodhya-kanda, 80 ſections, and 4170 ſtanzas; 3. Aranyaka-kanda, 114 ſections, and 4150 ſtanzas; 4. Keſhkinda-kanda, 64 ſections, 2925 ſtanzas; 5. Sundara-kanda, 43 ſections, 2045 ſtanzas; 6. Yudha-kanda, 105 ſections, 4500 ſtanzas; 7. Uttara-kanda, 90 ſections, 3360 ſtanzas. The Ramayana may be called an epic poem, as it is on one continued, intereſting, and heroic action. It is ſecond in celebrity only to the Mahabarat, and perhaps ſuperior to it in reputation for holineſs. (See MAHABARAT.) We have the authority of ſir William Jones for ſaying, that this great epic poem, in unity of action, magnificence of imagery, and elegance of diction, far ſurpaſſes the elaborate work of Nonnus, in forty-eight books, entitled Dionyſiaca; and for believing that the heroes of the poems Rama (patronimically diſtinguiſhed by the name of Daſrat Rama) and Dionyſos are the ſame.

A curious

A curious parallel might be drawn between the manners and cuſtoms deſcribed in theſe two works, the Dionyſiaca and Ramayana. The proceſſions and rites detailed in the former ſeem deſcriptive, with a little licence for poetical embelliſhment, of thoſe in uſage to this day in India. Some of theſe Bacchic orgia are noticed under our articles DIONYSIA and NONNUS; which ſee. A keen etymologiſt would find innumerable lingual coincidencies; and, in truth, many of the names of perſons, Bacchus and Dionyſos, and of places, as well as original perſons, ſeem ſoberly traceable to the ſacred language and rites of the Brahmans.

So highly is the Ramayana venerated, that the fourth claſs of Hindoos, the Sudra, is not permitted to read it. At the end of the firſt book, a promiſe is made of great benefit to any individual of the three firſt claſſes or tribes who ſhall duly read it. "A Brahman, reading it, acquires learning and eloquence; a Kſhetriya will become a monarch; a Vaiſya will obtain vaſt commercial profits; and a Sudra, *hearing* it, will become great." Of theſe diſtinctions of tribes or claſſes, the reader will find due notice under SECTS *of Hindoos*. Under RAMA we have ſtated that his name reiterated is uſed by ſeveral ſects as a ſort of ſalutation, or benediction. The author of the Ramayana, in the vanity of playful egotiſm, which, from its frequency with oriental poets, has ceaſed to ſeem aſſuming, calls on his readers to "ſalute Valmiky, the kukila (cuckoo), who, mounted on the branch of poeſy, ſounds the delightful note of Rām-Rām."

It has been ſurmiſed that the Ramayana, like the Mahabarat, is allegorical, ſo far as relates to perſonal adventures; which, in both caſes, are mere machinery for the introduction of a concealed ſyſtem of philoſophy and ethics: in the firſt inſtance the allegory is *phyſical*, in the latter *moral*. Under the article MAHABARAT the allegorical nature of that extraordinary poem is ſufficiently ſhewn. The Kurus and Pandus, the heroes of that poem (ſee KURU and PANDU), are perſonifications of virtues and vices. The Ramayana and the Dionyſiaca relate how their reſpective Indian conquerors led armies of ſatyrs. (See hereon under MARUTY and RAMA.) Theſe ſatyrs, or monkies, we apprehend to be perſonifications of winds, or gazeous metaphors. In the Ramayana we find the machinery to conſiſt of the ſun and planets, fire, the firmament, wind, water, &c. perſonified in the gods or regents of thoſe bodies, elements, &c. It has been farther ſurmiſed, that whenever theſe two extraordinary poems, the Mahabarat and Ramayana, ſhall appear in Engliſh, and their allegories be more fully examined, it may poſſibly be found, that not only the three Ramas will melt into one, but that all will amalgamate with Kriſhna. Some objections to the identity of the Ramas have been offered of a chronological nature. Paraſu Rama, it is contended, reigned or flouriſhed eight generations before Rama Chandra. Their poetical identity, however, is ſufficiently eſtabliſhed; and one can ſcarcely bring ſuch a tiſſue of allegory, incarnations, and whimſical adventures, to the teſt of ſober hiſtorical and chronological accuracy. Perſons of theſe names may have reigned or flouriſhed at any given period, for they have always been very common, and are ſo ſtill.

The Ramayana is ſo replete with incident, that it is carcely poſſible to give any analyſis of its ſubject with ſufficient brevity for this work. Unity of action is, however, its characteriſtic, namely, the recovery of Sita from the hands of her raviſher Ravena, the gigantic tyrant of Ceylon. It may be noticed in paſſing, that the Ramayana, like the Iliad, is founded on a rape, and that Sita is the Helen of the Hindoo epic. (See SITA.) So inſeparably intermixed are the varied ſubjects of the Hindoo mythological hiſtory, that the diſcuſſion of one neceſſarily brings another under notice. This is the cauſe of ſuch frequent references to and from the articles under which we have endeavoured to give a ſuccinct account of ſuch a number of ſubjects of that deſcription, diſtinct apparently, but in reality connected, and often confounded with each other. On the ſubject of this article, the Ramayana, or for quotations from it, we may therefore refer to the following, among others: CEYLON, LAKSHMI, LANKA, MANTRA, PARASU RAMA, MENAKA, RAVENA, RHEMBA, in addition to thoſe pointed to in earlier paſſages of this article, and in thoſe articles juſt named.

What precedes, referring to the poem bearing the title of this article, is offered reſpecting the Ramayana of Valmiki. There are many other poems of the ſame name in Sanſcrit, Prakrit, Hindvi, and many other Hindoo dialects; as well as in Arabic, Perſian, Malayan, and others derived from the like ſource. Theſe are of courſe of unequal celebrity and merit; and acknowledged to be greatly diſtant from Valmiki's divine poem. Even of this it may be ſaid, that the ſtyle is frequently flat and diffuſe, deficient in ornament, and abundant in repetitions. As well as Valmiki's work, ſeveral others, under the ſame title, are uſually conſidered with more reſpect than mere profane poems. One is aſcribed to Vyaſa, the reputed author or compiler of the *Vedas* and *Puranas*. (See thoſe articles.) A conſiderable portion of ſeveral of the latter mythological romances is occupied by the ſame ſubject, to wit, the adventures of Rama; but in the Vedas no mention is made of this perſon, except, indeed, in ſome detached parts, reaſonably ſuſpected to have been interpolated by zealous ſectaries. The titles even of the philoſophical and profane poems, commentaries, &c. that in divers languages owe their origin to the Ramayana, would require a catalogue of no inconſiderable extent to contain them. Among theſe are included many dramatic works. The quotations from, and alluſions to its mythological perſonages and fables, in the works of the minor poets, are inceſſant; and upon the whole, there is no ſubject, perhaps, in the whole range of Hindoo mythology, or hiſtory, ſo often in the minds and mouths of that race of all ranks and ſects, as the ſtory of the Ramayana in ſome of its bearings. That of Kriſhna rivals it in popularity. Both are chanted by itinerant bards, who illuſtrate their ſubjects by exhibiting a ſeries of pictures from the Ramayana and Mahabarat. Women ſingers frequently accompany theſe eaſtern troubadours, who are commonly met with in every city, camp, and town of India.

RAMAZZINI, BERNARDIN, in *Biography*, an Italian phyſician of diſtinction, was born at Carpi, near Modena, in 1633, where his father was a reſpectable citizen. Having received a claſſical education from the Jeſuits at his native town, he went to Parma for the ſtudy of philoſophy at the age of 19, undecided what profeſſion to adopt: at the end of three years he ſelected that of phyſic, and received the degree of doctor at Parma in the beginning of 1659. He then repaired to Rome for the completion of his ſtudies, and ſettled in practice in the duchy of Caſtro. He was ſoon obliged by ill health, however, to return to his native air; and, on his recovery, he married, and purſued his profeſſion at Carpi. Finding his reputation increaſing, he removed to Modena, at the ſolicitation of ſome friends, in 1671, where he met with merited ſucceſs, and excited the jealouſies of his brethren. In 1682 he was appointed profeſſor of the theory of medicine in the univerſity, which had been recently eſtabliſhed at Modena, by duke Francis II.; and he continued to fill this office for eighteen years, attending at the ſame time to practice, and not neglecting the cultivation of polite literature, to which he was particularly partial. The

elegance of his Latin ſtyle in his writings, evinces the ſucceſs with which he purſued the ſtudy of the claſſics. In 1700 he was invited to a profeſſorſhip at the more diſtinguiſhed univerſity of Padua, and removed thither. Though ſomewhat advanced in age, he fulfilled the duties of his chair with an ardour, not to be ſurpaſſed by his junior colleagues, for the ſpace of three years, when he was attacked with a diſeaſe of the eyes, which threatened to deſtroy his viſion, and which, in fact, did ultimately deprive him of that faculty. Having loſt the pleaſure of reading, which was the only ſource of his regret, he ſupplied that amuſement by the aſſiſtance of his grand-children, who read to him, and acted as his amanuenſes. In 1708, however, the ſenate of Venice appointed him preſident of the college of phyſicians of that capital, and in the following year raiſed him to the firſt profeſſorſhip of the practice of medicine. He continued to perform the duties of theſe honourable poſts, at the earneſt ſolicitations of his conſtituents and pupils, with great diligence, to the end of his life, and died on his birth-day, November 5th, 1714, in conſequence of an attack of apoplexy, which ſeized him while he was preparing for his lectures, at the age of 81.

Ramazzini was a member of ſeveral of the academies of ſcience eſtabliſhed in Germany, Berlin, &c., and left ſeveral works; the principal of which, and one which will ever be held in eſtimation, is his treatiſe on the diſeaſes of artiſts and manufacturers, entitled "De Morbis Artificum Diatriba," firſt publiſhed in 1700, and frequently reprinted. He alſo publiſhed ſome tracts relative to certain epidemics, both among men and cattle; ſome "Ephemerides Barometricæ;" a work on the abuſe of Peruvian bark; and ſeveral orations delivered in his profeſſorial capacity. All his works have been collected and publiſhed together at Padua, Geneva, London, and Naples; the edition of London is the moſt correct. Eloy Dict. Hiſt. de la Med. Hutchinſon's Biog. Med.

RAMBANG, in *Geography*. See REMBANG.

RAMBERVILLER, or REMBERVILLEE, a town of France, in the department of the Voſges, and chief place of a canton, in the diſtrict of Epinal; 19 miles E. of Mirecourt. The place contains 4926, and the canton 14,014 inhabitants, on a territory of 317½ kiliometres, in 28 communes. N. lat. 43° 21′. E. long. 6° 43′.

RAMBIN, a town of Anterior Pomerania; 10 miles W.S.W. of Bergen.

RAMBLE, a town of Spain, in the province of Cordova; ſeven miles N.W. of Montella.—Alſo, a town on the W. coaſt of the iſland of Teneriffe; three miles W. of Laguna.

RAMBOUILLET, a town of France, in the department of the Seine and Oiſe, and chief place of a canton, in the diſtrict of Verſailles, the ſeat of a tribunal, and of a national farm, where the ſheep are much celebrated for the fineneſs of their wool; 27 miles S.W. of Paris. The place contains 2586, and the canton 9652 inhabitants, on a territory of 305 kiliometres, in 17 communes. N. lat. 48° 39′. E. long. 1° 54′.

RAMBURE, a town of France, in the department of the Somme; 3 miles W. of Oiſemont.

RAMBURELLES, a town of France, in the department of the Somme; 9 miles S. of Abbeville.

RAMCHUND-POUR, a town of Bengal; 30 miles N.E. of Calcutta.

RAMCHUNDRA, a town of Hindooſtan, in the circar of Mohurbunge; 23 miles S.S.E. of Harriopour.

RAMCHUNPOUR, a town of Bengal; 60 miles N. of Dacca.

RAMCOTTA, a town of Thibet; 18 miles S.W. of Sirinagur.

RAMCOUTY, a town of Hindooſtan, in Bahar; 28 miles N.E. of Goorackpour. N. lat. 26° 51′. E. long. 84° 8′.

RAMDILLY, a town of Hindooſtan, in the Nayrs; 25 miles N.N.W. of Tellicherry.

RAMEAU, JOHN PHILIP, in *Biography*, chevalier de St. Michel, compoſer to the king of France, and to l'Academie Royale de la Muſique, or ſerious opera at Paris, was born at Dijon in 1683. He went early in his life to Italy, and at his return was appointed organiſt at Clermont en Auvergne, where his "Traité de la Muſique" was written, in 1722. He was afterwards elected organiſt of St. Croix de la Bretonnerie at Paris. Here his time was chiefly employed in teaching; however, he publiſhed harpſichord leſſons, and ſeveral other theoretical works, without diſtinguiſhing himſelf much as a vocal compoſer, till the year 1733, when, at fifty years of age, he produced his firſt opera of "Hippolite et Aricie." The muſic of this drama excited profeſſional envy and national diſcord. Party rage was now as violent between the admirers of Lulli and Rameau, as in England between the friends of Bononcini and Handel, or, in modern times, at Paris, between the Gluckiſts and the Picciniſts.

When the French, during the laſt century, were ſo contented with the muſic of Lulli, it was nearly as good as that of other countries, and better patronized and ſupported by the moſt ſplendid prince in Europe. But this nation, ſo frequently accuſed of more volatility and caprice than their neighbours, have manifeſted a ſteady perſevering conſtancy in their muſic, which the ſtrongeſt ridicule and contempt of other nations could never vanquiſh.

Rameau only anſwered his antagoniſts by new productions, which were ſtill more ſucceſsful; and, at length, he was acknowledged by his countrymen to be not only ſuperior to all competition at Paris, but ſole monarch of the muſical world. From 1733 to 1760 he compoſed twenty-one operas, of which the names and dates are annually publiſhed in the "Spectacles de Paris," and in many other periodical works.

Rameau's ſtyle of compoſition, which continued in favour almoſt unmoleſted for upwards of forty years, though formed upon that of Lulli, is more rich in harmony, and varied in melody. The *genre*, however diſpleaſing to all ears but thoſe of France, which had been nurſed in it, was carried by the learning and genius of Rameau to its acme of perfection; and when that is achieved in any ſtyle, it becomes the buſineſs of ſubſequent compoſers to invent or adopt another, in which ſomething is ſtill left to be done, beſides ſervile imitation.

The opera of "Caſtor and Pollux" having been long regarded in France as the maſter-piece of this compoſer, we ſhall here inſert a few remarks upon it, that have been made on a recent examination.

The overture is the beſt of this author, upon Lulli's plan. The opening ſymphony is beautiful; but why the ſame melody was not applied, in the ſame meaſure, to the poetry, we know not, unleſs the verſification required a change of time; but, in that caſe, why write the ſymphony on a ſubject that would not ſuit the words? But thoſe eternal changes in the meaſure, which teaze and diſappoint the ear of all that are uſed to other muſic, is general in ſerious French operas, and ſeems as much the fault of the poet as muſician. It is, however, wonderful, that this defect was not ſooner diſcovered. The over-charged tenderneſs of Rameau's muſic appears in all his ſlow movements, which are in one ſtyle, and generally in triple time. This maſter perpe-

tually diſcovers himſelf to be a great harmoniſt; but inured to a bad taſte and ſtyle of compoſition, as well as to bad ſinging, he has only augmented the defects of his predeceſſors, and rendered what was rude and clumſy in Lulli ſtill more offenſive, by endeavours at ſweetneſs or high ſeaſoning. The appoggiaturas, or leaning notes, being ſo frequently incorporated in the harmony, renders it crude, and the hanging on every note, as if unwilling to relinquiſh it, checks and impedes the motion of the air, and gives it a ſlow and languid effect, however lively the theme on which it is compoſed. Every paſſage in ſuch melody reſembles a French heroic verſe:

"Each is an *Alexandrine*, through the ſong,
That, like a wounded ſnake, drags its ſlow length along."

The opening of the ſecond act, "Que tout gemiſſe," is very fine, and the pathos well applied; but the ſubſequent air, which is caſt in an admirable mould, is ſpoiled by frequent and unneceſſary changes of meaſure; and yet in ſpite of theſe defects, and the vocal outrages of mademoiſelle Arnould, we were more pleaſed and affected by this ſcene, than any other we ever heard at the French ſerious opera. The march, which has few appoggiaturas in it, is like other Chriſtian muſic.

The *prelude tendre*, at the opening of the third act, abounds with too many of theſe drags, which being equally harſh to the ear and injurious to pulſation, ſeem to prevent the performer from ever falling on his feet; and bar eleventh, the chord of the ſuperfluous fifth, which makes all nature ſhudder, except our Gallic neighbours, is here continued ſo long, that it diſtorts the countenance of every other hearer, like *hiera picra*. The major minuet, page 121, after ſo long and tireſome a minority, is rich in harmony and graceful in melody. The voice is worſe uſed by the compoſer than the moſt inſignificant inſtrument. For after ſeveral ſymphonies that are extremely promiſing, and the ear has been made to expect a continuation of the prefatory ſtrain, nothing is given to the vocal part but broken accents and diſlocated meaſures. In the *chaconne*, which is admirable, the meaſure is well marked and well accented. This muſt long have preceded Jomelli's favourite chaconne, and have ſerved as a model to him, Theller, and others, in compoſing this ſpecies of dance. More genius and invention appear in the dances of Rameau than elſewhere, becauſe in them, there is a neceſſity for motion, meaſure, and ſymmetry of phraſe. And it may with truth be ſaid, that nothing in Lulli's operas was imitated or adopted by the reſt of Europe, but the ſtyle of his overtures, or in Rameau's, but the dances.

But though the ſeveral merits of this muſician have been too much magnified by partizans and patriots in France, and too much depreciated by the abettors of other ſyſtems and other ſtyles, as well as patriots of other countries, yet Rameau was a great man; nor can the profeſſor of any art or ſcience mount to the ſummit of fame, and be elected by his countrymen ſupreme dictator in his particular faculty, without a large portion of genius and abilities.

The ſucceſsful revival of his opera of "Caſtor and Pollux" in 1754, after the victory obtained by his friends over the Italian burletta ſingers who had raiſed ſuch diſturbance by their performance of Pergoleſi's intermezzo, the "Serva Padrona," was regarded as the moſt glorious event of his life. The partizans for the national honour could never hear it often enough. "This beautiful opera," ſays M. de la Borde, "without any diminution in the applauſe or pleaſure of the audience, ſupported a hundred repreſentations, charming at once the ſoul, heart, mind, eyes, ears, and imagination of all Paris."

From this era to the time of his death, in 1767, at eighty-four years of age, Rameau's glory was complete. The Royal Academy of Muſic, who all regarded themſelves as his children, performed a ſolemn ſervice in the church of the Oratory, at his funeral. And M. Philidor had a maſs performed at the church of the Carmelites, in honour of a man whoſe talents he ſo much revered. See Base, Basse *Fondamentale*, and Counterpoint.

RAMED, a name given by ſome chemical writers to rhubarb.

RAMEDEGA, in *Geography*, a town of Hindooſtan, in the circar of Gangpour; 15 miles S.W. of Pada.

RAMEE, a town of Bengal; 50 miles S. of Iſlamabad.

RAMEEAPATAM, a town of Hindooſtan, in the Carnatic; 30 miles S. of Ongole.

RAMEEPOUR, a town of Hindooſtan, in Allahabad; 35 miles E.N.E. of Gazypour.

RAMELLI, Agostino, in *Biography*, a celebrated Italian mechaniſt and engineer, was born, in 1530, at Maſanzana, in the dioceſe of Milan. Having entered the army, he ſerved a conſiderable time under the marquis de Marignano, a general of Charles V. After this, he ſerved under the duke of Anjou as captain, or engineer, at the ſiege of Rochelle, in 1573, where he was dangerouſly wounded, and taken priſoner. When that prince, afterwards Henry III., was called to the crown of Poland, he was the friend of Rameili, and he nominated him his engineer when on the throne of France. In 1588 he publiſhed a work in Italian and French, entitled "Le Diverſe et Artificioſe Machine del Capitono Agoſtino Ramelli," &c. with nearly 200 figures, deſcribing a great number of machines for various purpoſes, moſt of his own invention, and which exhibit much ingenious contrivance. The work is very ſcarce, and is much prized by the curious.

RAMELSPACH, in *Geography*, a town of Auſtria; 5 miles S.E. of Meiſſai.

RAMELTON, or Rathmelton, a ſmall poſt-town of the county of Donegal, Ireland, ſituated on a bay at the bottom of lough Swilly. It is 117 miles N.W. by N. from Dublin.

RAMENAPILLY, a town of Hindooſtan, in the circar of Rajamundry; 42 miles E. of Rajamundry.

RAMENTUM, in *Botany*, a form of pubeſcence in plants, which, as the name ſignifies, has the appearance of a ſhaving, being flat, membranous, moſtly irregular in ſize and ſhape, quite unlike the uniform hairs or briſtles of which the clothing of moſt plants conſiſts. (See Pubescence.) The above term was firſt uſed, if we recollect rightly, by l'Heritier, and occurs in ſome ſpecies of *Begonia*. The ſcalineſs of Ferns is of a ſimilar nature.

RAMERUP, in *Geography*, a town of France, in the department of the Aube, and chief place of a canton, in the diſtrict of Arcis-ſur-Aube; 6 miles E. of Arcis-ſur-Aube. The place contains 493, and the canton 8870 inhabitants, on a territory of 440 kiliometres, in 29 communes.

RAMESAN, an oriental term for a month of faſting, very religiouſly obſerved among the Turks, and otherwiſe called *Ramadan*; which ſee.

RAMESERAM, in *Geography*, a town of Hindooſtan, in the circar of Cuddapa; 6 miles E. of Gandicotta.

RAMETTA, a town of Sicily, in the valley of Demona; 6 miles W. of Meſſina.

RAMEX,

RAMEX, (*ramus*, a branch,) in *Surgery*, a rupture, or hernia. See HERNIA.

RAMEX *Varicoſus*. See CIRSOCELE.

RAMGAD, in *Geography*, a town of Hindooſtan, in Bahar; 10 miles W. of Bahar.

RAMGARY, a town of Hindooſtan, in the country of the Nayrs; 19 miles W.N.W. of Palicaudchery.

RAMGAUT, a town of Hindooſtan, in the ſubah of Delhi; 37 miles S.E. of Secundara.

RAM-GETTER, in *Rural Economy*, a term applied by the midland breeders to ſuch rams as are proper for getting ram-ſtock, in contradiſtinction to ſuch as are fit only for getting wedder-ſtock. See RAM.

RAMGONGA, in *Geography*, a river of Aſia, which riſes in Thibet, and runs into the Ganges, 10 miles N. of Canoge.

RAMGOT, a town of Hindooſtan, in Concan; 25 miles N. of Goa.

RAMGUR, a circar of Bengal, bounded on the N. by Bahar, on the N.E. by Curruckdeagh, on the S.E. by Pachete, on the S. by Nagpour, and on the W. by Koonda and Toree; about 90 miles long, and 60 broad.—Alſo, the capital of this circar; 175 miles W.N.W. of Calcutta. N. lat. 23° 40′. E. long. 83° 42′.—Alſo, a town of Hindooſtan, in Dowlatabad; 35 miles S. of Neermul. N. lat. 18° 30′. E. long. 79° 11′.—Alſo, a town of Hindooſtan, in Malwa; 8 miles S. of Ragoopour.—Alſo, a town of Hindooſtan, in the ſubah of Delhi; 5 miles N. of Coel.—Alſo, a town of Hindooſtan, in Guzerat; 50 miles E.S.E. of Surat.—Alſo, a town of Bengal; 13 miles N.W. of Midnapour.

RAMGUR. See SESVAH.

RAMGURRA, a town of Hindooſtan, in the Myſore, captured by the Engliſh in 1791; 42 miles N.E. of Seringapatam.

RAMHYTTE, a town of Sweden, in Weſtmanland; 36 miles from Stromſholm.

RAMI, in *Hindoo Mythology*, one of the many names of the goddeſs *Parvati*; which ſee. Under this name ſhe is ſaid to be worſhipped at the ſplendid temple on the iſland called Ramiſeram, between Ceylon and the cape named by us Comorin, but which ſhould be called cape Kaumari, or Kumari, another of the names of this goddeſs, and meaning the virgin. (On this point ſee LANKA and PARVATI.) Sami is the name of a tree or wood ſacred to Parvati, and ſhe is ſometimes called Sami Rami, and it has been upheld that this is the origin of the Semiramis of the Greeks. (See hereon Aſ. Reſ. vol. iv. p. 382. vol. viii. p. 256. 8vo. ed.) A deſcription of the celebrated temple of Ramiſeram will be found under that article. See alſo SAMI.

RAMJAVENPOUR, in *Geography*, a fort of Bengal; 27 miles S.S.W. of Burdwan.

RAMIFICATION, the production of boughs or branches, or of figures reſembling branches.

RAMIFICATIONS, in *Anatomy*, are the diviſions of the arteries, veins, and nerves, ariſing from ſome common trunk.

RAMIGRI, a word uſed by ſome writers as a name for colophony.

RAMILLIES, in *Geography*, a village of France, in the department of the Sambre and Meuſe, at the ſource of the river Geete; worthy of being recorded on account of a battle fought here in the year 1706, between the allies commanded by the duke of Marlborough, and the French under marſhal Villeroy. The confederates took the whole of the enemy's baggage and artillery, and about 120 ſtandards, 600 officers, and 6000 private ſoldiers: about 8000 were killed or wounded. The loſs of the allies did not exceed 3000 men; 13 miles N. of Namur.

RAMING, a town of Auſtria; 11 miles S. of Steyr.—Alſo, a town of Perſia, in the province of Irak; 40 miles E. of Conſar.

RAMINGAM, a town of Hindooſtan, in Dowlatabad; 10 miles N. of Oudigher.

RAMINGSDORF, a town of Auſtria; two miles E. of Steyr.

RAMINGUE, in the *Manege*. A horſe gets this name that is reſtive, and reſiſts or cleaves to the ſpurs; that is, defends himſelf with malice againſt the ſpurs; ſometimes doubles the reins, and frequently yerks to favour his diſobedience. See TICKLISH and DOUBLE.

RAMIS, BARTOLOMEO, in *Biography*, a Spaniard, the firſt modern who ſuſtained the neceſſity of a temperament in muſical inſtruments, of which the tones are fixed. He was contemporary with Franchinus, and in 1482 publiſhed a work, entitled "De Muſica, Tractatus, ſive Muſica practica."

He ſeems to have converted Pietro Aaron to his opinion: as that theoriſt manifeſtly exalts the character of Ramis on all occaſions at the expence of Franchinus.

The Spaniard was attacked in a rough manner by Nicholas Burtius, for differing from Guido in his diviſion of the monochord, in a tract entitled "Muſices Opuſculum cum Defenſ. Guidonis Arctini adverſus quendam Hiſpanum veritatis prævaricator." Bonon. 1487. This tract, printed in black letter, is in the Aſhmol. Collect. among the books of Ant. Wood.

Burtius imagined the honour of Guido to be injured by the Spaniard, as Guido uſed the Pythagorean proportions, and had never thought of a temperament. Burtius, in his turn, was handled very roughly by Spataro, the diſciple of Ramis (Joannes Spadarius Bononienſis, Muſices ac Bartolomii Rami Paulo ejus Præceptoris honeſta Defenſio in Nicol. Burtij Parmenſ. Opuſc. Bologna, 1491.); and the venerable Franchinus, finding himſelf very rudely handled in the diſpute by the favourers of temperament, in 1522, when he was upwards of ſeventy years of age, took up the defence of Pythagoras, as Fontenelle, at near a hundred, did of Des Cartes. After this, the war became general, and continued to rage with great violence for more than a century, between the friends of tempered ſcales, and the adherents to ancient proportions and equal harmony.

RAMISERAM, in *Geography*, an iſland in the Indian ſea, between the iſland of Ceylon and the coaſt of Coromandel; to which there is a paſſage of about 12 or 14 leagues from the iſland of Manaar, on the coaſt of Ceylon. But the advantages that might be derived from this ſpeedy communication are in a great meaſure prevented by the numberleſs ſhallows and ſand-banks, which every where interrupt the paſſage, and which are ſo high, that many of them are dry except during the monſoons. There is in particular a line of ſand-banks, which runs quite acroſs from Manaar to Ramiſeram, denominated Adam's bridge, and alſo Rama's bridge, becauſe God is ſaid to have come by this way into Ceylon. (See ADAM's *Bridge* and MANAAR.) From Rama, Ramiſeram takes its name, and it has a large temple dedicated to him. The ſhortneſs of the paſſage from Ramiſeram to Manaar is particularly uſeful on account of the ſpeedy conveyance it affords to people on buſineſs, and the communication of intelligence. The meſſengers who uſually go from Columbo to Manaar, a diſtance of 160 miles, in three days, take boat here, and croſs over by Adam's bridge to Ramiſeram, and then proceed along the Coromandel coaſt to Madras. An expreſs

expreſs in favourable weather will run from Columbo to Madras in eight days, and the journey has been accompliſhed once in ſeven days. (See MANAAR.) The iſle of Ramiſeram, which is the limit of the Hindoo religion in more modern times, and of the conqueſts of the Muſſulman princes, is, as we have ſaid, ſeparated from Ceylon by Adam's bridge. The iſland is low, ſandy, and uncultivated, except with a few ſcattered Palmira and cocoa-trees. The pagodas, for which it is ſo famous, lie on the Ceylon ſide, near the ſea, and are the reſort of innumerable multitudes of different ſects of religion in India, during the ſeaſon of certain feſtivals. The numerous pagodas are conſtructed in the ſame ſtile with thoſe on the Coromandel coaſt; and they are ſurrounded with the houſes of the brahmins, prieſts, and other religious perſons, whoſe zeal leads them to attend on their temples; among whom, in particular, may be ſeen the deſcendants of the Tamuls, Telingas, Canarians, Mahrattas, and Orias, who compoſe a great body of the original inhabitants of the ſouthern peninſula. Their houſes are built of the cocoa-tree, in ſmall ſquares and ſtreets, where their families are ſeen reclining on the little mud terraces, and under the payals or virandahs. They do not allow Europeans to enter theſe temples; but they are known to reſemble thoſe of the coaſt in their crowded ornaments, ſpires of brickwork, long porches in front, and viſtas, at the extreme end of which are placed the deities, in an obſcure ſituation, ſurrounded by lamps burning day and night. The ſame reſerve to ſtrangers ſubſiſts among all the ſouthern brahmins. The brahmins allow no labour or cultivation to be carried on in the iſland of Ramiſeram, conſidering it altogether as ſacred. The contributions of thoſe who viſit it are ſufficient for the ſupport of the temples. Several of the neighbouring Poligar chiefs contribute largely, and ſome of theſe rajahs have ſtatues erected to them for their gifts. The chief pagoda has ſeveral of theſe ſtatues in its different ſquares. Low as the ſand lies in this iſland, good water is eaſily procured; for on ſcooping it up, the water collects immediately in the holes; but this is not the caſe in Manaar and the weſt coaſt of Ceylon.

The guardianſhip of this ſacred iſle belongs to a family of devotees, called "Byragees," the chief of whom is always doomed to celibacy: the ſucceſſion being carried on by the ſiſters or the collateral branch, who only are permitted to marry. This inſtitution is ſimilar to that of the ſovereignty of the Travancorians and Nairs of the Malabar coaſt. The clothes and turbans of the devotees are of a tawny red colour, decorated with large black beads, of a particular kind of wood. From the pagodas juſt mentioned there runs out a long narrow piece of ſand, terminating in a point, within a mile of which is a choultry at Tona Goody. This is a ſquare of houſes with a court incloſed for the accommodation of pilgrims, who come to the fartheſt point of the iſland to perform their ablutions in the ſea, the moſt ſacred and the pureſt of their ceremonies. A brahmin takes care of this choultry, and a pole with a light is fixed at the end of the point to direct the pilgrim. N. lat. 9° 18′. E. long. 79° 22′. Percival's Ceylon.

Of the temple in this iſland we ſhall give ſome account, extracted from a publication of Mr. Cordiner, who viſited it. The external appearance is not remarkably grand, and at a diſtance, no idea is excited of the minute ornaments and laboured workmanſhip which ſtrike the eye on a nearer inſpection. All the architecture ſeen without doors is inſignificant, compared with the magnificence of the interior. After an examination of the whole ſtructure, which is entirely of hewn ſtone, Mr. C. deemed the extent of maſonic labour in its erection, muſt have been equal to that of any of the moſt ſplendid cathedrals of Europe. "On entering it we were," he ſays, "completely aſtoniſhed at the grandeur of the workmanſhip, and extent of the dimenſions, which far ſurpaſſed any idea that we had formed of Indian magnificence." From the weſt gate a low gallery, 144 feet in length, with three rows of pillars on each ſide, leads down to the centre of the building; where it branches off, in galleries ſimilarly conſtructed, to the right and left, each extending 150 feet, then running from weſt to eaſt 500 feet, and incloſing an oblong rectangular ſpace. The gallery runs alſo along the centre of the temple 788 feet, and a ſimilar gallery runs acroſs from north to ſouth, where are like entrances, interſecting the former in the centre of the rectangular ſpace. All the galleries have on each ſide triple rows of maſſy ſtone pillars, of highly laboured workmanſhip. Thoſe in the front line are the largeſt and moſt ſuperb, having a huge lion, with the mouth wide open, ſculptured in bas relief, above three diſtinct capitals, over which are a ſcroll, and a richly ornamented cornice. Statues of the ſize of life are attached to many of the pillars, repreſenting gods and deified perſons. The pillars ſtand on a continued baſement, forming the floor of the galleries, raiſed three feet, with ſteps to aſcend by, all of ſtone. The roofs of all the galleries are flat, formed of ſtones reaching acroſs, from the projection of one cornice to that of the other. The galleries are eighteen feet wide, and in the centre thirty feet high from the floor. The number of pillars within the temple amounts to 2628. The edifice is incloſed by a heavy ſtone wall, 20 feet high, 830 feet from eaſt to weſt, and 625 from north to ſouth. Large as theſe dimenſions may appear, they are ſtated to be but ſmall compared with thoſe of temples on the continent of India, one of which covers a ſquare mile of ground. The covered gallery, fronting the ſouth gate, which ſeems unfiniſhed, ſtrikingly reſembles the entrance of the Elephanta cavern, near Bombay. Solid pyramidal erections ſurmount the weſtern and eaſtern entrances, compoſed externally of a great number of ſmall pillars, two and two, in the form of window frames or gateways, riſing one above another, in ſeven different ſtories. That over the weſtern, which is the principal entrance, appears to be 150 feet high; the eaſtern ſeems lower, and unfiniſhed. The north and ſouth gates are leſs majeſtic than the others; but their completion is ſaid to be intended, when they will be ſimilarly ſurmounted and ornamented as the weſtern portal. Privileged perſons, among whom were women carrying water-pitchers, appeared conſtantly paſſing and re-paſſing about the interior of the temple.

Two hundred Brahmins are attached to this temple, and ſupported in eaſe and luxury by its endowments. It is dedicated to Siva, the deſtroying power, called by the vulgar Rama Lingam. It contains likewiſe, Mr. Cordiner ſays, images of Viſhnu the preſerver, and of all the ſubordinate divinities. Of Brahma, the creator, he ſtates, the Hindoos never dare to form any likeneſs. This is a common error, that is explained and corrected in the article IDOLATRY of this work.

A broad ſtreet runs parallel to each ſide of the temple compoſed of comfortable houſes, and large choultries for the accommodation of pilgrims and travellers, of ſtone, with flat roofs ſupported in front by pillars; the fronts being open. In one of theſe Mr. Cordiner obſerved two ivory palankeens inlaid with gold, the property of officers belonging to the ſanctuary. In others he noticed five carriages, called by the Engliſh Swamy coaches, uſed for the purpoſes of carrying the idols in proceſſion: the uſe to which the ivory palankeens are, we apprehend, alſo applied.

Theſe

Theſe carriages are deſcribed as ſolid maſſes of wood, of a pyramidal ſhape, intended to ſymbolize the Linga. (See LINGA.) The exterior of theſe coaches are covered with groſsly obſcene carving.

At the external corners of the temple, and in the ſtreets of the town, there are ſmaller temples in honour of different deities, and containing images. In ſome of the ſtreets ſpreading trees, among them the ficus religioſa and tamarind, are ſurrounded with ſquare ſtone terraces, on which are placed little images of Pollear or Ganeſa, (ſee POLLEAR,) the Linga, two ſerpents entwined, and other emblems of Hindoo mythology. Theſe terraces are uſed for contemplation, or more active religious duties, as noticed under the article PRADAKSHNA. Rows of fruit-trees, among them the cocoa-nut, plantain, and pomegranate, ſtand in gardens beyond the north and ſouth walls of the temple.

On the oppoſite ſide of the iſland, near the ſea, diſtant about eight miles from the temple, is the ancient fort and choultry of Pombom. The road between is very elegantly paved with ſmooth ſtones, each ſix feet by four; and the greater part of the road is nobly ſhaded by the moſt beautiful and majeſtic trees. The larger trees of this ſuperb avenue are ſurrounded by ſmooth raiſed terraces of maſonry, on which travellers reſt in comfort, completely ſhaded. About half way between the grand temple and Pombom is a very elegant ſmall temple, built on the ſame general plan with the larger, having two maſſy towers raiſed in the centre of the oblong area, and a covered walk, with three rows of pillars on each ſide, all round. The outſide of the towers is completely covered with ſtatues in miniature, repreſenting all the variety of their mythological divinities. The choultry, for the accommodation of pilgrims and travellers at Pombom, has two fronts, and three incloſed ſquares; and is ſurrounded by piazzas raiſed ſeveral feet, with ſquare pillars and terraced roofs. Contiguous is a ſmall temple, the door of which was open, diſplaying an image of Ganeſa or Pollear, in the uſual form, elephant-headed and pot-bellied, ornamented with necklaces of flowers.

There are ſeveral other elegant temples on this intereſting iſland, which is entirely dedicated to the purpoſes of religion. No plough is allowed to break the ſoil, and no animal, wild or tame, is ever killed on it.

Dancing girls, mountebanks, and beggars, abound here, as in other reſorts of the idle and wealthy.

The ſmall remains of antiquity ſtill extant on Ceylon, ſufficiently prove that ſimilar religious inſtitutions did once exiſt there, and that choultries and temples were erected at the different ſtages, all the way from Manaar through the iſland, 200 miles, to Dondra, its ſouthern extremity, and the ultimate extent of Hindoo pilgrimage. At the latter place, the ruins of a temple dedicated to Siva are ſtill to be recognized; but only ſome rows of ſcattered pillars, and a few remnants of broken images, have ſurvived the fanatic fury of the early European invaders. Rama's peaceful iſland falling under the protection of a more liberal and enlightened government, fortunately eſcaped thoſe religious tempeſts, which ſpread deſtruction round the coaſts of Ceylon.

Lord Valentia has more recently viſited this intereſting ſcene, and Mr. Salt, who accompanied his lordſhip, has publiſhed a very elegant view of the temple. The entrance is deſcribed to be through a gateway, about 100 feet high, covered with carved work to the ſummit. The door is 40 feet high, compoſed of ſingle ſtones placed perpendicularly, with others croſſing. This maſſive workmanſhip reminded lord Valentia of the ruins of Egyptian architecture. He deſcribes the quadrangle to be about 600 feet each ſide, and ſays that, on the whole, this temple is the fineſt piece of architecture that he had ſeen in the eaſt. Words, he ſays, cannot deſcribe its magnificence. The concourſe of pilgrims is very great, and brings in a large ſum; each paying according to his rank. The raja of Tanjore had been expected the year before, but could not afford it; as in preſents and various expences, it was eſtimated that his highneſs could not have performed this act of devotion under 60,000 pagodas, about 25,000*l.* ſterling. His whole family would of courſe have expected to participate in the happineſs and benefits of the pilgrimage. The idol uſes no water but what is brought from the Ganges by fakirs: with this it is bathed every morning; and this holy water, thus acquiring additional ſanctity, is fought and purchaſed by the devout for ſin-expelling purpoſes.

RAMISTS, in the *Hiſtory of Learning*, the diſciples of Peter Ramus, who was born in a ſmall village in Picardy, in 1515, and from being a ſervant in the college of Navarre at Paris, became, by his talents, induſtry, and perſeverance, one of the moſt famous profeſſors of the ſixteenth century. By attacking the authority of Ariſtotle, and attempting to ſubſtitute in the place of his logic a method of reaſoning better adapted to the uſe of rhetoric and improvement of eloquence, he excited a terrible uproar in the Gallic ſchools; ſo that the two firſt books he publiſhed, *viz.* his "Inſtitutiones Dialecticæ," and "Ariſtotelicæ Animadverſiones," were prohibited through the kingdom of France, and the author prohibited from any more teaching philoſophy. His enemies perſecuted him with lampoons and ſatires, and even held him up to public ridicule on the ſtage. However, Ramus afterwards recovered his credit, ſo that he obtained the royal profeſſorſhip of philoſophy and eloquence, and afterwards of mathematics, at Paris, in 1547. But his enemies were inveterate in their perſecution of him, and as ſoon as it was known that he favoured the party of the Hugonots, he was obliged once again to withdraw himſelf from the effects of their reſentment. In the intervals of peace, he returned to his ſtation; but in 1568, when the civil war was a third time renewed, he reſolved to leave France, and make a tour through Germany. After ſpending three years in viſiting the principal German univerſities, and receiving many tokens of reſpect, he reſolved, fatally for himſelf, in 1571, to return to his own country. Accordingly he ſettled at Paris, where he periſhed in the maſſacre on St. Bartholomew's day. On the tumult of this execrable day, Charpentaire, profeſſor of mathematics, who had been eclipſed by the ſuperior talents of Ramus, ſeized the opportunity of being revenged upon his rival, and, under the pretence of religion, employed aſſaſſins to murder him. His body was afterwards thrown into the ſtreet to the enraged pupils of Charpentaire, who dragged it ignominiouſly along the ſtreets, and then caſt it into the Seine.

The diſciples of Ramus, ſuch was the aſtoniſhing influence of their maſter's learning and character, prevailed ſo far as to baniſh the Peripatetic philoſophy from ſeveral ſeminaries of learning, and to ſubſtitute in its place the ſyſtem of their maſter, which was of a more practical kind, and better adapted to the purpoſes of life.

Although he had conſiderable merit in expoſing the defects and inconſiſtencies of the Ariſtotelian philoſophy, he does not ſeem to have been equally ſucceſsful in his attempt to eſtabliſh a new logical inſtitute. The general outline of his plan is as follows. Conſidering dialectics as the art of deducing concluſions from premiſes, he endeavours to improve this art, by uniting it with that of rhetoric. Of the ſeveral branches of rhetoric he conſiders invention and diſpoſition

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poſition as belonging equally to logic. Following chiefly the example of Cicero, he divides his treatiſe on Dialectics into two parts; the firſt of which treats of the invention of arguments, the ſecond of judgments. Arguments he derives not only from what the Ariſtotelians call middle terms, but from any kind of propoſitions, which, connected with another, may ſerve to prove any aſſertion. Of theſe he enumerates various kinds. Judgments he divides into axioms, or ſelf-evident propoſitions, and "dianoëa," or deductions by means of a ſeries of arguments. Both theſe he divides into various claſſes; and illuſtrates the whole by examples from the ancient orators and poets.

In the logic of Ramus, many things are borrowed from Ariſtotle, and only appear under new names; and many others are derived from other Grecian ſources, and particularly from the dialogues of Plato, and the logic of the Stoics. Whilſt the author has the merit of turning the art of reaſoning from the futile ſpeculations of the ſchools to forenſic and common uſe, his plan is defective in confining the whole dialectic art to the ſingle object of diſputation, and in omitting many things which reſpect the general culture of the underſtanding, and the inveſtigation of truth. Defective as the ſyſtem of Ramus is, lord Bacon (Augm. Sc. l. vi. c. 2.) has paſſed too ſevere a cenſure upon him, and others have concurred in it: for he is unqueſtionably entitled to great commendation for having, at the period in which he lived and wrote, with ſo much firmneſs and perſeverance, aſſerted the natural freedom of the human underſtanding. The logic of Ramus obtained great authority in the ſchools of Germany, Great Britain, Holland, and France; and ſcience derived ultimate advantages from the conteſts which were maintained between the followers of Ramus and thoſe of the Stagyrite. But the fame of Ramus vaniſhed before that of Des Cartes. Brucker's Phil. by Enfield, vol. ii.

RAMLA, in *Geography*, the original *Arimathea*, a town of Paleſtine, diſtant one-third of a league from the village of Loudd, or the ancient Lydda and Dioſpolis. This town is almoſt in as ruinous a ſtate as Loudd itſelf. Within its boundaries nothing is found but rubbiſh; nevertheleſs, the aga of Gaza reſides here in a ſerai, the floors and walls of which are tumbling down. He maintains about 100 horſemen, and as many Barbary ſoldiers, who are lodged in an old Chriſtian church, the nave of which is uſed as a ſtable, and in an ancient kan, which is diſputed with them by the ſcorpions. The adjacent country is planted with lofty olive trees, diſpoſed in quincunces. Amidſt theſe plantations, which are decaying, are found dry wells, ciſterns fallen in, and vaſt vaulted reſervoirs, which prove that, in ancient times, this town muſt have been upwards of 1½ league in circumference. At preſent it ſcarcely contains 200 families. The little land, which is cultivated by a few of them, belongs to the mufti, and two or three of his relations. The reſt content themſelves with ſpinning cotton, which is chiefly purchaſed by two French houſes eſtabliſhed there. At Ramla there is alſo a ſoap manufactory, the produce of which is almoſt wholly ſent to Egypt. In 1784 the aga built here a wind-mill, which, ſays Volney, is the only one I have ſeen in Syria or Egypt, though they are ſaid to have been invented in theſe countries. The only remarkable antiquity at Ramla is the minaret of a ruined moſque on the road to Yafa. By an Arabic inſcription, it appears to have been built by Sai-el-din, ſultan of Egypt. From the ſummit, for it is very lofty, the eye diſcerns the whole chain of mountains, which begins at Nablous, and ſkirting the plain, loſes itſelf toward the ſouth. Volney's Travels in Egypt and Syria, vol. ii.

RAMLEAH, a mountain of Arabia, in the province of Nedsjed, extending from S.W. to N.E. about 250 miles; the S.W. extremity being 80 miles E. of Kalaat el Moilah.

RAMLER, Charles-William, in *Biography*, a celebrated German poet and profeſſor of belles lettres at Berlin, was born at Colberg in the year 1725. He was diſtinguiſhed at a very early period by his poetical genius; and in 1754 publiſhed a poem, entitled "The Game of Chefs," which diſplayed a conſiderable ſhare of genius. In 1758 he tranſlated the abbè Batteaux's Treatiſe on the Belles Lettres, which he adapted to the genius of his native language, and added ſome diſſertations on the German ſtyle and verſification. In the following year he publiſhed, in conjunction with Leſſing, the epigrams of Logan, an author who, notwithſtanding his great merit, had been ſuffered to remain in obſcurity. In 1760 he publiſhed "Sacred Cantatas," which were followed, during the next 20 years, by a great number of other publications, chiefly poetical, of which a liſt is given in the General Biography. In the year 1780 Ramler turned his attention to ſeveral of the old German poets, and publiſhed at Leipſic the Epigrams of Wernike, Opitz, Tſcherning, Andrew Gryphius, and Adam Olearius. He was ſo ſucceſsful in poliſhing the works of others, and gave ſuch proofs of his taſte and critical talents, that Göze, one of the moſt diſtinguiſhed German amatory poets, allowed him full liberty in his laſt will to retain or reject ſuch parts of his poems as he might think proper. In 1782-3 he publiſhed at Berlin a tranſlation of the poetical pieces in the different volumes of the Spectator, which he followed, in the ſubſequent ten years, by a variety of other works on different ſubjects; among which may be mentioned "A ſhort Introduction to Mythology, in two Parts." Ramler has been ſtyled the German Horace; and his biographer ſays, that though his verſes diſplay perhaps leſs boldneſs and ſimplicity than thoſe of the Roman, they equal them in ſublimity, and ſurpaſs them in harmony. It has been remarked to the honour of Ramler, that he attached to him Frederic the Great, and his ſucceſſor, by his poetical talents: from the latter he had a conſiderable penſion paid him during the cloſing years of his life. Ramler was one of the directors of the national theatre at Berlin, and profeſſor of the belles lettres in the ſchool of the corps of cadets; but the latter office he reſigned in 1790. Gen. Biog.

RAMME, in *Geography*, a river of the duchy of Bremen, which joins the Oſte, near its ſource.

RAMMED *Earth Buildings*, in *Rural Economy*, are ſuch as are raiſed with ſome ſort of earthy material. This mode of building with earthy materials is ſuppoſed by ſome to have been known at a very early period, and has been long practiſed with ſucceſs in the ſouthern parts of France, eſpecially about Lyons, though but little underſtood in any other part of Europe until lately. This method has, however, appeared to have ſo many advantages, that it was made trial of in different places in this country; and the reſult has been ſo favourable, that the practice ſeems to deſerve the attention of the proprietors of land, in all ſituations where buildings are to be erected on a cheap and economical plan. In order to facilitate the knowledge of the art, Mr. Holland has preſented the public with the method of performing the buſineſs, in a paper, tranſlated from a French work on the ſubject, inſerted in the firſt volume of Communications to the Board of Agriculture, in which he ſays that the French writer, M. Francois Cointeraux, remarks, that the poſſibility of raiſing the walls of houſes two or even three ſtories high, with earth only,

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which will ſuſtain floors loaded with the heavieſt weights, and of building the largeſt manufactories in this manner, may aſtoniſh every one who has not become an eye-witneſs of ſuch things. It is a method, which in the above diſtrict of France is known by the term *piſé*; but as it is accompliſhed by the ramming or compreſſing earth, or earthy ſubſtances, in moulds or caſes, the above term has alſo been applied to it. See Piſé, *Building in.*

RAMMEKENS, in *Geography*, a ſea-port town of Holland, in the iſle of Walcheren, formerly one of the beſt harbours in Zealand. This town, which was conſtructed as a fortreſs in the year 1547, and called "Zeebourg," was one of the towns pledged to queen Elizabeth by the ſtates general for the ſuccours ſhe lent them againſt Spain in the year 1585; three miles E. of Fluſhing.

RAMMEL, in *Agriculture*, a term applied to a ſubſtance which forms a part of the ſubſoil or ſubſtrata of particular diſtricts. It is uſually covered with a thin weak earth or mould in ſome places. It is penetrable by the roots of ſome plants, but notwithſtanding that, is very unfriendly to the vegetation of plants in general. It is frequently met with in Cheſhire and ſome other counties. See Soil.

The term ſignifies a compoſition of various kinds of clay, white ſand, and gravel, which is intimately intermixed with a ſmall portion of oxyd of iron. It is for the moſt part found under a weak brown or grey earth which is rarely more than four or five inches in depth in the above diſtrict, lying in ſtrata of from eighteen to thirty inches in thickneſs, upon a white or red ſand or clayey marle, the latter often partaking of its nature for the depth of ſome feet. Rammel or rammelly ſoils are therefore conſtantly of a barren and unprodu ctive nature.

RAMMELBERG, in *Geography*, a large and lofty mountain in Weſtphalia, celebrated for its mines. Theſe mine-works yield lead, copper, ſilver, ſome gold, borax, lapis calaminaris, zinc, ſulphur, jet, vitriol, and yellow ochre. It lies near Goſlar.—Alſo, a town of Weſtphalia, in the county of Mansfeld; three miles S.E. of Wippra.

RAMMELLY, in *Agriculture*, a word uſed to ſignify ſuch crops as are tall or rank, as beans, &c.

RAMMER, a well-known implement formed of wood in different ways, according to the purpoſe for which it is to be uſed. Theſe implements are very neceſſary in putting poſts into the ground, in incloſing land, in order to cloſe the earth firmly about them, as well as for laying down turf or ſward, in order to render it ſmooth and even. See Beetle.

Rammer *of a Gun*, the *gun-ſtick*; a rod or ſtaff uſed in charging a gun, to drive home the powder to the breech, as alſo the ſhot, and the wad, which keeps the ſhot from rolling out.

The rammer of a great gun is a cylinder of wood, whoſe diameter and length are each equal to the diameter of the ſhot, with a handle fixed to it. See Spunge.

RAMNA, in *Geography*, a mountain of Boſnia; 16 miles N. of Orach.

RAMNAGUR, a town of Hindooſtan, in Bahar; 42 miles N.E. of Durbungah.—Alſo, a town of Bengal; 10 miles N.E. of Kiſhenagur.—Alſo, a town of Hindooſtan, in Oude; 27 miles N.E. of Lucknow.

RAMONCHAMP, a town of France, in the department of the Voſges, and chief place of a canton, in the diſtrict of Remiremont. The place contains 2385, and the canton 11,325 inhabitants, on a territory of 245 kiliometres, in 6 communes.

RAMONDON, Lewis, in *Biography*, an Engliſh ſinger, who firſt appeared on the ſtage of Drury-lane in 1706. But he ſung in Arſinoe, and Pyrrhus and Demetrius, when theſe operas were performed at the Queen's theatre in the Haymarket. He appears no more as a public ſinger after this period, but his name occurs as a compoſer in a collection of ſongs called the "Merry Muſician," 1716; and as the editor of "the ſong tunes in the opera of Camilla, contrived and fitted to the harpſichord or ſpinet;" in the title of which it is ſaid, "that the leſſons being placed on five lines render them proper for a violin and a baſe." Almoſt all organ and harpſichord muſic was till this time written and printed on ſix lines.

RAMOO, in *Geography*, a town of Aracan; 60 miles N.N.W. of Aracan.

RAMOR, Lough, a lake of Ireland, in the ſouthern part of the county of Cavan, which contains ſeveral iſlands, on which are beheld the ruins of ſome ancient caſtles. Theſe were formerly adorned with wood, but are now bleak and deſolate. The river Blackwater, which iſſues from it, joins the Boyne at Ravan. Lough Ramor is about 13 miles S. from Cavan.

RAMOS, or Lamos, a river of Africa, which runs into the Atlantic, 60 miles N.N.W. of cape Formoſa. N. lat. 5° 45'.

Ramos, *Dos*, an iſland in the river of the Amazons, about 70 miles long, and from 10 to 20 broad; 60 miles above Pauxis.

RAMOSE Leaf, in *Botany*. See Leaf.

RAMOTH, in *Scripture Geography*, a famous city of Paleſtine, in the mountains of Gilead, and hence called Ramoth-Gilead. This city belonged to the tribe of Gad. It was aſſigned to the Levites, and was one of the cities of refuge beyond Jordan. According to Euſebius, it was 15 miles E. from Philadelphia; but St. Jerom places it in the vicinity of Jabok, and conſequently N. of Philadelphia.

RAMOUCH, in *Geography*, a river of Thibet, which runs into the Dewa, N. lat. 30° 20'.

RAMOURY, a town of Hindooſtan, in the circar of Hindia; 20 miles E. of Hurdah.

RAMPAH, a town of Hindooſtan, in the circar of Rajamundry; 40 miles N. of Rajamundry.

RAMPANT, in *Heraldry*, is applied to a lion, bear, leopard, or other beaſt, in poſture of climbing, or ſtanding upright upon his hind-legs, and reáring up his fore-feet; ſhewing only half of his face, as one eye, and one ear.

The term is French; and ſignifies, literally, *creeping*.

It is different from *ſaliant*, which denotes a poſture leſs erect, or ſomewhat ſtooping forwards, as if making a ſally.

This poſture is to be ſpecified, in blazoning, in all animals, except in the lion and gryphon; it being their natural ſituation.

RAMPARA, in *Geography*, a town of Hindooſtan, in Concan; 20 miles N. of Gheriah.

RAMPART, or Rampier, in *Fortification*, a maſſy bank, or elevation of earth about the body of a place, to cover it from the direct fire of the enemy, and of ſufficient thickneſs to reſiſt the efforts of the cannon for many days; and formed into baſtions, curtains, &c.

The word is formed from the Spaniſh *amparo*, *defence*, or *covering*.

Upon the rampart the ſoldiers continually keep guard, and pieces of artillery are planted there for the defence of the place. Hence, to ſhelter the guard from the enemy's ſhot, the outſide of the rampart is built higher than the inſide, *i. e.* a parapet is raiſed upon it with a platform. Hence, alſo, earth not being capable to be raiſed perpendicularly, like ſtone, the rampart is built with a talus or ſlope, both on the inner and outer ſide.

The rampart is fometimes lined, *i. e.* fortified with a ſtone wall withinſide, otherwiſe it hath a berme.

It is encompaſſed alſo with a moat or ditch, out of which the earth that forms the rampart is dug.

The height of the rampart ſhould not exceed three fathoms, this being ſufficient to cover the houſes from the battery of the cannon: neither ought its thickneſs to be above ten or twelve, unleſs more earth be taken out of the ditch than can be otherwiſe beſtowed. See CONSTRUCTION, *according to M. Vauban's firſt Method.*

The ramparts of half-moons are the better for being low, that the ſmall fire of the defendants may the better reach the bottom of the ditch; but yet they muſt be ſo high as not to be commanded by the covert-way.

RAMPART is alſo uſed, in *Civil Architecture*, for the ſpace left void between the wall of a city and the next houſes. This is what the Romans call *pomærium*, in which it was forbid to build, and where they planted rows of trees, for the people to walk and amuſe themſelves under.

RAMPARTS, in *Geography*, a town of Bengal; 8 miles S.E. of Rungpour.

RAMPERING, or SODDING, denotes the proceſs of building ſod or turf walls, or banks.

RAMPFERSGRUBE, in *Geography*, a town of Germany, in the county of Henneberg; ſix miles W. of Meinungen.

RAMPHASTOS, the *Toucan*, in *Ornithology*, a genus of birds of the order Picæ, of which the generic character is as follows: Bill very large, light, hollow, convex, ſerrate at the edges; each mandible incurvate at the tip; noſtrils behind the baſe of the bill, long, narrow; the tongue is feathered at the edges, the feet moſtly climbers.

The birds of this genus firſt became known to naturaliſts on the diſcovery of South America, and to the warmer regions they appear, in general, to be confined. Like the hornbills, they are diſtinguiſhed by the ſize of their beaks, which, in ſome ſpecies, is nearly equal to that of the whole body. It is, however, of a very light ſubſtance, and, in the living bird, it is compreſſible between the fingers. Both mandibles are ſerrated in an outward direction; the tongue is of a highly ſingular form, repreſenting the appearance of a very narrow lanceolate feather, being of a ſomewhat horny or cartilaginous nature, and divided on each ſide into innumerable ſhort and cloſe-ſet fibres; in conſequence of which ſtructure it was deſcribed by ſome early writers on natural hiſtory as a real feather, ſupplying the place of a tongue. The orbits of the eyes are generally bare. The toucans are ſuppoſed to feed on fruits, but in a ſtate of captivity they will eat animal food. They depoſit their eggs, which are uſually two in number, in the hollows of trees, on the ſurface of the decayed wood. Theſe birds have been as yet met with only in South America, and there merely between the tropics, being totally incapable of ſuſtaining the cold. They are eaſily tamed and familiarized, and ſeveral ſpecies have been brought to England, where fruits, fiſh, and fleſh have been promiſcuouſly devoured by them with conſiderable voracity. Whatever was received by the bill was thrown into the air, and on its return caught, and, without the ſlighteſt maſtication, inſtantly devoured. There are ſeventeen ſpecies enumerated by Gmelin, though Mr. Latham mentions only fifteen.

Species.

VIRIDIS; Green Toucan. Green, with a yellow belly, and red rump. This ſpecies is found in Cayenne, and is about fourteen inches long. The upper mandible is yellow, with red ſides, and a black line in the middle; the lower one is black, the baſe and round the noſtrils are red; the teeth in both are white; the irides and naked orbits are yellow; the legs are of a lead colour; the claws are black; the tail is wedged, beneath inclining to aſh; head, chin, and throat, in the male black, in the female bay, terminated by a black narrow tranſverſe band.

EDENTULUS; Toothleſs Toucan. In this the bill is not ſerrate at the edges. It inhabits Cayenne, and is twelve inches long. The upper part of the body is green, but beneath it is more of a yellowiſh colour; the head and neck are chefnut; the rump is red; the upper mandible is brown, the lower black; the thighs green, and it is thought to be a variety of the *viridis*.

PAVONICUS; Pavonine Toucan. The general colour of this is green; but the feathers are ſprinkled with red ſpots. It is alſo known by a mixture of red and changeable or peacock-coloured feathers interſperſed. The bill is variegated yellow and black; the legs and claws are black.

PIPERIVORUS; Piperine Toucan. Green; the fore parts are black; the vent and thighs red. This ſpecies has been deſcribed by Edwards under the name of the green toucan. Its length is about ſeventeen inches, and its general colour is of a dull green; the head, neck, and breaſt, are of a deep black; behind each ear is a ſomewhat lengthened orange-coloured ſpot, and immediately behind the lower part of the neck is an orange-coloured bar or collar; the belly is pale and yellowiſh-green; the thighs are purple; the vent is red, and the tail, which is cuneated, ſlightly tipped with dull red; the bill is about three inches long, and of a black colour, but towards the baſe it is varied with red, whitiſh, and orange-yellow. In the female the head, neck, and breaſt, are brown inſtead of black, and the lower part of the belly is grey. It is a native of Cayenne, and ſaid to feed on the pepper of the country. The female of this ſpecies has been known to vary in having the bill of a horn colour, with a black bar near the end, and two others near the edge; the ridge alſo being black, and the yellow creſcent at the neck is wanting.

ARACARI. This ſpecies is green, but the abdominal band, vent, and rump, are red; the belly and breaſt are yellow. It is a native of Brazil, Surinam, and Cayenne, and is full ſixteen inches long. The upper mandible is black on the back and tip, but the ſides are whitiſh. The baſe is three-lobed at the noſtrils, with a white arch at the root, lower black; the head, the wings, and tail, are black; the breaſt and body are yellow and ſcarlet, with a black roundiſh ſpot in the middle of the breaſt, and a ſimilar tranſverſe one on the beginning of the belly; the thighs are tawny.

TORQUATUS; Collared Toucan. This bird is black above, and beneath it is whitiſh; the belly is green, the hind part is red, and the collar red. It inhabits the coaſts of New Spain, is about eighteen inches long, and feeds on fiſh. The upper mandible is blackiſh, and the lower black; the irides are of a reddiſh-yellow; the head and neck are black; the lower tail-coverts are red; the thighs purple; the legs are of a greeniſh-aſh colour; the claws are black.

PISCIVORUS; Brazil Toucan. This is blackiſh, but the abdominal band and vent are red; the rump is white. It inhabits South America, and is twenty-one inches long. The bill is yellow, with a ſcarlet ſpot on the tip; the lower mandible is blue; the cap, back, wings, tail, belly, and thighs, are black; the temples, chin, breaſt, and rump, are white.

ERYTHRORYNCHOS; Red-beaked Toucan. Blackiſh; cheeks, chin, and throat, white; upper tail-coverts ſulphur, but the lower and creſcent on the breaſt are red. This is

found in various parts of South America. The baſe and back of the bill are yellow; tip of the upper mandible, and hollow of the lower, red; the noſtrils are edged with black; the orbits are blueiſh; the legs are plumbeous, and the claws are black.

Tucanus; Yellow-breaſted Toucan. This is alſo blackiſh; the abdominal band, vent, and rump, yellow. It meaſures about nineteen inches in length, and has been deſcribed by Mr. Edwards from a living ſpecimen brought into England. According to this gentleman, the bill of this ſpecies is large in proportion to the ſize of the bird; it is compreſſed ſideways, having a ſharp ridge along its upper part, and toothed on its edges; the upper mandible is green, with a long triangular ſpot of orange colour on each ſide, and the ridge on the upper part yellow; the lower mandible is blue, with a ſhade of green in the middle; the point is red; it has about five tranſverſe faint duſky bars, which croſs the joinings of the two mandibles; the noſtrils are inviſible in the black line that furrounds the bill; the iris of the eye is of a fair green colour; round the eye is a broad ſpace of naked ſkin, of a violet colour; the ſkin beneath the feathers is of a violet colour, below which is a bar of ſcarlet feathers, which parts the yellow on the breaſt from the black on the belly; the covert-feathers of the tail are white above, and thoſe beneath are of a fine red; the crown of the head, upper part of the neck, the back, wings, belly, and tail, wholly black, though on the upper ſide of the wings and tail it has a changeable gloſs of blueiſh-purple; the legs and feet are all of a blue or violet colour. The ſpecimen from which this deſcription was made, was brought from Jamaica, but the bird is a native of the hotter parts of South America.

Picatus; Preacher Toucan. Blackiſh; breaſt yellow, vent and tips of the tail-feathers red, rump black. It inhabits Guinea and Brazil, and is more than twenty inches long. The bill is yellowiſh-green, tipt with reddiſh; the belly is red; the tail is dotted with red at the tip. This bird is ſaid to have a frequent habit of moving its head from ſide to ſide, while uttering its notes; hence it has obtained the name of preacher.

Dicolorus; Yellow-throated Toucan. Blackiſh; breaſt, belly, vent, and rump, red; the chin is yellow. It inhabits Cayenne, and is ſeventeen inches long. The bill is olive, with a black baſe; the mandibles are edged with red; the cheeks are of a ſulphur colour; the throat is orange, but edged with ſulphur.

Toco; White-throated Toucan. Blackiſh; chin, throat, and rump, white; orbits, circle on the breaſt, and vent, red. It inhabits Cayenne, and is about nine or ten inches long. The bill is of a reddiſh-yellow, the baſe is black; the upper mandible is black at the tip.

Indicus; Indian Toucan. The throat, quill-feathers, and tail, black; the cheeks and breaſt are white; belly and thighs are yellow; the crown is of a reddiſh-orange; rump crimſon. It is found in divers parts of India. The bill is hardly ſerrate, and not ſo large as in the others.

Luteus; Yellow Toucan. This is of a yellowiſh-white; the neck is marked with two black lateral ſtripes; the tail and wings are variegated with black and white; the leſſer wing-coverts are yellow. It inhabits New Spain, and is about the ſize of a pigeon. The bill is black; the irides are yellow; the legs are brown; the claws are yellowiſh.

Cæruleus; Blue Toucan. Blue mixed with cinereous. It inhabits the coaſts of New Spain. The bill is longer than the body; the eyes are black and the irides are tawny.

Dubius. This is the blue-throated toucan of Mr. Latham, deſcribed from a catalogue of the muſeum of baron Fangeres of Montpellier, where it is announced as an undeſcribed ſpecies.

Albus; White Toucan. This is entirely white.

RAMPICHERLA, in *Geography*, a town of Hindooſtan, in the circar of Guntoor; 12 miles N.E. of Innaconda.

RAMPIN, in the *Manege*. See Toe.

RAMPION, in *Botany*. See Rapunculus, of which Dr. Johnſon ſuppoſes it a corruption. See alſo Phyteuma.

Rampions, *Creſted*, a ſpecies of the *lobelia*.

Rampions, *Common eſculent*, a ſpecies of the *campanula*; which ſee.

Rampions *with ſcabious heads*. See Jasione.

RAMPOUR, in *Geography*, a town of Bengal; 13 miles N. of Curruckpour.—Alſo, a town of Hindooſtan, in Bahar; 31 miles N.W. of Bettiah.—Alſo, a town of Almora; 30 miles N.N.W. of Bereilly. N. lat. 28° 45′. E. long. 79° 22′.—Alſo, a town of Hindooſtan, in Oude, on the Ganges; 34 miles N.W. of Manickpour.—Alſo, a town of Hindooſtan, in Oude, on an iſland formed by the divided ſtream of the Dewah; 35 miles N.E. of Lucknow.—Alſo, a town of Hindooſtan, in Oude; 25 miles E.S.E. of Goorackpour.—Alſo, a town of Hindooſtan, in Oude; 30 miles N.E. of Goorackpour.—Alſo, a town of Hindooſtan, in the Carnatic; 30 miles S.W. of Nellore.—Alſo, a town of Hindooſtan, in the circar of Boggilcund; 20 miles W. of Rewah.—Alſo, a town of Hindooſtan, in Benares; 20 miles N.W. of Bidzigur.—Alſo, a town of Hindooſtan, in the circar of Schaurunpour; 23 miles S.S.W. of Schaurunpour.—Alſo, a town of Hindooſtan, in the circar of Oudipour; 40 miles E.N.E. of Oudipour.

RAMPS, in *Fortification*, are gentle ſlopes made for the cannon to be drawn up and down by, and alſo for the eaſy communication of the troops poſted in a battery that is raiſed above the level of the ground on which it is built. The riſe of theſe ſlopes is about two inches, on twelve of baſe, or the length of the ramp's baſe is ſix times the height, and this is general for the draught of carriages; but footways need not be of ſo gentle a ſlope, as a riſe in one foot in three may anſwer the purpoſe; or, inſtead of ramps, ſtairs may be, and commonly are, uſed for the paſſage of the foot. The breadth of a carriage ramp is uſually about nine or ten feet, that breadth being ſufficient both for the carriage and footway; but thoſe for foot-paſſage only need not be above three or four feet wide. Ramps may either riſe on the ſide of an elevated work, or againſt a ſaliant angle of that work, or on each ſide of an entering angle.

RAMQUILLA, in *Geography*, a town of Sweden, in the province of Smaland; 5 miles N.W. of Calmar.

RAMSAY, Allan, in *Biography*, a poet of conſiderable celebrity, who wrote in the Scottiſh dialect, was born in the year 1686, in the pariſh of Crawford, Lanerkſhire. He received no other education than that of the pariſh ſchool, and was apprenticed to a barber in Edinburgh. It has not been aſcertained when he firſt began to make verſes; but about the year 1715, ſeveral of his poems had been publiſhed. Soon after this he laid aſide the trade to which he had been brought up, and adopted the more congenial one of a bookſeller. In 1721 his detached poems were publiſhed, by ſubſcription, in a quarto volume. In 1724 he began to publiſh his collection of ſongs, entitled "The Tea-table Miſcellany," which at length extended to four volumes. This work was followed by one, entitled "The Evergreen," being a collection of ſongs written by the ingenious before the year 1600. Theſe publications were well received; but his fame was greatly extended by his

"Gentle Shepherd," which was afterwards enlarged from two paſtoral poems, in the form of a regular drama. He now held a correſpondence with ſeveral poets and other ingenious perſons of the time, and his ſhop in Edinburgh was the reſort of the men of letters who then flouriſhed in the capital of Scotland. He is ſuppoſed to have opened the firſt circulating library in that city, and in 1736 he built a play-houſe, which was the firſt ever known at Edinburgh; but the act prohibiting the exhibition of plays in unlicenſed buildings, cauſed it to be ſhut up. Ramſay, towards the middle of his life, withdrew from the field of authorſhip, and attended to the much more profitable buſineſs of ſelling, rather than writing of books. He died in 1758, at the age of 71. The poems of Allan Ramſay, ſays an eminent critic, "diſplay none of the fire of the genius ſo conſpicuous in thoſe of Burns, but have occaſionally an agreeable paſtoral ſimplicity, and are often marked with a vein of humour, natural, though coarſe. The Gentle Shepherd is, perhaps, one of the beſt paſtorals with reſpect to the pictures of real life, which are drawn with great propriety, and generally preſent pleaſing images."

Ramsay, Allan, ſon of the preceding, was born at Edinburgh about 1709, and having devoted himſelf to painting, went at an early period of his life to ſtudy in Italy, and there received inſtructions from Solimene and Imperiale.

After his return, he practiſed in Edinburgh for ſome time, but afterwards removed to London, and by the influence of his countryman, the earl of Bute, was introduced into the vortex of the court, painted the prince of Wales, and on the death of Shakleton in 1767, was appointed principal painter to the crown; although Reynolds was then in poſſeſſion of the higheſt reputation.

Ramſay never ventured to attempt the higher walks of the art, but confined himſelf ſolely to portraits, which he painted agreeably. Not poſſeſſed of brilliancy of genius ſufficient to attempt ſtrong character, with ſtriking effects in his pictures, he contented himſelf with that portion of art which meets the expectations of common obſervers; never offending with affectation or neglect, he finiſhed his pictures with care and neatneſs, and retained his friends and reputation till he ceaſed to practiſe. He was ſo far attached to his art, that he viſited Italy four times: to what purpoſe does not appear, unleſs it were to derive benefit from the portraits of Pompeo Batt'oni; for no traces of higher character are obſervable in his productions. Yet he was a man of ſound ſenſe and ſtrong underſtanding; poſſeſſed of literary acquirements, and devoted to ſtudy. Though he underſtood the Latin, French, and Italian languages, he was not ſatisfied till he added a knowledge of the Greek, acquired when he was advanced in life. Thus endowed, he was emulous of literary fame, and publiſhed, under the title of "The Inveſtigator," Eſſays on Ridicule, as the teſt of truth, on the Naturalization of Foreigners, on Taſte, &c.; and, as occaſion prompted, the town was favoured by him with ſome fugitive pieces on the politics of the day. He was always held to be highly eſtimable as a man, and enjoyed his fame and good fortune to about the advanced age of 75.

Ramsay, Andrew Michael, called the chevalier Ramſay, was born at Ayr, in Scotland. He received a good education at Edinburgh, where he diſtinguiſhed himſelf ſo much, that he was choſen to attend the ſon of the earl of Weemys at St. Andrew's. After this he went to Leyden, with the view to farther improvement, where he became acquainted with Poiret, one of the leaders of the Quietiſts, ſome of whoſe doctrines he imbibed. He next went on a viſit to the celebrated Fenelon, archbiſhop of Cambray, who converted him to the Roman Catholic religion, and Ramſay ever after this conſidered himſelf as the diſciple of that excellent prelate. Upon his works he formed his literary taſte, and he even adopted France for his country, and made uſe of its language in his writings. Here he obtained ſome poſts of honour and emolument, and was made knight of the order of St. Lazarus, whence he had the title of chevalier. His reputation cauſed him to be invited to Rome by the Pretender, in order that he might undertake the care and education of his children. This he accepted; but having found that little court ſo divided by faction, he quickly reſigned his office, and returned to Paris. In the next year, 1725, he re-viſited his native country, and reſided ſome years with the duke of Argyle, employing himſelf in the compoſition of ſeveral works. After his return to France, he entered into the ſervice of the prince of Turenne, duke of Bouillon. He died in 1743, at St. Germain-en-Laye, the retreat of the exiled Stuart family, at the age of 57. His principal writings were, "L'Hiſtoire de la Vie et les Ouvrages de M. de Fenelon;" "Eſſai ſur le Gouvernement Civil;" "Diſcours ſur le Poeme Epique;" "Le Pſychometre," being remarks on lord Shafteſbury's Characteriſtics; "L'Hiſtoire du Marechal de Turenne;" and "Les Voyages de Cyrus." The laſt is that which is by much the beſt known, and it has been frequently printed in the French and Engliſh languages. Voltaire has ſtyled it a feeble imitation of Telemachus; it is, however, written with elegance, but is tedious. Another of the chevalier's works was "A Diſſertation on Free-Maſonry," of which he was grand chancellor in France. In this he traces the origin of the inſtitution to Paleſtine, in the time of the Cruſades; and having found a great declenſion of the myſtical ceremonies formerly practiſed, he ſtrongly urged their renewal, and propoſed a general aſſembly of the brotherhood of all nations to be held at Paris. Biog. Brit.

Ramsay, in *Geography*. See Ramsey.

Ramsay *Point*, a cape on the S.E. coaſt of the iſland of Lewis. N. lat. 57° 44′. W. long. 6° 36′.

RAMSBURY, a village and pariſh in the hundred of Ramſbury, and county of Wilts, England, is ſituated about ſix miles to the eaſtward of the town of Marlborough, and 70 miles weſt by ſouth from London. In the time of the Saxons it was a place of ſo much importance, as to be conſtituted the ſeat of the ſee, when Wiltſhire was made a diſtinct biſhopric by Plegmund, archbiſhop of Canterbury, in the year 909. Ramſbury church was then the cathedral church of the dioceſe, and continued to be ſo till biſhop Herman prevailed upon king William the Conqueror to unite the biſhoprics of Wiltſhire and Sherborne, and fixed his epiſcopal ſeat at Old Sarum. The church, an ancient building, is divided into a nave, two aiſles, and a chancel, with a maſſive ſquare tower at its weſtern extremity. In the chancel is a long ſtone, which tradition affirms to be the grave-ſtone of a giant; alſo an old altar tomb of Purbeck marble, without any inſcription, and ſeveral monuments commemorative of the Joneſes of Ramſbury manor, or park. This ſeat is now the property of ſir Francis Burdett, bart. in right of his mother, ſecond daughter of the late William Jones, eſq. The houſe was deſigned in the Grecian ſtyle, by John Webb, nephew to Inigo Jones. The incloſures are extenſive and well wooded, and are interſected by a branch of the river Kennet, which ſpreads itſelf out in the form of a lake, from the ſides of which the grounds riſe in eaſy, ſloping lawns.

Littlecot park, the ſeat of major-general Edward Leybourne

bourne Popham, is ſituated partly in the pariſh of Ramſbury, and partly in that of Chilton-Foliot. The houſe is a large ancient ſtructure, built by one of the Darells, the former poſſeſſors of this domain, about the time when feudal warfare ceaſed, and defence was no longer an object in a country manſion. Notwithſtanding many late alterations, the interior ſtill preſerves many of its original features. The great hall is very ſpacious, floored with ſtones, and lighted by large and very lofty windows. In it ſtands a large oaken table, at which the vaſſals of the domain were wont to feaſt at the expence of their lord. The remainder of the furniture is in a ſuitable ſtyle, particularly an arm-chair, which is ſaid to have been uſed by ſir John Popham, chief juſtice of the court of king's bench in the reigns of queen Elizabeth and king James I., who purchaſed the houſe and manor from the laſt of the Darells. There is alſo a curious inſtrument for the puniſhment and confinement of ſervants; by faſtening their thumbs between two boards. The walls of the hall are decorated by numerous guns, carbines, piſtols, doublets, &c.: and here are alſo two very fine candelabras, deſigned and executed by Mr. George Bullock of London, in an admirable ſtyle, as adapted to the age and character of the manſion. One of the bed-rooms is ſaid to have been the ſcene of a ſingular and myſterious murder, the incidents attending which are recorded in a note to Scott's poem of Rokeby. In the gallery, which is about 110 feet in length, are portraits of judge Popham and Nell Gwyn; alſo a curious piece of needle-work, repreſenting a large Roman teſſellated pavement, which was diſcovered in the adjoining park in 1728, by Mr. George (ſteward to Edward Popham, eſq.), who made a coloured drawing of it, and communicated the ſame to the Society of Antiquaries. This pavement conſiſted of two diviſions, which appear to have formed the floor of a temple. The interior diviſion was ornamented with the figure of Apollo playing on a harp; and in four ſurrounding compartments were four female figures riding on different animals, and deſigned to repreſent the Horæ, or Seaſons. Exterior to the circle incloſing them were three other compartments, each diſplaying a face of the ſun. From theſe circumſtances the temple is ſuppoſed to have been dedicated to Apollo; but ſome emblems on its exterior diviſion referring to Ceres and Neptune, it may, perhaps, be more properly eſteemed a ſort of pantheon. Another ſmaller Roman pavement, and a curious cup or patera of braſs, were likewiſe diſcovered by Mr. George on Rudge-farm, adjoining the northern boundary of Littlecot park. The cup was adorned with foliage, and was inſcribed with the names of five Roman ſtations. It was conjectured by Gale to have been a libation cup uſed at an annual feaſt inſtituted by the inhabitants of theſe towns.

Pickedfield, in this vicinity, is a government depôt for the interior, eſtabliſhed in 1803. It includes about forty acres of ground, on which are erected three magazines for powder, barracks for a detachment of the military, and various neceſſary houſes and offices. Beauties of England and Wales, vol. xv. by John Britton, F.S.A.

RAMSDAL. See REMSDAL.

RAMSDEN, JESSE, in *Biography*, an eminent Engliſh mathematical and aſtronomical inſtrument-maker, the ſon of an inn-keeper at Salterhebble, near Halifax, in Yorkſhire, where he was born in the year 1735. At nine years of age he was admitted into the Halifax free-ſchool, where he acquired, during three years, the elements of claſſical learning; after which he was removed to the care of an uncle at Craven, by whom he was ſent to a clergyman of the name of Hall, who had acquired much reputation by teaching at his ſchool the mathematical ſciences. Under this gentleman's inſtructions, young Ramſden became a proficient in geometry and algebra, and was advancing rapidly in theſe and other collateral branches of ſtudy when his father ſent for him home, to apprentice him out with a clothier at Halifax. At the age of twenty he went to London, where he became clerk in a wholeſale cloth warehouſe. This ſituation he retained about two years and a half, when his inclination for the ſciences revived ſo ſtrongly, that he reſolved to qualify himſelf for ſome buſineſs which ſhould prove ſuitable to the bent of his mind. With this view he bound himſelf apprentice for four years to Mr. Burton in the Strand, who was eſteemed one of the beſt workmen of his time in making thermometers and barometers, and in engraving and dividing mathematical inſtruments. After the expiration of his apprenticeſhip, he worked as journeyman with a perſon of the name of Cole, with whom he afterwards aſſociated himſelf as partner. This connection did not laſt long, when Mr. Ramſden opened a workſhop on his own account, in which he ſoon recommended himſelf to the employment of the principal mathematical inſtrument-makers in London. In the courſe of his buſineſs his repeated examination of the inſtruments which were ſent him to be engraved or divided, led him to diſcover their defects, and his genius ſuggeſted to him the means of removing them, or of conſtructing better inſtruments. In order to put his plan into execution, he made himſelf maſter of the practical operations of the trade, and formed the deſign of examining every aſtronomical inſtrument in uſe, with the view of correcting thoſe which, being founded on good principles, were faulty only in the conſtruction, and of proſcribing thoſe which were defective in both theſe reſpects. About this time, by his marriage with Miſs Dollond, he became poſſeſſed of a part of Mr. Dollond's patent for achromatic teleſcopes. In the year 1766, Mr. Ramſden opened a ſhop in the Haymarket, where he continued till 1774, when he removed to Piccadilly, where he remained till the time of his death. Before his ſettlement in the Haymarket, he had improved the ſextant, and he had invented his celebrated dividing machine. (See the art. ENGINE.) Having ſpent ten years in bringing this machine to perfection, he obtained from the Board of Longitude a premium of 1000*l.* Mr. Ramſden conſtructed an inſtrument for dividing ſtraight lines, which has been deſcribed in a former volume of the New Cyclopædia, and while he was employed on his dividing-machine he made great improvements in ſeveral other inſtruments. The THEODOLITE (ſee the article), before his time, conſiſted merely of a teleſcope, turning on a circle, divided at every three minutes, by means of a VERNIER, which ſee; but in the hands of Mr. Ramſden it became a new and perfect inſtrument, ſerving for meaſuring heights and diſtances, as well as taking angles. The largeſt and moſt perfect theodolite ever conſtructed was made by him for general Roy, for the purpoſe of meaſuring the ſeries of triangles in England. Though this inſtrument is only of eighteen inches radius, its accuracy is ſo great as not to admit of an error of a ſingle ſecond. With this inſtrument general Roy meaſured the angle between the polar ſtar and the ſides of his triangles, in order to have the exact difference between the obſervations of Paris and Greenwich, which he found to be 9′ 20″. Mr. Ramſden was a great improver of the barometer for meaſuring the height of mountains, which he could obtain to a degree of accuracy that was very ſurpriſing, and he cauſed to be engraved a table to accompany his barometers, which, without the trouble of calculation, gives the heights of places, according to the heights of the mercury, and even at different temperatures. He alſo pointed

pointed out a new method and apparatus adapted to the conveyance and ſupport of the portable barometer. Mr. Ramſden made improvements on the electrical machine; and on manometers for meaſuring the denſity of the air: he invented an inſtrument for meaſuring inacceſſible diſtances: aſſaying balances which turn with leſs than a ten-thouſandth part of the weight uſed: levels and a variety of other inſtruments. The pyrometer alſo exerciſed his talents, and on this occaſion, as on all others, Mr. Ramſden ſhewed a ſort of natural and almoſt intuitive ſagacity in diſcovering the eſſential faults of an inſtrument, and in inventing the moſt ſimple and exact methods of correcting them. With reſpect to optics, he diſcovered a method of correcting, in a new and perfect manner, the aberration of ſphericity and refrangibility in compound eye-glaſſes applied to all aſtronomical inſtruments. Opticians had imagined that the purpoſe might be accompliſhed by making the image of the object-glaſs fall between the two eye-glaſſes, which was attended with this great inconvenience, that the eye-glaſs could not be touched without deranging the line of collimation, and the value of the parts of the micrometer. To remedy this inconvenience, he ſet out from a ſimple experiment, *viz.* that the edges of an image obſerved through a priſm are leſs coloured, according as the image is nearer the priſm. This led him to attempt placing the two eye-glaſſes between the image of the object-glaſs and the eye, without failing to correct the two aberrations; which he did by changing the radii of the curves, and placing the glaſſes in a manner very different from that commonly employed. In the Philoſophical Tranſactions for the year 1779, Mr. Ramſden has deſcribed a new reflecting object-glaſs micrometer; to the paper on this ſubject we refer our readers, and alſo to the article MICROMETER in this Dictionary. With this micrometer the diameters of the planets may be meaſured; it may be adapted to all kinds of achromatic teleſcopes; it may be brought near to, or removed from, the object-glaſs at pleaſure, to render viſion diſtinct; and it may be removed from the teleſcope, if the obſerver wiſh to uſe the latter without a micrometer. The high degree of merit to which Mr. Ramſden's many and important inventions were intitled, led his friends to propoſe him as a member of the Royal Society, and he was elected in the year 1786.

The *Equatorial* or *Tranſit* inſtrument (ſee the articles) received great improvements in the hands of Mr. Ramſden, who rejected the endleſs ſcrew, which by preſſing on the centre deſtroyed its preciſion; he placed the centre of gravity on the centre of the baſe, and cauſed all the movements to take place in every direction; he pointed out the means of rectifying the inſtrument in all its parts, and he applied to it a very ingenious ſmall machine, for meaſuring or correcting the effect of refraction. The greateſt equatorial inſtrument ever attempted, is that which he conſtructed for ſir George Shuckburg, on which he employed ſeveral years, and of which we have given a deſcription and figure. Mr. Ramſden's meridian teleſcopes which he made for Blenheim, Manheim, Dublin, Paris, and Gotha, are alſo remarkable for the excellence of their object-glaſſes. With that of Dublin, Mr. Uſher obſerved ſtars of the fourth magnitude in the open day, and thoſe of the third very near their conjunction with the ſun. Theſe teleſcopes are eight feet in length. There is a five-feet one at the obſervatory at Palermo. Mr. Ramſden made great improvements in the mural quadrant, of which a full account will be found in the article CIRCLE, to which we refer our readers for much valuable information on the ſubject of aſtronomical inſtruments. Having in various parts of our work entered into the nature of Mr. Ramſden's improvements and inventions, it is unneceſſary to repeat here what has already been fully explained.

The field in which the inventive genius and ſuperior talents of Mr. Ramſden were exerciſed, was, as we have ſeen, very extenſive. In order that every part of his inſtruments might be fabricated under his own inſpection, he collected in his workſhops men of every branch of trade neceſſary for their conſtruction. So important did he conſider the principle of diviſion of labour, that he always confined the ſame workmen to the ſame branch, and by that means arrived at the greateſt correctneſs and nicety in executing it. Notwithſtanding the great perfection of his inſtruments, which ought to have ſecured to Mr. Ramſden a large fortune, he ſold them cheaper than any other artiſt in London, ſometimes even one-third below the uſual price. Such was the demand for them, from almoſt all parts of the world, that though he employed ſixty men, he was unable to execute all the orders which he received. His great attention to buſineſs injured his health, and haſtened his death. He died at Brighton, where he had been for the benefit of the ſea-air, November 5, 1800, in the ſixty-ſixth year of his age. He had been elected a member of the Imperial Academy of Sciences at Peterſburg in 1794, and in the following year he was preſented with the gold medal, adjudged by the Royal Society to perſons diſtinguiſhed for their ſcientific talents.

Mr. Ramſden was by nature endowed with uncommonly ſtrong reaſoning powers, and a moſt accurate and retentive memory, but, at the ſame time, with ſuch a quickneſs of penetration, that he could, as it were, with a ſingle glance, view in every light the ſubject on which he thought, and adopt the moſt advantageous mode of conſidering it. He poſſeſſed, in an exquiſite degree, that quality of mind which is emphatically ſtyled elegance, which in the abſtract ſciences leads to clearneſs, ſimplicity, and preciſion, as in the fine arts and literature, it gives the laſt poliſh to genius, and is more generally known by the appellation of taſte. In his habits he was temperate to abſtemiouſneſs, ſatisfied with ſmall quantities of food, and a ſmall portion of ſleep. Unacquainted with diſſipation or amuſement, and giving but little time even to the ſociety of his friends, the whole of thoſe hours which he could ſpare from the duties of his profeſſion, he devoted either to further improvements in his inſtruments, or to the peruſal of books of ſcience, particularly thoſe mathematical works of the ſublime writers which had any connection with the ſubject of his own purſuits. Mr. Ramſden's only relaxation from almoſt conſtant and ſevere ſtudies, was the occaſional peruſal of the beſt authors, both in proſe and verſe; and when it is recollected that at an advanced age he made himſelf ſo completely maſter of the French language, as to read with peculiar pleaſure the works of Boileau and Moliere, no one can believe that he miſ-ſpent even his hours of amuſement. Short and temperate as were his repaſts, a book or a pen was the conſtant companion of his meals; and when illneſs broke his ſleep, a lamp and a book were ever in readineſs to beguile the ſenſe of pain, and make bodily ſickneſs miniſter to the progreſs of his mind. He was well ſkilled in the abſtruſer parts of mathematics, and converſant with the beſt writers on the ſciences; and ſuch was his manual dexterity, that there was not one tool in any of the numerous branches of his profeſſion which he could not uſe with a degree of perfection equal to that of the very beſt workman in that particular branch, and he could have begun and finiſhed every ſingle part of his moſt complicated inſtruments. For this article we are chiefly indebted to a very elaborate and excellent original memoir in the 8th vol. of the Gen. Biog.

RAMS-

RAMSDORF, in *Geography*, a town of Saxony, in the biſhopric of Naumburg; three miles N.E. of Zeitz.

RAMSEA, or RAMSEY, a market and ſea-port town in the pariſh of Kirk-Maughold, Iſle of Man, Great Britain, is ſituated at the diſtance of fourteen miles north-eaſt from Douglas, the chief town in the iſland. Anciently this place was of conſiderable note, but it is now comparatively decayed. The bay upon which it is built might be rendered capable of affording anchorage and ſecurity to very large veſſels, but it is much choaked up with ſand at the entrance to the harbour, and is therefore little frequented, though protected by a fort, mounted with ſeveral pieces of cannon. At the extremity of the pier is a light-houſe, the lower diviſion of which is uſed as an occaſional priſon. The chief article of export from Ramſea is grain, the produce of the vicinity which is among the beſt cultivated diſtricts in the Britiſh iſlands. Several boats, with good accommodation for paſſengers, ſail weekly from hence to Liverpool, and to Whitehaven; but what gives moſt importance to the town at preſent is, the circumſtance of its being the ſeat of the courts of juſtice for the northern diſtrict. According to the population returns of 1792, (the laſt returns made for the iſland,) Ramſea contained 1100 inhabitants, but their number is now probably increaſed to 1400.

In the pariſh of Kirk-Andreas, to the north of Ramſea, are ſeveral curioſities, particularly an ancient intrenchment at Ballachurry, which occupies a ſmall iſolated eminence, in a very level tract of country. This carthen work is of a ſquare form, and is ſurrounded by a wide and deep foſſe and rampart, flanked at each angle by a very noble baſtion. The area within is much ſunk below the level of the works, which are in a ſtate of excellent preſervation, and might eaſily be rendered effectual for the purpoſes of modern warfare. This diſtrict abounds with ſepulchral tumuli; ſome of them environed by large upright ſtones. Several of theſe barrows were opened, about twenty years ago, by Mr. Chaloner, and found to contain ſimple urn interments. In the church-yard here ſtands a ſquare pillar of ſtone, bearing a Runic inſcription, which is thus tranſlated by Mr. Beauford of Athy, in Ireland. "The ſon of Ulf of the Swedri (Swedes) erected this croſs to the warrior Afterarin, the ſon of Cunnu." Another inſcription on a ſimilar monument is to be ſeen in the neighbouring church-yard of Kirk-Michael, which is an extenſive village, pleaſantly ſituated near the ſea. In this pariſh is a monument of the cairn deſcription, compoſed of ſmall ſtones heaped together. It is called Cairn-Viael, but nothing is known reſpecting its origin, and peculiar appropriation. About a mile from hence is Biſhop's-Court, the uſual reſidence of the biſhops of Man. The palace was nearly rebuilt about twenty years ago. It is an elegant and convenieut manſion, ſurrounded by agreeable gardens and pleaſure grounds. Beauties of England and Wales, vol. iii. By John Britton and E. W. Brayley, 1802. Carliſle's Topographical Dictionary of Scotland, 2 vols. 4to. 1813.

RAMSEIL, a town of Hindooſtan, in Baglana; ten miles N. of Naſſuck.

RAMSELE, a town of Sweden, in Angermanland; 70 miles N.W. of Hernoſand.

RAMSENTHAL, a town of Germany, in the principality of Culmbach; four miles N. of Bayreuth.

RAMSEY, a market-town in the hundred of Hunſtingſtone, and county of Huntingdon, England, is ſituated on the banks of a ſmall river, to which it gives name, at the diſtance of ten miles N.N.E. from the town of Huntingdon, and ſixty-eight miles N.W. from London. It is particularly celebrated in hiſtory for its abbey, which was founded by the renowned duke Ailwin, at the perſuaſion of Oſwald, biſhop of Worceſter, in the year 969. The buildings were completed in the courſe of five years, at the expiration of which, the monaſtery was dedicated to the Holy Virgin and St. Benedict, and filled with monks of the Benedictine order. Ailwin gave conſiderable poſſeſſions to his new eſtabliſhment, and procured for it many valuable privileges from king Edgar. This monarch confirmed to the monks all their lands, and gave them the right of impreſſing the image of his royal perſon upon their ſeals. Several ſucceeding princes, and many private perſons of rank and opulence, contributed to enrich the abbey, which afterwards became one of thoſe diſtinguiſhed by the title "mitred." Its abbots were conſequently privileged to ſit in parliament among the peers, and enjoyed all the other accuſtomed rights of mitred abbots. Many of the monks were men of pre-eminent genius and learning, and were eſpecially noted for their proficiency in the Hebrew language. The library belonging to the monaſtery was extenſive, and contained many books written in that tongue by its inmates. At the era of the diſſolution, its annual revenues were eſtimated, according to Dugdale, at 1716*l.* 12*s.* 4*d.*; but Speed, on the authority of ſir Robert Cotton, ſtates their amount at 1987*l.* 15*s.* 3*d.* Some years after that event, the demeſnes and lands of the abbey, with ſeveral lakes belonging to it within this pariſh, were granted to ſir Richard Cromwell, anceſtor to the Protector.

Ramſey conſiſts chiefly of one long ſtreet, with another branching off from it, in a northern direction. The abbey ſtood at the upper end of the town, towards the ſouth, near the manor-houſe, a large and elegant manſion, built out of its ruins. The only portion of the old buildings ſtanding is a gateway, which appears, from the ſtyle of its architecture, to have been erected about the reign of Henry VI. Since the deſtruction of the abbey, it was for ſome time uſed as a priſon. At a ſhort diſtance from this relic ſtands the preſent church of Ramſey, a ſpacious and handſome edifice, conſiſting of a nave, chancel, and aiſles, with an embattled tower at the weſt end. The nave is ſeparated from the aiſles by ſeven large and well-proportioned arches on each ſide, ſpringing from cluſtered columns; and from the chancel by a ſtill larger arch, with a ſcreen richly carved in wood croſſing the lower part. The windows are large, and, as is apparent from many fragments remaining, have once been filled with ſtained glaſs, exhibiting figures of angels, crowned heads, &c. Several branches of the Cromwell family were buried in this church, but there are no monuments to their memory. In this town is a free-ſchool, founded and endowed in 1663, under a decree of chancery, but the eſtabliſhment has been much neglected; alſo a charity-ſchool for girls, inſtituted about a century ago by John Dryden, eſq. who bequeathed 16,000*l.* for various charitable purpoſes. The market day here is Wedneſday, weekly, and there is an annual fair on the 22d of July. Ramſey ſuffered greatly from the plague in the year 1665—6, that dreadful diſtemper having been introduced by the accident of major William Cromwell wearing a coat, the cloth of which had been brought from the metropolis. The number of deaths amounted to 400 within one month. This town likewiſe ſuſtained much injury from fire in 1731; but the damage was ſoon repaired. According to the population returns of 1811, the pariſh contains 484 houſes, and 2390 inhabitants.

The country around Ramſey is extremely marſhy, and hence is interſected by numerous ditches, or drains to carry off the water. To the north-weſt about two miles, is a lake

lake called Ugg-Mere, and at the diſtance of a mile further northwards, is a ſtill larger collection of water, named Whittleſea-Mere; and there is a third to the north-eaſt of the town, ſtyled Ramſey-Mere. All theſe lakes abound with fiſh of various kinds. Running northwards from that laſt mentioned, is a high cauſeway, called King's-delf, or dyke, which is mentioned in record as early as the reign of king Edgar. It is commonly confounded with Cnuts-delf, or Swerdes-delf, called alſo Steeds-dyke, which forms the boundary of this county with Cambridgeſhire. Beauties of England and Wales, vol. vii. by E. W. Brayley, 1808.

Ramsey, *Iſle of*, an iſland in the cwmwd of Mynyw, cantref of Pybidiog, (now called the hundred of Dewiſland,) and county of Pembroke, South Wales, is ſituated in the Iriſh ſea, oppoſite to the promontory called St. David's Head, from which it is about three miles diſtant. This iſland is nearly four miles in length, and exceeds one mile in breadth. Throughout its whole extent the ſurface is lofty, and at each extremity a mountain ſhoots to a great height above the general level, giving the iſland a very romantic appearance. From the ſhore the aſcent is bold and precipitous on all ſides, and at one ſpot, called the Choir, the rocks aſſume an amphitheatrical form, and riſe perpendicularly to a ſtupendous elevation. Ramſey was formerly cultivated, but is now chiefly appropriated as paſturage for ſheep and horſes. It is abundantly ſupplied with freſh water, for which benefit tradition records that the iſland is indebted to Juſtinian, a devotee from Brittany, who ſettled here in the fifty century. Here were anciently two chapels, one ſacred to Devanus, or Devynoy, and the other to Juſtinian above-mentioned, who was murdered by his ſervants, and buried on the ſpot where the chapel was raiſed to his memory. Ramſey belongs to the biſhop of St. David's, as do likewiſe ſeveral ſmaller iſlands in its vicinity, of which ſeven are diſtinguiſhed by the appellation of the Biſhop and his Clerks. Innumerable flocks of birds frequent and breed on theſe iſlands, and, among other kinds, the celebrated hunting falcon is frequently ſeen. An Hiſtorical Tour through Pembrokeſhire, by Richard Fenton, F. S. A. Carliſle's Topographical Dictionary of Wales, 4to. 1813.

RAMSGATE, a member of the town and port of Sandwich, in the upper half hundred of Ringlow, Iſle of Thanet, lathe of St. Auguſtine, and county of Kent, England, is ſituated on the ſhore of the German ocean, at the diſtance of 72 miles S.E. from London. Like Margate, it was formerly only a ſmall fiſhing hamlet, conſiſting of a few mean, and indifferently built, houſes. In the reign of queen Elizabeth, indeed, it was returned in the maritime ſurvey as having no more than ſeventy ſailors belonging to it, and theſe chiefly fiſhermen. What firſt gave it importance was the extenſion of the Ruſſian trade after the revolution in 1688; but it is chiefly indebted for its preſent conſequence to the improvements made in the harbour ſince the middle of the laſt century; for although a pier for ſhipping exiſted here, at leaſt from the time of Henry VIII., yet it was altogether inadequate to afford ſecurity to the numerous ſhips driven on the coaſt in tempeſtuous weather. Parliament was therefore induced, at the petition of the merchants and ſhipowners who were intereſted, to paſs an act, ordering a proper harbour to be formed for the reception "of ſhips of, and under, 300 tons burthen." Under this act truſtees were, as uſual, appointed; and in the year 1749-50, the work was begun, according to deſigns by William Ockenden, eſq., and captain Robert Brooke. So many difficulties, however, occurred in carrying it into execution, that the harbour was not completed till the year 1791. The ſum which the whole coſt exceeded 600,000*l.*; but that amount is trivial compared to the great benefit derived from it to our ſhipping intereſt. The area of the harbour is nearly circular, and comprehends about forty-ſix acres. The piers, baſin, &c. are conſtructed of Purbeck and Portland ſtone, principally the latter. The entire length of the eaſt pier, including its flexures, or angles, amounts to nearly 2000 feet; that of the weſt pier is about 1500 feet; the width of the entrance is 240 feet. The general breadth of the piers is twenty-ſix feet, including a ſtrong parapet, which defends the outer ſides next the ſea. What is called the Eaſt Channel, is formed by the paſſage between the eaſt pier and a large bank of ſand which nearly croſſes the harbour as far as the baſin, and is of conſiderable uſe for ſhips to bring up upon, in heavy gales, when driven into the harbour without anchors or cables. Near the north end of the weſt pier is a maſſive frame work of timber, and a ſtaircaſe, called Jacob's ladder, forming a communication from the top to the bottom of the cliff. The eaſt pier is a favourite promenade in ſummer, and is much admired for the peculiarly fine ſea-views which it commands.

In judicial proceedings, Ramſgate is technically denoted the *ville* of Ramſgate. It is in the pariſh of St. Lawrence, and is aſſeſſed to that church, but it maintains its own poor ſeparately, and the inhabitants have the right of chooſing one churchwarden from among themſelves. As an ancient member of the town of Sandwich, it is in ſubjection to the juſtices of that place. The mayor of Sandwich appoints a deputy, or conſtable, here, and the inhabitants are allotted by the commiſſioners of that borough, what proportion of land tax they ſhall pay. A ſmall annual ſum is alſo paid out of the duties collected at Ramſgate harbour towards the ſupport of Sandwich haven. The influx of viſitors to this town of late years has greatly increaſed, and has conſequently occaſioned a conſiderable extenſion of its buildings. A market has been eſtabliſhed for ſeveral years; and the ſtreets are paved, lighted, and watched, under the authority of an act of parliament paſſed in 1785. Here is a ſpacious chapel of eaſe, and ſeveral meeting-houſes for diſſenters of different denominations. The accommodation for the ſummer reſidents are ſimilar to thoſe at Margate, though perhaps leſs numerous, and ſcarcely ſo ſplendid. The aſſembly room and tavern is a ſpacious building adjoining the harbour. It is elegantly fitted up, and contains convenient tea and card-rooms, a billiard-room, and a coffee-room. Here are likewiſe ſeveral good inns, with bathing-rooms, libraries, boarding-houſes, &c. The bathing-place is a fine ſandy ſhore, beneath the cliffs to the ſouth of the pier: the machines are ſimilar to thoſe at Margate, *viz.* a ſort of cloſe caravan, having a door and ſmall flight of ſteps behind, by which the bathers deſcend to the water, and are concealed from view by a pendant covering of canvas. Within the laſt forty years the population of Ramſgate has increaſed almoſt in the ratio of three to one. In 1801, according to the parliamentary returns, it contained 726 houſes, and 3110 inhabitants; but, in 1811, the former were returned as amounting to 919, and the latter to 4221.

Half a mile weſtward from Ramſgate is Ellington, anciently a ſeat of a family of the ſame name, who, towards the end of the reign of Edward IV., were ſucceeded by the Thatchers, another ancient Kentiſh family, from whom it paſſed to the Sparklings. St. Lawrence is a large village, ſituated on the brow of the hill overlooking Ramſgate; the houſes forming a long winding ſtreet along the high road to London. The church here is a ſpacious edifice, conſiſting of a nave, aiſles, and three chancels, with a ſquare tower, ſupported upon four maſſive columns, between the nave and principal chancel. The tower, and part of the body, are of Norman architecture, and on the outſide of the former, by way of

decoration, appear ranges of ſmall ſemicircular arches ſpringing from plain octagon pillars; the capitals of the piers which ſupport it alſo diſplaying ſome curious ſculpture. Among the ſepulchral memorials here, are ſeveral in memory of the Sparklings of Ellington, and the Manſtons of Manſton-court, an ancient manſion, ſituated about two miles to the north-weſt of St. Lawrence, now converted into a farm-houſe. Minſter, another village in this vicinity, derives its name from a church or nunnery founded here in 670, by Domneva, wife to Merwald, ſon of Penda, king of Mercia. In the early part of life ſhe had been left, with her ſiſter Ermengitha, and her brothers Ethelred and Ethelbright, under the guardianſhip of her uncle Egbert, king of Kent, who murdered the princes, and in expiation of the crime offered to give to Domneva whatever ſhe ſhould aſk. The lady demanded as much land as a tame deer would run over at one courſe, to endow a monaſtery, which was accordingly granted to her. When her buildings were raiſed, ſhe placed therein 70 nuns, and, taking the veil herſelf, became their firſt abbeſs. She was ſucceeded by her daughter St. Mildred, from whom the abbey afterwards was denominated St. Mildred's abbey. This eſtabliſhment was frequently plundered by the Danes during the eighth and ninth centuries, and at length was ſet fire to, and totally deſtroyed, together with the nuns, the clergy, and many of the people who had fled hither for ſanctuary. The poſſeſſions of this abbey were ſubſequently granted to the monks of the monaſtery of St. Auguſtine, in Canterbury, by king Canute, and by them the body of St. Mildred was removed to their own abbey. The pariſh church of Minſter, which occupies the ſcite of the ancient nunnery, appears to have been originally founded about the time of the conqueſt, but it has undergone many alterations, and conſequently exhibits various ſtyles of architecture. The nave, which is the oldeſt portion of it, is divided from the aiſles by ſemi-circular arches ſpringing from ſhort maſſive columns. The chancel is vaulted with ſtone, as is likewiſe part of the tranſept. Beauties of England and Wales, vol. viii. by E. W. Brayley. Hiſtory of Kent, by Edward Haſted, eſq., 8vo. edit. vol. x. Lewis's Hiſtory of the Iſle of Thanet, 4to.

RAMSHAGUR, a town of Bengal; 5 miles S. of Dinagepour.

RAMSHYDA, a town of Sweden, in the province of Nericia; 28 miles N. of Orebro.

RAMSIN, a town of Saxony; 3 miles W. of Bitterfeld.

RAMSONS, in *Botany*, a name given to the broad-leaved wild allium. See Allium.

RAMSTADT, in *Geography*, a town of Heſſe-Darmſtadt; 3 miles S.E. of Darmſtadt.

RAMTCHIEU, a lake of Thibet, formed by three ſeparate rivulets, and ſurrounded with an incruſtation, of a white colour and ſaltiſh taſte. This ſubſtance is collected and employed for cleanſing and waſhing woollen and cotton cloths, as a ſubſtitute for ſoap, to which the inhabitants of the adjacent country are utter ſtrangers. Near this lake is a large monaſtery, called Lubchea Goomba, ſeated amidſt rocks, which protrude their baſes into the lake, and are bordered with a white foam, produced by its agitated waves. The banks of this lake are perforated with innumerable burrows of a ſmall animal, to which they give the name of rat, larger than a muſk rat, of a cinereous grey, without a tail, conceived by Mr. Turner to have been the daman of Iſrael and Egypt, or the Schaphan of the Hebrews. The lake is alſo frequented by great abundance of water-fowl, wild geeſe, ducks, teal, and ſtorks, which, on the approach of winter, take their flight to milder regions. Prodigious numbers of ſauraſſes, the largeſt ſpecies of the crane kind, are here ſeen at certain ſeaſons of the year, ſo that any quantity of eggs may be collected. The lake gradually narrows, and from its northern edge ſends off a ſmall brook; and at the other extremity it diſcharges itſelf into a much larger lake. This lake, it is ſaid, is held in high reſpect by the inhabitants of Bootan, whoſe ſuperſtition leads them to conſider the increaſe or decreaſe of its waters as portentous of good or evil to their nation. They fancy it to be a favourite haunt of their chief deities. Turner's Thibet, p. 212, &c.

RAMTEAK, or Ramtegh, a town of Hindooſtan, in the circar of Goondwana, held ſacred by the Hindoos, who pretend that Ram collected his army here, prior to his expedition againſt Rawun at Lanka, or Ceylon. The Hindoos believe all the Europeans to have deſcended from Rawun, and Ceylon to be an immenſe mountain of gold inviſible to them. Near the town is a temple, in which they offer up their ſacrifices and devotions; 15 miles N.E. of Nagpour. N. lat. 21° 23'. E. long. 79° 57'.

RAMTRUT, in *Mythology*, the name of a deity worſhipped by the Kanazins, a people of Hindooſtan, where he has a celebrated temple, at Onor. The characters under which he is repreſented more reſemble thoſe of a monkey than of a man.

RAMULOSE Leaf, in *Botany*. See Leaf.

RAMUNDA, or Romla Boda, in *Geography*, a town of Sweden, in Nericia.

RAMURAH. See Ramgur.

RAMUS, Peter, in *Biography*. See Ramists.

Ramus, in *Anatomy*. This word, ſignifying *branch*, and the term *ramification*, are uſed in deſcribing the arteries, veins, and nerves, the diviſions and ſubdiviſions of which bear ſome analogy to the branching of a tree. In the ſame way we ſpeak of *trunks* of arteries, &c. and deſcribe them as *branching* out.

Ramus, in the *Anatomy of Plants*, a name given to the firſt or lateral branches, which go off from the petiolum, or middle rib of a leaf. The ſubdiviſions of theſe are called *furculi*; and the final diviſions of theſe into the moſt minute of all, are by ſome called *capillamenta*: but in general, both theſe kinds are comprehended under the name of *furculus*.

RAMUSIO, or Rannusio, Giambatista, in *Biography*, an early collector of voyages and travels, the ſon of Paolo, an eminent lawyer, deſcended from a learned and diſtinguiſhed family of Venetian citizens, was born at Venice in 1485. He was in early life deputed by the ſtate upon public buſineſs to Switzerland, Rome, and France; and in the latter country he ſo much ingratiated himſelf with Lewis XII., that he was by him cauſed to travel through almoſt the whole of his kingdom. As a reward for his ſervices, he was made ſecretary of the council of ten at Venice, which poſt he at length reſigned; and returning to Padua, employed himſelf in compiling his great work, "Raccolta delle Navigazioni e de Viaggi," which was publiſhed at different periods between the years 1554 and 1559, in three volumes folio. He had prepared a fourth volume, which was burnt at the printer's. Ramuſio died at Padua in 1557; of courſe, a part of his work was given to the world after his deceaſe. Ramuſio was author of a treatiſe "De Nili Incremento." He was a man of great learning, and was extremely converſant in hiſtory, geography, and the ancient languages: he had ſome knowledge in aſtronomy, and held a correſpondence with many learned men and well informed perſons, both in Italy and Spain. It was by their aſſiſtance, and at the deſire of Fracaſtoro, that he compoſed

the work already mentioned. This work was a collection of all the voyages and travels that had hitherto been published; in which he gave translations of those in foreign languages; and he prefixed dissertations, in which he diligently examined the pretensions of different authors, comparing them with one another.

RAN, in our *Old Writers*, is used for open and public robbery, so manifest that it cannot be denied. "Ran dicitur aperta rapina quæ negari non potest." Lamb. 125. Leg. Canut. cap. 58. Hence it is to this day vulgarly said of one who takes the goods of another injuriously and violently, that he has taken or snatched all he could *rap* and *ran*.

RAN, twenty cords of twine, wound on a reel; and every cord so parted by a knot, as to be easily separated.

RANA, in *Geography*, a town of Austria; 12 miles S. of Aigen.—Also, a town of Austria; 13 miles S.S.W. of Zwetl.

RANA, or *Oranoi*, one of the Sandwich islands, in the North Pacific ocean, situated about three leagues from Mowee and Morotoi, and lying to the S.W. of the passage between these islands. The country to the south is high and craggy; but the other parts of the island had a better aspect, and appeared to be well inhabited. It produces very few plantains, and bread-fruit trees; but abounds in roots, such as yams, sweet potatoes, and tarrow. The number of inhabitants is estimated at 20,400. Its S. point is in lat. 20° 46′. E. long. 203° 8′. Cook's Third Voyage, vol. iii.

RANA, in *Surgery*. See RANULA.

RANA, in *Zoology*, the frog, a genus of the class Amphibia, of the division Reptiles, of which the generic character is: Body four-footed, naked; it generally has no tail, the hind legs are longer than the fore. This genus differs from the *Lacerta* (see the art. LIZARD), in having a shorter body, broader, thicker head, and in general no tail. The animals of it feed on insects; they are full grown about the fourth year, and seldom live beyond the twelfth. Their fore-feet are mostly cleft, having four toes: their hind-feet are palmate and five-toed; they are extremely salacious, sticking to the female for days and weeks: the tadpole is excluded from the egg without feet, but with a tail resembling a fish's, which drops off as the legs are protruded; in this state they have likewise a sort of gills and lungs, and many have a small tube on the lower lip, by which they can affix themselves to other bodies; near the left eye is a vesicle, from which they discharge water: in breeding time, the fore-thumb of the male is warty: toads, as we all know, are filthy in their aspect, and live in damp, obscure, dark places, and crawl out only by night: their eggs are in a long chain: frogs are more active, and more about by day; these lay their eggs in a confused mass.

Dr. Shaw, in his entertaining and instructive Zoology, says this genus may be divided into three sections; *viz.* 1. Frogs, commonly called *Ranæ*, with light active bodies, and which leap when disturbed. 2. Slender-limbed frogs, *Hylæ*, *Calamitæ*, or *Ranæ arboreæ*, *viz.* such as have light bodies, very slender limbs, and toes terminating in flat, circularly expanded tips, enabling the animal to adhere at pleasure to the surface even of the smoothest bodies. Several of this division actually reside on trees, adhering by their toes to the lower surfaces of the leaves and branches. 3. Toads, *Bufones*, or such as have heavy bodies, short thick limbs, and which rather crawl than leap when disturbed.

Gmelin has given a different arrangement, which, according to our usual custom, we shall follow in this article. He divides the genus into three sections, *viz.* A, those with warty and puffed up bodies; and short legs: these are *toads*. B, those with bodies rather oblong, smooth and with longer legs: these are *frogs*, properly so called. And C, whose hind feet are very long; and whose claws are lenticulate. Dr. Shaw enumerates more than fifty species, but Gmelin describes only thirty-six.

Section A.—*Body warty, puffed up: shorter Legs.*

Species.

PIPA; Surinam Toad. The toes of the fore-feet of this species are unarmed, four-cleft; those of the hind-feet are clawed and palmate.

This hideous and deformed animal inhabits the waters of Guiana, and is actually eaten by the natives. The male, after the exclusion of the eggs, collects the mass together, and smears it over the back of the females with its paws, where they are received into small cells, impregnated by the males and closed up; after some time the perfect young are excluded from those hollow tubercles on the back of the female.

The size of the *Pipa* considerably exceeds that of the common toad; the head is flat, broad, and very short; the beak is spatula-shaped; the eyes very small and remote; neck very short, wrinkled; the body is orbicular, flat, with a hard cartilaginous skin; the fore toes are round, and the hind ones very long, connected by an undivided membrane. This species was first made known to the Europeans about the latter end of the 17th century.

MUSICA; Musical Toad. The specific character of this is, that it has gibbous shoulders that are dotted; the body is varied with lurid and brown; the fore-feet are cleft, and the hind-feet are subpalmate and five-toed, with scarcely any claws. It inhabits the fresh waters of Surinam: it is larger than the common toad: in the evening, and during the whole night, it keeps up a continual musical kind of croaking; hence it takes its name.

*BUFO; Common Toad. Body lurid and brown: of this animal there are three varieties, as follows: the first has its back of an olive colour; and an unequal yellowish-red band down the side: the body of the second is marked with confluent green spots and warts on the spots of the same colour, those of the intervals red, the spaces between bicoloured. The third is particularly distinguished for its size, being much less than the others. This of all the European toads seems to be the most universally known. It is found in shady places, in gardens, woods, and fields, and frequently makes its way into cellars, or any obscure recesses in which it may occasionally conceal itself, and where it may find a supply of food, or a security from too great a degree of cold. In the early part of spring, like others of this genus, it retires to the waters, where it continues during the breeding season, and deposits its ova or spawn in the form of double necklace-like chains or strings of beautifully transparent gluten, and of the length of three or four feet, in each of which are disposed the ova in a continued double series throughout the whole length, having the appearance of so many small jet-black globules or beads; being in reality no other than the tadpoles or larvæ convoluted into a globular form, and waiting for the period of their evolution, or hatching, which takes place in the space of about fourteen or fifteen days, when they break from the surrounding gluten, and like the tadpoles of frogs, swim about in the water, and are nourished by various animalcules, gluten, leaves of water-plants, &c. &c. till, having arrived at their full growth, the legs are formed, the tail

gradually becomes obliterated, and the animals leave the water, and betake themſelves to the ſurface of the ground. This generally happens early in the autumn, at which period it is not uncommon to find ſuch numbers of the young animals in ſome particular places, that their appearance has frequently given riſe to the vulgar idea of their having been ſhowered from the clouds.

The toad is an animal too well known to require any very particular deſcription of its form. It may be neceſſary to obſerve, that it is always covered by tubercles, or elevations on the ſkin, of larger or ſmaller ſize in different individuals, and that the general colour of the animal is an obſcure brown above, much paler and irregularly ſpotted beneath. The toad, however, is occaſionally found of an olive caſt, with darker variegations; and in ſome ſpecimens, more eſpecially in the earlieſt part of ſummer, the ſhoulders and limbs are marked with reddiſh ſpots, while a tinge of yellow often pervades the under parts both of the limbs and body.

The toad arrives at a conſiderable age; its general term of life being ſuppoſed to extend to fifteen, or even twenty years; and Mr. Pennant, in his Britiſh Zoology, gives us a curious account, communicated by Mr. Arſcott, of Teholt, in Devonſhire, of a toad's having lived, in a kind of domeſtic ſtate, for the ſpace of more than forty years, and of having been, in a great degree, tamed, or reclaimed from its natural ſhyneſs or deſire of concealment; ſince it would always regularly come out of its hole at the approach of its maſter, &c. in order to be fed. It grew to a very large ſize, and was conſidered as ſo ſingular a curioſity, that even ladies, laying aſide their uſual averſion and prejudices, requeſted to ſee the favourite toad. It was, therefore, often brought to table, and fed with various inſects, which it ſeized with great avidity, and without ſeeming to be embarraſſed by the preſence of company. This extraordinary animal generally reſided in a hole beneath the ſteps of the houſe door, fronting the garden; and might probably have ſurvived many years longer, had it not been ſeverely wounded by a raven, which ſeized it before it could take refuge in its hole, and notwithſtanding it was liberated from its captor, it never again enjoyed its uſual health, though it continued to live above a year after the accident happened.

The toad is looked upon with great averſion by the major part of mankind, and it muſt be confeſſed, that its appearance is diſguſting, yet the eyes are remarkably beautiful, being ſurrounded by a reddiſh gold-coloured iris, the pupil, when in a ſtate of contraction, appearing tranſverſe.

We ſhall conclude the hiſtory of this animal, with mentioning the very extraordinary circumſtance of its having been occaſionally diſcovered incloſed, or imbedded, without any viſible outlet, or even any paſſage for air, in the ſubſtance of wood, and even in that of ſtone or blocks of marble. "For my own part," ſays Dr. Shaw, "I have no heſitation in avowing a very high degree of ſcepticiſm as to theſe ſuppoſed facts, and in expreſſing my ſuſpicions that proper attention, in ſuch caſes, was not paid to the real ſituation of the animal. That a toad may have occaſionally latibulized in ſome part of a tree, and have been in ſome degree overtaken or incloſed by the growth of the wood, ſo as to be obliged to continue in that ſituation, without being able to effect its eſcape, may perhaps be granted: but it would probably continue to live ſo long only as there remained a paſſage for air, and for the ingreſs of inſects, &c. on which it might occaſionally feed: but that it ſhould be completely blocked up in any kind of ſtone or marble, without either food or air, appears entirely incredible, and the general run of ſuch accounts muſt be received with a great many grains of allowance for the natural love of the marvellous, the ſurprize excited by the ſudden appearance of the animal in an unſuſpected place, and the conſequent neglect of minute attention at the moment, to the ſurrounding parts of the ſpot where it was diſcovered."

* Rubeta; the Natter Jack. Of this the vent is obtuſe; and it has a yellow line on the back; the body beneath is ſpotted with black, but above it is of a dirty yellow, clouded with brown, and covered with porous pimples of unequal ſizes. This ſpecies frequents dry and ſandy places, and is found on Putney Common, and near Reeveſby-Abbey in Lincolnſhire, where it derives its trivial name. It never leaps, neither does it crawl, with the ſlow pace of a toad, but its motion is more like running. Several are frequently found together, and like others of the genus they appear in the evening.

Gibbosa; Gibbous Toad. Body oval, convex, with a longitudinal cinereous dentate band. A variety has its back marbled with red and yellowiſh-aſh; the belly is yellow, ſpotted with black. The firſt is found in divers parts of India, the ſecond at Surinam.

Bombina; Laughing Toad. Belly orange, ſpotted with ſky-blue; the pupil is triangular. Gmelin gives three varieties of this ſpecies; *viz.* 1. That which is diſtinguiſhed with a black belly, marked with clear white ſpots and points. 2. One which is brown with white ſpots; the ſides and round the joints are red. 3. One which is diſtinguiſhed for its loud ſonorous voice. It is found in the fenny parts of Germany and Helvetia; leaps like a frog; emits a clear ſound like a man laughing: it a good deal reſembles the common toad, but is ſmall, black, and every where rough, with dots on the upper part, and variegated beneath, with tranſverſe wrinkles under the neck.

Salsa; Salt Toad. Above of a dirty olive colour, but beneath it is white, ſpotted with black. This ſpecies is found in the ſtagnant waters of Berchteſgad, and is leſs than the R. arborea, hereafter to be noticed; it avoids the light, is inodorous, and emits no liquid from its minute perforated warts: the legs are marked with brown bands, beneath it is yellow.

Ventricosa; Tumid Toad. The mouth of this is ſemiovate, and the throat ovate. A variety is marked with pale white puſtules. It is found in South America, and in ſome parts of India. The body is brown and orbicular; the tubercles on the top of the neck longitudinally diſpoſed; the back has three longitudinal wrinkles; the flanks are tumid and dilated.

Marina; Marine Toad. Shoulders tumid; eye-lids warty, conchate; the hind feet are ſubpalmate: there is a variety, which is ſpotted with brown; beneath it is ſhaded with livid, the neck and ſhoulders are ſpotted with grey. This is found in various parts of America, and is more than ſix inches long. Its body is yellowiſh-grey, with a few rather tawny ſpots: the warts are diſtinguiſhed with an elevated bay ſpot in the middle: the protuberances of the ſhoulders are oval, ſmooth, and porous; the vent is ſurrounded with wrinkled radii; the hind toes are connected only as far as the firſt joint, the laſt joint is fringed with a bay membrane.

Brasiliensis; Braſil Toad. Yellowiſh-aſh, with red waved ſpots, beneath ſmooth.

Arunco; Chili Toad. All the feet of this ſpecies are palmate. It inhabits, as its name imports, the waters of Chili: in its ſize it reſembles the R. temporaria deſcribed below: on the hind toes there is a ſlight appearance of claws.

Lutea;

Lutea; Yellow Toad. The body of this is yellow; all the feet are ſubpalmate. This is alſo found in Chili, and much reſembles, in its habits, the R. eſculenta, but is much leſs; the laſt joints of the toes are not connected.

Margaritifera; Pearled Toad. Body brown-red, ſprinkled with pale red ſpots.

Cornuta; the Horned Toad. This takes its ſpecific name from the circumſtance of having its eye-lids horned. It inhabits Virginia and Surinam, and of the whole tribe it is the moſt deformed. It is ſaid, indeed, to ſurpaſs all animals in uglineſs. It is thus deſcribed: the head is large, and rounded before; the mouth is exceſſively large; the eye-lids are ſoft, mucronate, trifid at the point; the eyes are ſeated in the middle; the body is of a greeniſh-brown, with broad longitudinal whitiſh ſtripes on the back; the legs are tranſverſely faſciate with brown: when full grown, the back, the thighs, and vent, are ſpiny.

Sitibunda; Deſart Toad. The ſpecific character is, that above it is aſhy-glaucous, varied with blackiſh-green ſpots, beneath of a dirty white; the hind feet are ſemi-palmate, with the appearance of ſeven toes. It inhabits the dry deſarts near the Ural, ſometimes hides itſelf in holes, and crawls out in the evening; it reſembles the common toad, but is ſomewhat larger.

Veſpertina; Siberian Toad. This has a tranſverſe ſpot between the eyes, forked behind, and other ſpots running obliquely from the eyes to the noſe; the body above is cinereous, with longitudinal ſubconfluent brown ſpots, varied with different ſhades of green; beneath it is daſhed with a whitiſh-aſh. As its trivial name imports, it inhabits Siberia, and is about the ſize of a common toad; it leaps ſlowly: the head is ſhort; the body above is ſprinkled with ſubwarty papillæ.

Ridibunda; Jocular Toad. Body brown, ſpotted above with cinereous; the dorſal line is yellow, or greeniſh; beneath it is ſmooth, whitiſh; haunches brown, ſpotted with milk-white. The head of this ſpecies is broad; the upper eye-lid is convex, ſprinkled with pores; the apertures of the ears are flat; the back is porous; the ſides are marked with obſolete warts; the fore thumb is divaricate, thick at the baſe; the next toe ſhorter than the reſt; the hind limb ſubfaſciate; the hind feet have a callus within, reſembling a ſixth toe; the toes have a wart beneath, near the joints.

This ſpecies is found in great numbers near the rivers which empty themſelves into the Caſpian ſea; it never ventures on the dry land; it is very large, and frequently weighs more than half a pound: it reſembles the R. temporaria, but is broader and ſhorter; its voice in the evening is like that of a man laughing.

Variabilis; Changeable Toad. Colour variable; back and ſides gibbous; warts yellowiſh in the centre; it is very ſmall on the middle of the back, and larger on the moſt prominent part of the flanks. It inhabits the ſhady places in Germany, and is only about two inches long: in its habits, it holds an intermediate place between the toad and frog; when full awake its body is white, with green ſpots; in the heat of the ſun it is entirely cinereous; when aſleep, the ſpots are only cinereous, and when torpid the body has a fleſh-coloured caſt.

The head is rounded, and the mouth without teeth; the margin of the upper jaw is doubled; the tongue is fleſhy, thick, placed far back, the baſe obſcurely bifid, very entire at the tip; it has hardly any upper eye-lid, the lower one is folding; cavities of the ears white; the warts reſemble teats, very numerous on the groin; the chin is marked with prominent dots; the colour, when preſerved in ſpirits, is yellowiſh, and above it is of a pale olive; the fore feet are three-toed, beneath they are emarginate, the thumb is larger; the ſecond toe of the hind feet is very long.

Section B.—*Body more oblong, ſmooth; Legs longer.* Frogs.

Species.

Typhonia; Hurricane Frog. Of this ſpecies, the diſtinguiſhing characteriſtic is, that the lobes of the ears are oval. It inhabits America, and is ſaid to make a noiſy croaking before hurricanes and whirlwinds. The back is marked with four longitudinal wrinkles, elevated points, and black ſpots; the hind toes are narrow, without claws, the ſecond is verv long.

Pentadactyla; Mackarel Frog. All the legs are faſciate, five-toed; body veined, the dorſal ſtreaks tranſverſe, the lateral ones are ocellate. There is a variety which is brown; the fore feet have four toes, with the rudiment of a fifth; the hind feet have five toes, with the rudiment of a ſixth.

Ocellata; Ocellate Frog. The ears are marked with an ocellate ſpot; feet with claws, the hind ones ſub-palmate. It inhabits America.

Pipiens; Clamorous Frog. This is green, with numerous ocellate ſpots, ſurrounded with a yellowiſh ring. This ſpecies is ſmaller than the *green* frog, but, in its general habits, it bears a conſiderable reſemblance to that animal. It is a native of North America, and frequents rivulets and ditches of water, and is ſo ſtrong and vigorous, that it is ſaid it can leap to the diſtance of five or ſix yards. In the ſpring and beginning of ſummer, it is ſaid to indicate the approach of rain by the peculiar ſound which it emits. In the living animal the ears are of a ſhining gold colour; the region of the anus is very much wrinkled; the third fore toe from the thumb longer than the reſt; the body reſembles that of the eſculent, or green frog, but the hind thighs are longer; the ſhanks are longer ſtill, and hind feet are longer than theſe, marginate on each ſide; the toes are connected nearly to the tip, the fourth is longer than the reſt.

Bicolor; Blue and Yellow Frog. Colour blue, ochreous beneath, feet unwebbed; toes flattened and orbicular. This elegant ſpecies is of a moderate ſize; it meaſures more than four inches in length. The whole of the upper ſurface is of a beautiful blue, while the under parts are of a pale orange, or ochre colour. The head is large, the mouth wide, and the tip of the noſe truncated. All the toes are furniſhed with a large orbicular tip, and beneath each of the joints there is a proceſs or tubercle. The upper parts of the female have a deeper ſhade of violet than thoſe of the male. It is ſuppoſed to be a native of Surinam.

Maxima; the Great Frog. All the feet are palmate, as well as the toes, faſciate; body veined and variegated; the top of the back obliquely ſpotted. Bands of the legs in pairs, approximate, above confluent.

Alpina; Alpine Frog. This is entirely black, and inhabits the declivities of the mountains in Auſtria.

Venulosa; Veined Frog. Feet cleft; the body veined with confluent ſpots. It inhabits India and South America.

Virginica; Virginian Frog. Cinereous, ſpotted with red, beneath it is yellowiſh; the back is five-angled, with as many ſtripes. It is found in Virginia.

* Temporaria; or Common Frog. The back of this is flattiſh and ſub-angular. There is a variety, which is of a dirty olive colour, with large warty ſpots, the head above plain, beneath whitiſh; twice the ſize of the common frog. Both are found in this country, and the latter alſo in Perſia; it lives, during the ſpring, in water, among toads, and in the

ſummer

ſummer on land, at which time it is ſilent; it feeds on various inſects, and is the prey of ducks and cranes, croaks very much when in muddy ditches; the variety makes, by night, a noiſe like that of an angry man.

Of all the European ſpecies this is the moſt common. The general colour is of an olive-brown, variegated on the upper parts of the body with irregular blackiſh ſpots. The patch beneath each eye, which reaches to the ſetting on of the fore-legs, ſeems to conſtitute one of the principal ſpecific diſtinctions. The under part of the body is of a pale greeniſh colour, and obſcurely ſpotted. But it ought to be obſerved, that the colour of the frog varies at different ſeaſons of the year, and perhaps in different places. Towards the end of ſummer, for inſtance, the colours are much brighter; and as this ſpecies frequently caſts its ſkin, the cuticle falling off irregularly from different parts of the body, produces conſiderable variations in the intenſity of the colours.

The frog has a light elegant form and a lively appearance; the limbs are well calculated for its peculiar motions, and the hind feet being ſtrongly webbed, enable it to ſwim well. The frog, it is ſaid, does not reach its full ſize till it is five years old, and it lives from twelve to fifteen years. It retires during the heat of ſummer to the water, and in winter it becomes torpid, and is generally found in the ſoft mud at the bottom of ſtagnant waters, or in the cavities beneath their banks, where it remains till the return of ſpring.

The frog, as well as many other of the reptile tribe, is extremely tenacious of life. It ſurvives, for a conſiderable time, the loſs even of ſome of its eſſential organs, and it has been found to exiſt for ſeveral days when entirely confined under water.

The frog depoſits its ſpawn in the month of March. This is compoſed of a gelatinous tranſparent maſs, including the ova or eggs, in each of which is imbedded the embryo or tadpole, which has then the appearance of a round black globule. The period of hatching varies according to the temperature of the ſeaſon, but it is commonly in about a month or five weeks. In its progreſs the egg becomes gradually larger, and before the tadpole is excluded, it is ſeen in motion within the ſurrounding gluten. When they are firſt hatched, their only food is the remains of the gluten in which they were included. A few days afterwards, if they are minutely examined, a pair of ramified branchiæ, or temporary organs, may be obſerved on each ſide of the head, which after a ſhort time diſappear. The tadpole, which is ſo extremely unlike the animal in its perfect ſtate, ſeems to conſiſt only of a head and tail. The head is large, black, and roundiſh; the tail is ſlender, and margined with a broad tranſparent fin. The motions of the tadpole are very lively. Its food conſiſts of duck-weed and other ſmall water plants, with different kinds of animalcula. The mouth is furniſhed with very minute teeth, and when the tadpole has reached a certain ſize, it may ſometimes be heard gnawing the edges of the leaves on which it feeds. By means of a ſucker placed between the lower jaw, with which the animal in this ſtate is furniſhed, it can attach itſelf at pleaſure to the under ſurface of aquatic plants. When it is very young, it ſometimes hangs from this part by means of a glutinous thread, ſimilar to ſome ſmall ſlugs.

The internal ſtructure of the organs of the tadpole is very different from that of the future animal. In no reſpect is this difference greater than in the diſpoſition of the inteſtines, which are coiled in the form of a flat ſpiral, like a cable. The firſt change which appears on the tadpole is at the end of five or ſix weeks after it is hatched. It is about this time that the hind legs firſt appear; and gradually increaſing in length and ſize, they are ſucceeded about two weeks afterwards by the fore legs. Theſe latter, indeed, are formed at an earlier period beneath the ſkin, and are ſometimes protruded, and again drawn back by the animal, through a ſmall hole on each ſide of the breaſt, before their complete evolution. The tail now gradually decreaſes, and afterwards more rapidly, ſo that in the ſpace of a day or two, it is quite obliterated. After this change, the animal leaves the water, and covers the banks in myriads. The ſudden appearance of ſuch multitudes of young frogs, has probably induced the groundleſs but popular belief, of their having fallen from the clouds in ſhowers. The frog having now arrived at its perfect form, it changes entirely the nature of its food. It lived formerly on vegetables, now it depends ſolely for its exiſtence on animal food. It lives chiefly on ſmall ſnails, worms, and inſects. To ſeize its prey, the ſtructure and poſition of the tongue are remarkably well fitted. It is of conſiderable length, and is attached to the fore part of the mouth; and when at reſt it lies backwards. The extremity is biſid, and ſecretes a glutinous matter, ſo that in this way it can ſecure its prey, by darting out its tongue with great celerity, and to ſome diſtance from the mouth. This it does with ſo inſtantaneous a motion, that it is ſcarcely perceptible to the eye.

Marginata; Bordered Frog. The ſides of this are marginate, and the feet cleft. It inhabits India and South America.

* Esculenta; Eſculent, or Edible, or Green Frog. Of this ſpecies the diſtinguiſhing characteriſtics are, that it is of an olive colour, ſpotted with black, with three yelloviſh lines on the back; the abdomen is whitiſh.

Of all the European frogs this is the largeſt ſpecies. The general appearance is very like that of the R. temporaria, but it is larger in ſize, and of an olive-green colour, ſtrongly marked on the upper part of the body with roundiſh black ſpots. The limbs are elegantly marked with tranſverſe bands of the ſame colour. Three diſtinct pale yellow ſtripes run from the tip of the noſe down the whole length of the back; the middle one being ſlightly depreſſed, but the two lateral ones are conſiderably elevated. The head is proportionably larger than that of the common frog.

The green frog is rare in England, but is very common in France, Italy, and Germany, where it is employed as an article of food.

This ſpecies, it is obſerved by naturaliſts, does not leave its winter retirement till a much later period than the common frog; and in thoſe countries where it is uſed as food, it is worth while to attend to this fact: for if they are pretended to be brought to market at an earlier period, the common frog, and ſometimes even toads, muſt be ſubſtituted. During the breeding ſeaſon, the croaking of the male is ſo loud, that it may be heard at a great diſtance; and in thoſe places where they are numerous, it becomes ſo intolerable to thoſe who are unaccuſtomed to hear them, that they are often deprived of ſleep. At this time, too, a large inflected globular veſicle is protruded from each ſide of the head of the male. The globules of ſpawn in the green frog are proportionally ſmaller than in the former ſpecies: they have ſomewhat of a yelloviſh caſt. The progreſs of the tadpole, towards the evolution of the perfect animal, is conſiderably ſlower in this ſpecies. The fore legs do not appear before October, and the animal does not aſſume its perfect ſhape till the beginning of November. The tail at this time begins to decreaſe, and in the ſpace of four days entirely diſappears.

This ſpecies is extremely voracious, ſeizing, it is ſaid, on young

young birds of different kinds, mice, and even ducklings, and, as it does with the reſt of its prey, ſwallowing them whole. At the end of four years it has reached its full growth. It begins to breed the year following, and the period of its life is ſometimes extended to ſixteen years.

Australisia; Auſtralian Frog. The body of this is brown above, beneath blueiſh; the ſides are ſpeckled with ochre colour; the toes of the fore feet are ſpiny. It inhabits New Holland. The ſecond toe of the hind foot is very long; the claws are red.

Paradoxa; Paradoxical Frog. This is of a yellowiſh and olive colour, variegated with rufous bands; the hind legs or thighs are obliquely ſtreaked.

In its general form this ſpecies reſembles the R. temporaria. The oblique longitudinal ſtripes on the hind legs conſtitute the principal mark of diſtinction. There are four toes on the fore feet, and they are unwebbed; the hind feet have five toes, and are deeply palmated to the very ends of the toes. Near the ſhorteſt toe there is an oblong callus, forming a ſpurious one. The upper jaw is beſet with a row of ſmall denticulations. This ſpecies is a native of South America, and is more common in Surinam than in other places.

Naturaliſts, ſays Dr. Shaw, have been extremely puzzled with regard to the real nature of what has been taken for the tadpole of this frog. At one time it was conſidered by Linnæus as a ſpecies of lizard, and therefore arranged by him under the genus lacerta. At another time he has placed it under the preſent genus, with the ſpecific name piſcis. It was deſcribed by Edwards under the denomination of the frog-fiſh of Surinam. The ſtructure of the animal, which has been the ſubject of ſo much diſcuſſion, ſhews clearly that it is the larva or tadpole of a frog; and it is ſuppoſed, with no ſmall degree of probability, that the differences in the accounts given of this animal by naturaliſts have ariſen from the different ſtages of its progreſs, in which it has been found. But as this tadpole is ſo much larger in ſize, in proportion to the perfect animal, than any other ſpecies yet known, it may be the larva or tadpole of ſome of the larger ſpecies, and not that of the R. paradoxa, which is but a ſmall frog.

C. *Hind Feet very long; the Claws lenticulate.*

Arborea; Tree-Frog. The body of this ſpecies is green, beneath granulate; feet cleft. Gmelin enumerates five varieties of this ſpecies. 1. Thoſe which have four toes to their fore feet, and five to thoſe that are behind; the knees are warty beneath. 2. Thoſe that are of a green colour, with a ſtraight yellow line on each ſide. 3. The body of this variety is reddiſh. 4. Of this it is browniſh-green. 5. The ſlenderneſs of the body marks this variety.

"In the beauty of its colours," ſays Dr. Shaw, "as well as in the elegance of its form, and agility of its movements, the tree-frog exceeds every other European ſpecies. It is a native of France, Germany, Italy, and many other European regions, but is not found in the Britiſh iſlands. Its principal reſidence, during the ſummer months, is on the upper parts of trees, where it wanders among the foliage in queſt of inſects, which it catches with extreme celerity; ſtealing ſoftly towards its prey, in the manner of a cat towards a mouſe, and, when at the proper diſtance, ſeizing it with a ſudden ſpring, frequently of more than a foot in height. It often ſuſpends itſelf by its feet, or abdomen, to the under parts of the leaves; thus continuing concealed beneath their ſhade. Its ſize is ſmaller than any European frog, except the R. bombina. Its colour, on the upper parts, is more or leſs bright in different individuals; the abdomen is whitiſh, and marked by numerous granules; the under ſurface of the limbs is reddiſh; and the body is marked on each ſide by a longitudinal blackiſh or violet coloured ſtreak, ſeparating the green of the upper parts from the white colour of the lower: the inferior edge of this dark lateral ſtripe is tinged with yellow. The body is ſmooth above, and moderately ſhort or plump; the hind legs are very long and ſlender; the fore feet have four, and the hind feet five toes, all of which terminate in rounded, flat, and dilated tips, the under ſurface of which, being ſoft and glutinous, enables the animal to hang with perfect ſecurity from the leaves of trees, &c. The ſkin of the abdomen is alſo admirably calculated by nature for this peculiar power of adheſion, being covered with ſmall glandular granules, in ſuch a manner as to faſten cloſely even to the moſt poliſhed ſurface; and the animal can adhere at pleaſure to that of glaſs, in whatever poſition or inclination it be placed, by merely preſſing itſelf againſt it.

Though the tree-frog inhabits the woods during the ſummer months, yet, on the approach of winter, it retires to the waters, and there ſubmerging itſelf in the ſoft mud, or concealing itſelf beneath the banks, remains in a ſtate of torpidity; and again emerges in the ſpring, at which period it depoſits its ſpawn in the waters, like the reſt of this genus. The male at this period inflates its throat in a ſurpriſing manner, and exerts a very loud and ſharp croak, which may be heard to a vaſt diſtance. The ſpawn is depoſited about the end of April, in ſmall cluſtered maſſes; the incloſed globules or embryos being of a pale yellowiſh-brown colour. The tadpoles become perfect frogs, by the total decay of the tail, about the beginning of Auguſt; and ſoon begin to aſcend the neighbouring trees, where they continue to reſide during the remainder of the warm ſeaſon; as do likewiſe the parent animals, after the breeding ſeaſon is paſt. During their reſidence among the trees, they are obſerved to be particularly noiſy on the approach of rain; ſo that they may be conſidered, in ſome meaſure, as a kind of living barometers; more eſpecially the males, which, if kept in glaſſes, and ſupplied with proper food, will afford an infallible preſage of the changes of weather.

Leucophyla; White-ſpotted Frog. Body ſmooth, hoary, with oblong milk-white ſpots; the fore feet are lobate, the hind feet palmate. It inhabits America, and weighs only about forty-ſix grains. Eyes of a fine golden colour, and between theſe, on the ſides and middle of the back, there are oblong white ſpots; the haunches are ſlender.

Squantigera; Scaly Frog. In this a ſcaly band reaches half-way round the back; the ſides and throat have folds; the fore feet are ſemi-palmate, the hind feet are palmate. This is about two inches long, and is ſuppoſed to be an inhabitant of America. The body is varied with grey and brown in thick aggregate ſpecks, and a few ſpots down the hind part of the back, in a ſerpentine direction; the band conſiſts of minute, ſub-pellucid, rhomboid, imbricate ſcales; the hind limbs are twice as long as the fore.

Boans; Croaking Frog. Body ſmooth, with continuous dots beneath; feet palmate. There are two varieties. 1. The body above is of a blueiſh lead-colour. 2. The body of this is inclining to orange. It is found in America, and differs only from the tree-frog in having the feet webbed, and the body marked with white ſpots.

Rana *Arborea*, the *Tree-Frog*. See Ranunculus *Viridis*, and the preceding article.

Rana *Piſcatrix*. See Lophius *Piſcatrix*, and Sea-*Devil*.

RANA-

RANARIDL, in *Geography*, a town of Auſtria; 11 miles S. of Aigen.

RANASAGUR, a town of Hindooſtan, in Bahar; 18 miles W. of Arrah. N. lat. 25° 37'. E. long. 84° 31'.

RANCAGUA, a juriſdiction of South America, in Chili. It derives its name from the inhabitants living in ſingle houſes, without the appearance of a village; every family lodging in their lonely cottage, four, ſix, or more leagues from each other. It is not, however, without a capital, conſiſting of about 50 houſes, and between 50 and 60 families, moſt of them being Meſtizos, though their caſt is not perceivable by their complexion. The whole juriſdiction may contain about 1000 families, Spaniards, Meſtizos, and Indians. Ulloa's Voyage, vol. ii.

RANCE, Armand-John le Bouthillier de, in *Biography*, the inſtitutor of the order of La Trappe, was of noble deſcent, and born at Paris in the year 1626. At a very early period he exhibited an extraordinary genius for claſſical and polite learning; and at the age of 10 he had read many claſſical works, in the Greek as well as the Latin languages, and is ſaid at that early period to have underſtood Homer. When he was only 13 years of age, he prepared for the preſs a new edition of Anacreon, with notes, that diſplayed conſiderable talent and reſearch. This was publiſhed in 1639. Four years previouſly to this, he had received the clerical tonſure, and had been nominated a canon of Notre Dame at Paris. He was promoted by the king to the ſinecure priory of Boulogne, near Chambor; and he was ſubſequently promoted to three different abbies, among which was that of La Trappe, and to other places of honour and truſt in the church. He ſtudied divinity at the Sorbonne, and in 1651 he was ordained prieſt; and in leſs than three years, the degree of doctor of divinity was conferred upon him by the faculty of the Sorbonne. Having thus completed his ſtudies, he entered into the world, and, like one broken from his ſhackles, he devoted himſelf eagerly to its honours, pleaſures, and gaieties. He ſoon became a favourite at court, and was appointed almoner to the duke of Orleans, and one of the deputies of the ſecond order in the aſſembly of the clergy in 1655. On a ſudden, and for a cauſe that never was well underſtood, he became diſguſted with the world, and reſolved to renounce for ever its pleaſures, enjoyments, and vanities. No ſooner had the abbè de Rancè formed the reſolution than he withdrew to his eſtate in the country, to deliberate concerning the mode of life which he ſhould purſue. Having made up his mind to embrace the monaſtic life, he ſold his eſtate, and beſtowed the money which it produced on the Hôtel-de-Dieu at Paris. He alſo reſigned all his benefices and dignities, excepting his priory of Boulogne, and the abbey of La Trappe; the latter of which he retained by a ſpecial permiſſion of the king, in order to introduce into it a reformation of the ſtatutes and diſcipline. He took the habit, and made his profeſſion in the year 1664, and ſet about eſtabliſhing the gloomy and auſtere diſcipline of monkery in its full perfection. The place itſelf ſeemed peculiarly adapted to the horrid ſyſtem which he eſtabliſhed, being the moſt gloomy, barren, and deſolate ſpot in the whole kingdom of France. Here the days of the monks were conſtantly ſpent in prayers, tears, contemplation, ſilence, the peruſal of holy books, the hardſhips of bodily labour, and the practice of the moſt rigid auſterities. All other deſigns and occupations, however laudable and excellent in themſelves, they were to regard as vain and ſinful to perſons of their order. The leaſt relaxation, or amuſement of the moſt innocent nature, they were not allowed; and they were prohibited from engaging at all in literary ſtudies. Strange! that a mind ſtored with liberal knowledge, and diſtinguiſhed by good taſte, ſhould have been ſo far perverted by ſuperſtition and fanaticiſm, as to deviſe or ſanction ſuch regulations.

That the world might be acquainted with the diſcipline of his community, he publiſhed "A Treatiſe on the Sanctity and Duties of the Monaſtic State." As de Rance advanced in years, the ſevere diſcipline to which he ſtrictly conformed, rendered him ſo infirm, that, finding himſelf unequal to the duties of his poſt, he reſigned it into the king's hands, but was permitted to appoint his ſucceſſor. At length, worn out with infirmities and mortifications, and lying on a bed of aſhes and ſtraw, he died in 1700, in the 74th year of his age. He was author of a great number of theological and other pieces, among which may be mentioned "Moral Reflections on the Four Evangeliſts;" "The Conſtitution and Rules of the Abbey of La Trappe," in 2 vols.; and "A Diſcourſe on Purity of Intention." Moreri.

Rance, in *Geography*, a river of France, which runs into the ſea near St. Malo.

RANCHANO, a ſmall iſland near the coaſt of Darien, in the Pacific ocean.

RANCHERIA, a town of South America, in the vice-royalty of Granada, and province of St. Martha; 20 miles N.E. of Hacha. N. lat. 11°. W. long. 72° 36'.—Alſo, a ſmall iſland in the Pacific ocean, near the coaſt of Veragua. N. lat. 7° 50'. W. long. 82° 16'.

RANCHERIAS, a name given, in the province of Panama, to aſſemblages of Indian huts under the juriſdiction of a village. Theſe rancherias are ſituated to the ſouthward, in the ſmall chaſms or breaches of the mountains.

RANCID, in *Rural Economy*, from the Latin *rancidus*, of *rancio, to be rank*, a term applied to ſubſtances, which have contracted a ſtrong offenſive ſmell and taſte by keeping, as bacon, butter, and all fat ſubſtances are apt to do. It would be a very uſeful diſcovery, to find out any eaſy ſimple method of preventing this effect from taking place.

RANÇON, in *Geography*, a river of France, in the department of the Lower Seine, which runs into the Seine, at Caudebec.—Alſo, a town of France, in the department of the Upper Vienne; 8 miles E. of Bellac.

RANCONET, Aimar de, in *Biography*, a learned and worthy magiſtrate, who flouriſhed in the 16th century, was born at Bordeaux, in which city his father was an advocate of parliament. Having received the advantages of a good education, he became deeply ſkilled in the Roman law, to the ſtudy of which he joined that of philoſophy, mathematics, and antiquities. Having been ſome time a counſellor in the parliament of Bourdeaux, he was raiſed to the poſt of preſident of the fourth chamber of inqueſts in that of Paris. The religious contentions of the time were fatal to him. When the cardinal of Louvain aſſembled the parliament of Paris, to procure its opinion concerning the puniſhment of heretics, Ranconet brought the works of Sulpicius Severus, and read aloud the paſſage in which that writer cenſures the execution of Priſcilian; upon this the prelate cauſed him to be impriſoned in the Baſtille, where he died of grief in 1559, at the age of 60. His latter days had been ſingularly unfortunate. He was reduced by want to be a corrector of the preſs to the Stephenſes; he ſaw his daughter die on a dunghill, and his ſon executed, and his wife was killed by lightning. This learned man publiſhed ſcarcely any thing in his own name, but contributed much to the labours of others. He is ſaid to have had the chief part in the valuable treatiſe, "De Verborum Significatione," and in the "Formulæ" of Briſſon; and Pithou aſſerts,

aſſerts, that he compiled the Dictionary that bears the name of Charles Stephens. He wrote "Le Treſor de la Langue Françoiſe, tant ancienne que moderne." Moreri.

RANÇONNIERES, in *Geography*, a town of France, in the department of the Upper Marne; 9 miles W. of Bourbonne.

RANDAL, *Dr.* John, in *Biography*, organiſt, doctor in muſic, and muſic profeſſor in the univerſity of Cambridge. He was brought up in the king's chapel, was one of the children of that choir who firſt performed in Handel's oratorio of Eſther, at the houſe of Bernard Gates, maſter of the boys in James-ſtreet, Weſtminſter, on Wedneſday, February 23, 1731, when it was performed in action, previous to its having been heard in public, or any where but at Cannons, the magnificent ſeat of the duke of Chandos, for whoſe chapel it was compoſed in 1720.

Randal was never rated very high in his profeſſion: he was regarded as a ſlight organ-player, and had never diſtinguiſhed himſelf as a compoſer. He obtained his degree at the inſtallation of the duke of Grafton in the univerſity of Cambridge, for which he compoſed the ode written by Mr. Gray, to the aſtoniſhment of all the muſical profeſſion, by undertaking to have it performed by the muſicians reſident in the univerſity, without putting his grace to the expence of additional hands and voices from London, as Drs. Greens and Boyce had thought neceſſary on former occaſions at Cambridge, and Dr. William Hayes at Oxford.

As Dr. Randal's profeſſional life was unmarked by talents, his death, which happened in 1799, was hardly noticed, except by the candidates for the profeſſorſhip, and his organiſt's places.

RANDALSTOWN, in *Geography*, a poſt-town of Ireland, in the county of Antrim, in the neighbourhood of which is Shanes caſtle, the ſeat of lord O'Neill. It is ſituated on the river Maine, to the northward of lough Neagh. Randalſtown is 4 miles N.W. from Antrim, and 88 N. by W. from Dublin. Before the union, it was repreſented in parliament. Carliſle, &c.

RANDANS, a town of France, in the department of the Puy-de-Dôme, and chief place of a canton, in the diſtrict of Riom; 12 miles N.E. of Riom. The place contains 1047, and the canton 7996 inhabitants, on a territory of 130 kiliometres, in 11 communes.

RANDASALMI, a town of Sweden, in the government of Kuopio; 52 miles S. of Kuopio.

RANDAZZO, a town of Sicily, in the valley of Demona; 25 miles W. of Taormina. N. lat. 37° 57′. E. long. 15° 4′.

RANDEER, a town of Hindooſtan, in Guzerat, on the Taptee, oppoſite to Surat.

RANDEGG, a town of Auſtria; 8 miles N.N.E. of Bavarian Waidhoven.

RANDERADT, a town of France, in the department of the Roer; 10 miles N.W. of Juliers. N. lat. 50° 59′. E. long. 6° 8′.

RANDERS, a town of Denmark, in North Jutland, on the Gulden. This town is reduced, and has now only one pariſh church, a grammar-ſchool, an hoſpital, and a chapel near the town. The chief articles of trade conſiſt of leather gloves, ſalmon, earthen-ware, and ſtrong beer. It was formerly well fortified; 20 miles E. of Viborg. N. lat. 56° 28′. E. long. 10° 3′.

RANDERSACKER, a town of the duchy of Wurzburg, on the Maine; 2 miles S. of Wurzburg.

RANDIA, in *Botany*, was ſo named by Houſtoun and Linnæus, in honour of Mr. Iſaac Rand, F.R.S., an apothecary in London, who filled the place of lecturer and demonſtrator of botany in the Chelſea garden, from the year 1722 to 1739. He publiſhed in 1730 an octavo index of the officinal plants of that collection, 518 in number, ſpecifying the part of each uſed in phyſic. He alſo printed, in 1739, a general catalogue of the Garden. His name often occurs among the botaniſts of that period. The *Randia*, however, of which two ſuppoſed ſpecies are defined in Linn. Sp. Pl. 213, 214, by the names of *mitis* and *aculeata*, both Weſt Indian ſhrubs, is now ſunk in Gardenia; ſee that article, where we have ſuggeſted a doubt, poſſibly not well founded, of the propriety of this meaſure. Both ſpecies of *Randia* are united by Willdenow, Sp. Pl. v. 1. 1230, on the authority of Swartz, as well as in Ait. Hort. Kew. v. 1. 370, under the name of *Gardenia Randia*. This plant, ſent by Houſtoun to Miller, before the year 1733, does not appear to exiſt in our ſtoves at preſent. Its form may be ſeen in Browne's Jamaica, 143, t. 8. f. 1. That author ſays the pulp of the berries ſtains paper or linen of a fine permanent blue, which reſiſts the action of ſoap and of acids. The ſhrub is frequent in the low lands of Jamaica, on the moſt barren clay ſoil.

RANDNITZ, in *Geography*, a town of Bohemia, in the circle of Schlan; 12 miles N.N.E. of Schlan. N. lat. 50° 23′. E. long. 14° 24′.

RANDOLPH, Thomas, in *Biography*, an Engliſh poet of great celebrity, was born at Newnham, in Northamptonſhire, in 1605. He was educated at Weſtminſter ſchool, and having completed his courſe, he was elected to Trinity college, Cambridge. He ſhewed an early turn for poetry, and at ten years old wrote "The Hiſtory of the Incarnation of our Saviour," in verſe. He acquired an unfortunate, and, to him, a fatal habit of conviviality, which diverted him from the purſuit of any profeſſion, and which led him to waſte his ſcanty patrimony, and his health, in the company of wits and men of pleaſure in the metropolis. He died in his 30th year, to the great regret of thoſe who admired his poetry and loved his company. He poſſeſſed an excellent genius, and had his life been extended, it has been thought he might have attained to a very high rank among the poets of his age. His miſcellaneous poems were collected after his death by his brother, who publiſhed them at Oxford, in 1640. They have been, but not of late years, ſeveral times reprinted. He likewiſe compoſed ſix dramatic pieces of the comic claſs, one of which, "Hey for Honeſty, down with Knavery," was taken from the Plutus of Ariſtophanes. His pieces are ſaid to be ſome of the beſt in the manner then prevalent, which conſiſted in playing with words and thoughts, and connecting remote ideas by fanciful reſemblances. His expreſſions are often elegant, and his verſes harmonious. His friend, ſir Chriſtopher Hatton, cauſed, at his own expence, a monument of white marble to be erected over his grave, the inſcription on which, in Latin and Engliſh verſe, was made by Peter Hauſted. Biog. Brit.

Randolph, John, a learned prelate of the church of England, deſcended from a reſpectable family in Kent, was born July 6th, 1749. He was the younger ſon of Dr. Randolph, formerly preſident of Corpus Chriſti college, Oxford, who died in March 1783, after having preſided over the college for the long ſpace of 35 years. The preſident's father was recorder of Canterbury, and had ſeveral ſons, among whom was Dr. Francis Randolph, principal of Alban Hall, Oxford. The whole family have been remarkable for their orthodox zeal and attachment to the eſtabliſhed religion of the country. The ſubject of this article became a ſtudent of Corpus Chriſti college, Oxford, where he took his ſeveral degrees, that of D.D. he had by diploma in 1783. Pre-

viouſly to this he had been appointed prelector of poetry, proctor, and in 1782 Regius profeſſor of Greek. In this ſame year he was made prebendary of Saliſbury, canon of Chriſt-church, and Regius profeſſor of divinity; and in 1783 rector of Ewelme. In 1799 he was elevated to the biſhopric of Oxford, from which he was tranſlated to that of Bangor in 1807, and then to the metropolitan ſee of London in the year 1809. Notwithſtanding theſe high preferments he paſſed a great part of his life in the univerſity of Oxford, and it was generally believed that when he was elevated to the ſee of Oxford, the univerſity was complimented with the nomination by the crown. His lordſhip was author of many ſingle ſermons, and charges delivered on different occaſions: alſo of "De Græcæ Linguæ Studio Prælectio habita in Scholâ Linguarum," 1783, and "Concio ad Clerum in Synodo Provinciali Cantuarienſis Provinciæ ad D. Pauli," 1790. His lordſhip was a zealous promoter of the *National ſchools* in oppoſition to thoſe founded by Lancaſter, and he was underſtood to be a violent opponent to the bible ſociety, and to the ſpread of what has been termed Sectariſm. One of his laſt works was a Report of the Progreſs made by the National Society, to which the general committee referred in terms of gratitude, at their firſt meeting after his lordſhip's deceaſe, in the following terms; "whoſe lateſt employment had been to ſtate, for the information of the public, the progreſs of a work to which he had contributed his time, his labour, and his counſels, the committee could not fail to entertain a common ſentiment of profound regret for the loſs which they have ſuſtained, and to cheriſh in their minds the livelieſt recollection of the ſervice which has been ſo ſucceſsfully fulfilled by him in this ſecond report. They wiſh, therefore, to add to this document, deſigned for general circulation, their ſenſe of what is due from the public, and themſelves, to the memory of one who was a conſtant and aſſiduous promoter of this ſalutary inſtitution, from its firſt eſtabliſhment to the laſt hour of his life.—The committee truſt, that this teſtimony, though limited to a ſingle object in the large field of paſtoral duty in which he was inceſſantly engaged, may ſerve to denote the benefits which have reſulted from his prompt, unwearied, and effectual exertions." The following is the character drawn of him by Mr. archdeacon Jefferſon, and which alludes to his zeal for the church of which he was an active member. "Fearleſs now of being cenſured for mercenary adulation, or reproved by unconſcious merit, a juſt tribute may be paid to the character of that departed and exalted prelate, who is, and will be, moſt lamented where he was beſt and moſt entirely known. This opportunity, therefore, is willingly embraced of offering a heart-felt condolence to the miniſtry of the dioceſe on the affecting and important loſs, which, in theſe perilous times of contending ſects and unſettled opinion, has ariſen to them, and to the church:—To them, in the premature privation of a dioceſan, firm in his ſupport of eccleſiaſtical authority, but conſiderate in its application; eminently verſed in the letter of eccleſiaſtical law, but liberal in its practical conſtruction, reluctant in interference, but determined in duty, ſlow in the profeſſion of ſervice, but prompt in its execution; diſintereſted in patronage, unwavering in meaſures, correct in judgment, attentive in counſel, and kind and compaſſionate to diſtreſs:—To the church, in the premature privation of a father, diligent in her rites and ſervices, but unoſtentatious in piety and devotion; ſound and unrelaxing in her doctrines and faith, but diſcreet in zeal, and comprehenſive in charity; ever vigilant in defending her intereſts, ever forward in aſſerting her privileges, and ever able in the aſſertion and the defence." The biſhop died ſuddenly on the 28th of July 1813. He was one of the governors of the Charter-houſe; truſtee of the Britiſh Muſeum; dean of the Chapel royal; viſitor of Sion college; and provincial dean of Canterbury. Gent. Mag.

RANDOLPH, in *Geography*, a poſt-town of America, in Maſſachuſetts, formed of the S. precinct of Braintree, in Norfolk county, in the year 1783; 15 miles S.E. of Boſton. The inhabitants are moſtly farmers, but manufacture large quantities of ſhoes for market.

RANDOLPH, a county of Hillſborough diſtrict, in North Carolina, bounded N.E. by Orange, and N.W. by Guilford. The number of inhabitants is 10,112, and they are moſtly Quakers; the other denominations are Preſbyterians, Baptiſts, Methodiſts, and Univerſaliſts. Their good land produces 40 or 50 buſhels of Indian corn, or 20 of wheat, *per* acre. The chief town is Aſhborough.

RANDOLPH, a county of Virginia, bounded N. by Monongalia, and S. by Pendleton. The number of inhabitants is 2854.

RANDOLPH, a poſt-town in Orange county, Vermont, being the 4th town W. of Thetford, on Connecticut river. The number of inhabitants is 2255. White river, by its two branches, waters the E. and W. ſide of the town. It has a large bed of iron ore, two forges, and a ſlitting mill. The congregational meeting-houſe has a ſteeple, and is large; 47 miles from Rutland.

RANDOLPH, a county of the Indiana territory.

RANDOLPH, a town of Morris county, in New Jerſey, containing 1271 inhabitants.

RANDOM, a townſhip of Eſſex county, in Vermont, W. of Brunſwick.

RANDOM *Iſland*, a ſmall iſland in Trinity bay, near the E. coaſt of Newfoundland. N. lat. 48° 15′. W. long. 53° 40′.

RANDOM-*Shot*, a ſhot made when the muzzle of a gun is raiſed above the horizontal line, and is not deſigned to ſhoot directly, or point-blank.

The utmoſt random of any piece is about ten times as far as the bullet will go point-blank; and the bullet will go fartheſt when the piece is mounted to about forty-five degrees above the level range.

The ſpace or diſtance of the random is reckoned from the platform to the place where the ball firſt grazes.

RANDOW, in *Geography*, a river of Brandenburg, which runs into the Ucker; three miles S. of Uckermunde.

RANDS, a lake of Norway, in the province of Aggerhuus, 35 miles long, and two broad; 20 miles N. of Chriſtiania.

RANDSBERG, a town of Sweden, in Weſt Gothland; 76 miles E. of Uddevalla.

RANDYCHOAR, a town of Bootan; 18 miles N. of Beyhar.

RANEA, a town of Weſt Bothnia; 60 miles W. of Tornea.

RANELAGH, *Rotunda* and *Gardens*, built and opened for muſical performances and public amuſements in 1742. The building was erected in the ſpacious garden belonging to the reſidence, at Chelſea, of lord Ranelagh, one of the miniſters of Charles II., when paymaſter of the army.

It was planned by the late Mr. Lacey, afterwards joint-patentee of Drury-lane theatre with the great actor Garrick.

At the firſt opening of this ſtupendous building, ſeveral experiments were made in placing the orcheſtra, in filling it, and in the time of performance, before it was ſettled as an evening promenade. The orcheſtra was at firſt placed in the middle of the rotunda. The performance was in a morning; and oratorio choruſſes chiefly furniſhed the bill of fare. Sir John Barnard complaining to the magiſtrates, that

that the young merchants and city apprentices were frequently ſeduced from their counting-houſes and ſhops by theſe morning amuſements, they were prohibited, and the doors opened at ſix o'clock in the evening. The performance, however, did not begin till eight o'clock, but was ended at ten.

It was intended to rival Vauxhall, and was little injured by bad weather; as the company, at ſuch times, had a ſafe and pleaſant retreat into the rotunda, and as few went thither but in carriages.

Its ſucceſs as an evening's amuſement remained undiminiſhed more than 40 years. It was ruined by the late hours to which it was gradually brought by fine folks, who, at length, never came thither till paſt ten o'clock, when the muſical performances were over, and ſober people uſed to return home before eleven o'clock to their ſupper, which enabled them and their ſervants to go to bed, and riſe, at their accuſtomed time.

But, at length, perſons of rank and faſhion made a debauch of this innocent amuſement, and went to it and departed from it as late as at a maſquerade. This precluded all that had any thing to do themſelves, or any employment for their ſervants in the morning, and ſo much refined the company, that at midnight there had been ſeldom ſufficient money received at the entrance, to cover the expences of the lamps, the terms of admiſſion being only 3*s.*, for which, beſides a good concert by the beſt performers in London, the company was furniſhed with excellent rolls, butter, and tea. In the year 1803 it was ſhut up, and only uſed occaſionally for a maſquerade, a feſtival, or an exhibition of fire-works. But ſince the period juſt-mentioned, the building has been pulled down, and the materials ſold piecemeal, as was the caſe at Cannons, the ſplendid manſion of the duke of Chandois, (or *Palazzo*, as it would have been called in Italy,) and the ground is now (1809) of no other utility than occaſionally to drill and exerciſe the Chelſea volunteers.

RANES, in *Geography*, a town of France, in the department of the Orne; 10 miles S.W. of Argentan.

RANESTAD, a town of Sweden, in Angermannland; 50 miles N.N.E. of Hernoſand.

RANFORCE RING. See REINFORCED *Ring*.

RANG, in *Geography*, a town of Sweden, in the province of Skonen; 11 miles S.S.W. of Lund.

RANGA, in *Hindoo Mythology*, one of the many names of Siva, the perſonification, according to the Hindoo mythologiſts, of the deſtructive or changing form of the deity. (See SIVA.) The epithet Sri, meaning holy, or divine, or bleſſed, prefixed, has given this name to the capital of Myſore; Sri Ranga-pattan being the city of the bleſſed Ranga, altered by Europeans to Seringapatam. See SRI.

RANGALORE, in *Geography*, a town and fortreſs of Hindooſtan, in the circar of Cicacole; 38 miles W. of Cicacole.

RANGAMATTY, a circar of Bengal, bounded on the N. by Bootan and Aſſam, on the E. and S. by Aſſam, and on the W. by Baharbund, Bettrebund, and Goollah; about 40 miles long, and from 10 to 40 broad. Rangamatty, the capital, is 128 miles N.N.E. of Moorſhedabad, and has a celebrated pagoda. N. lat. 26° 8′. E. long. 90° 6′.

RANGANJA, a town of Bengal; 15 miles N.E. of Chittigong.

RANGAPALEAM, a town of Hindooſtan, in Coimbetore; eight miles N.N.E. of Daraporum.

RANGAPILLA, a town of Hindooſtan, in the Carnatic; ſix miles N.E. of Pondicherry.

RANGASUNDRUM, a town of Hindooſtan; 15 miles W. of Tinevelly.

RANGE, in *Gunnery*, the path of the ball, or the line it deſcribes from the mouth of the piece to the point where it lodges. The flight of a ſhot is diſtinguiſhed, by artillerymen, into three different ranges, of which the firſt is called the *point-blank*, the ſecond the *random-ſhot*, and the third the *ricochet*, or rolling and bounding ſhot. The firſt, or point-blank, is to ſuppoſe a piece ſtood upon a level plain, and laid level, then the diſtance between the piece and the point where the ſhot touches the ground firſt, is called the *point-blank range* of that piece; but as the ſame piece ranges more or leſs, according to a greater or leſs charge, the point-blank range is to be underſtood to be that, when the piece is loaded with that charge which is commonly uſed in action.

This range is much leſs than the greateſt range, or random-ſhot; but the piece cannot be levelled, or, as it is generally expreſſed, *pointed* at an object intended to be battered, if that object is not within the diſtance of the point-blank range; for beyond that the ſhot is very uncertain, therefore rarely uſed in the ſea-ſervice, and on land only when the ſhot cannot fail of doing great execution in the place on which it falls.

In ricochet firing, the piece is only elevated from three to ſix degrees, and loaded with a ſmall charge, in order that the ball may be bounded, and roll along the inſide of the parapet. The ſhot, thus diſcharged, goes rolling and bounding, killing and maiming, or deſtroying all it meets in its courſe, and creates much more diſorder by going thus ſlowly, than if thrown from the piece with greater violence. See CANNON, GUN, and PROJECTILE.

RANGE *of a Projectile, Amplitude of the*. See AMPLITUDE.

RANGE, *Point-blank*. See POINT-*blank*.

RANGE, in a *Ship*, denotes a ſufficient length of the cable, drawn up on the deck, before the anchor is caſt looſe from the bow, to let it ſink to the bottom, without being interrupted, that the flukes may be forced the deeper into the ground, by the additional weight which the anchor acquires in ſinking. For this reaſon, the range, which is drawn up out of the tire, ought to be equal in length to the depth of the water, where the ſhip anchors.

RANGER, a ſworn officer of the foreſt, whoſe buſineſs it is to walk daily through his charge, to drive back the deer out of the purlieus or diſafforeſted places into the foreſt lands; and to preſent all treſpaſſes done in his bailiwick at the next court held for the foreſt.

The ranger is made by the king's letters, and has a fee paid yearly out of the exchequer, and certain fee-deer. In the Charta de Foreſta mention is made of twelve kinds of rangers. It is now principally a honorary and ſinecure employment; but the holders ſometimes likewiſe receive pay.

RANGES, in *Ship Building*, horned pieces of oak, like belaying cleats, but much larger, bolted to the inſide of a ſhip, in the waiſt, for belaying the tacks and ſheets. Alſo thoſe pieces of plank fixed between the ports, with ſemi-circular holes in them for keeping ſhot in.

RANGIFER, in *Zoology*, a variety of the CERVUS *Tarandus*; which ſee.

RANGING, in *War*, the diſpoſing of troops in a condition proper for engagement, or for marching.

In *Building*, the ſide of a work that runs ſtraight, without breaking into angles, is ſaid to *range*, or *run range*.

RANGING *out a canal*, denotes determining or ſetting out on the ground the lines which are to be occupied by its middle and ſides.

RANGLE, in *Falconry*, is when gravel is given a hawk to bring her to her ſtomach.

RANGOON, in *Geography*, a ſea-port town of the

Birman empire, ſituated on a branch of the Irrawaddy, called the Rangoon river, which forms the only communication that the Pegue river has with the ſea. The town, in its preſent ſtate, has been extended by increaſing trade and conſequent population far beyond the limits which formerly comprehended Rangoon, as it was originally founded, in 1755, by Alompra, the ſovereign of the Birman empire. Rangoon, or Dzangoon, which ſignifies victory achieved, was denominated Dagon, before Alompra took it, and laid the foundation of the preſent town. Here ſtood, in former days, a large and populous city, called in the Pali, or ſacred language, Singounterra; the ſcite of which Alompra diligently explored, and raiſed on its ruins the preſent flouriſhing ſea-port of the Pegue dominions. Dagon, often called Shoe-Dagon, or the golden Dagon, is a name peculiar to the temple; a noble edifice, three miles diſtant from the banks of the river. (See DAGOUNG.) Rangoon ſtretches along the bank of the river about a mile, and is not more than a third of a mile in breadth. The city, or miou, (mious being a term applied either to a city or a diſtrict,) is a ſquare ſurrounded by a high ſtockade, in the manner of the country, and on the N. ſide it is further ſtrengthened by an indifferent foſſe, acroſs which a wooden bridge is thrown; in this face there are two gates, in each of the others only one. Wooden ſtages are erected in ſeveral places within the ſtockade, for muſqueteers to ſtand upon in caſe of an attack. On the S. ſide, towards the river, which is about 20 or 30 yards from the paliſade, there are ſeveral huts, and three wharfs, with cranes for landing goods. A battery, of twelve cannon, ſix and nine-pounders, raiſed on the bank, commands the river; but the guns and carriages are in ſuch a wretched condition, that they could do little execution. Cloſe to the principal wharf are two commodious wooden houſes, uſed by the merchants as an exchange, where they uſually meet in the cool of the morning and evening, to converſe, and tranſact buſineſs. The ſtreets of the town are narrow, and much inferior to thoſe of Pegue, but clean and well paved; there are numerous channels to carry off the rain, over which ſtrong planks are laid, to prevent an interruption of intercourſe. The improvement of the town has been very much owing to the activity of the deſcendant of a Portugueſe family, named Jaunſee, of low origin, but advanced at length to the important office of Shawbunder, or intendant of the port, and receiver of the port-cuſtoms. Under his direction and influence, the ſtreets were paved, ſeveral well built wooden bridges were conſtructed, and alſo a wharf, which, extending into the river, and raiſed on poſts, enables the ſhips to deliver and receive cargoes without the aſſiſtance of river-craft; under his direction alſo a ſpacious cuſtom-houſe has been erected. This is the only lay building in Rangoon that is not conſtructed of wood, it is compoſed of brick and mortar, and the roof covered with tiles; within, there is a number of wooden ſtages for the reception of bale goods. The houſes, in general, are raiſed on poſts from the ground; the ſmaller ſupported by bamboos, the larger by ſtrong timbers. All the officers of government, the moſt opulent merchants, and perſons of conſideration, live within the fort; ſhipwrights, and people of inferior rank, inhabit the ſuburbs; and one entire ſtreet, called Tackally, is excluſively aſſigned to common proſtitutes, who are not permitted to dwell within the precincts of the fortification. Swine are ſuffered to roam about the town at large; they do not belong to any particular owners, but are regarded as ſervants of the public, or common ſcavengers; as they go under the houſes and deſtroy the filth. The Birmans are alſo fond of dogs, numbers of which infeſt the ſtreets; the breed is ſmall, and very noiſy. The borders of the terrace on which the temple of Dagoung is raiſed, are planted with ſhady trees in regular rows; and from this eminence there is a beautiful and extenſive proſpect; the Pegue and Rangoon rivers are ſeen winding through a level woody country, and the temple of Syriam, little inferior to others at Pegue and Rangoon, ſtands near the junction of the ſtreams. The road leading from the city to the temple is formed with care, a wide cauſeway in the centre throwing off the rain to the ſides; and numberleſs little ſpaces are ranged along the edge of the road, in which are niches to receive ſmall images of their divinity Guadma. Several kioums or monaſteries lie in this direction, generally removed at a ſhort diſtance from the public way, under the ſhade of pipal or tamarind trees. The Birmans being, like other inhabitants of the eaſt, fond of proceſſions, ſcarcely a week paſſes in which there is not a religious diſplay at Rangoon; either a funeral of ſome perſon who leaves ſufficient to defray the expence of a pompous public burning, or the ceremony of admitting youths into the convents of the Rhahaans, on which occaſion parents and friends ſpare no expence in entertainments and preſents to the Rhahaans. See RHAHAANS.

The population of Rangoon is conſiderable; there are 5000 regiſtered taxable houſes in the city and ſuburbs; ſo that if each houſe be ſuppoſed to contain ſix people, the eſtimate will amount to 30,000. Having long been the aſylum of inſolvent debtors from the different ſettlements of India, it is crowded with foreigners of deſperate fortunes, who find from the Birmans a friendly reception, and generally ſupport themſelves by carrying on a ſmall trade. The exchange, if it may be ſo called, exhibits a motley aſſemblage of merchants, ſuch as few towns of much greater magnitude can produce; Malabars, Moguls, Perſians, Parſees, Armenians, Portugueſe, French, and Engliſh. The members of this diſcordant multitude, engaged in various branches of commerce, are not only permitted to reſide under the protection of government, but likewiſe enjoy the moſt liberal toleration in matters of religion. They celebrate their ſeveral rites and feſtivals, totally diſregarded by the Birmans, who have no inclination to make proſelytes. In the ſame ſtreet may be heard the ſolemn voice of the Muezim, calling pious Iſlamites to early prayers, and the bell of the Portugueſe chapel tinkling a ſummons to Romiſh Chriſtians. Proceſſions meet and paſs each other without giving or receiving cauſe of offence. The Birmans never trouble themſelves about the religious opinions of any ſect, nor diſturb their ritual ceremonies, provided they do not break the peace, or meddle with their own divinity Gaudma; but if any perſon commit an outrage, which the Muſſulmen, in their zeal for the true faith will ſometimes do, the offender is ſure to be put into the ſtocks; and if that does not calm his turbulent enthuſiaſm, he is baſtinadoed into tranquillity.

The Parſees, the Armenians, and a ſmall proportion of Muſſulmen, engroſs the largeſt ſhare of the trade of Rangoon; and individuals from their number were frequently ſelected by government to occupy employments of truſt, that related to trade and tranſactions with foreigners, the duties of which the Birmans conceive that ſuch perſons could perform better than themſelves. Theſe people, particularly the Armenians, naturally behold with a jealous eye any ordinance of a commercial nature, that may tend to diminiſh their influence, and deprive them of that dictatorial power, which they aſſume and exerciſe over all merchants and mariners that reſort to Rangoon; but of none are they ſo apprehenſive as of the Engliſh: a connection with whom might teach the Birmans to tranſact foreign buſineſs without their aſſiſtance, and give them a more adequate ſenſe of their own intereſt.

The

The French have long maintained an agent at Rangoon, and are thoroughly acquainted with the advantages which the country of Pegue affords. The imports into Rangoon from the Britiſh ſettlementss in the years 1794—5, amounted, according to Mr. Symes, to more than twelve lacks of rupees, about 135,000*l.* ſterling: theſe conſiſted chiefly of coarſe piece goods, glaſs, hardware, and broad cloth, the demand for the laſt article being conſiderable; and returns were almoſt wholly made in timber. Teak, the moſt durable wood that is known, and beſt adapted for the conſtruction of ſhips, is produced in the Birman and Pegue empire in inexhauſtible abundance. The river of Rangoon is equally commodious for the conſtruction of ſhips; the ſpring tides riſe 20 feet in perpendicular height; the banks are ſoft, and ſo flat, that little labour is neceſſary for the formation of docks: veſſels of any burden may be built. Nature, ſays Symes, has liberally done her part to render Rangoon the moſt flouriſhing ſea-port of the eaſtern world. The entrance of the river, about twelve miles below Rangoon, and the banks on each ſide, bear a near reſemblance to thoſe of the Ganges; but the navigation is much more commodious. The channel is bold and deep, from ſix and a half to eight fathoms, uninterrupted by ſhoals or inequality of ſoundings. At this place the breadth of the river is eſtimated to be from three quarters to one mile. On the bank of the river, oppoſite to Rangoon, is a conſiderable town, called Maindu, the reſidence of the governor of the province of Dalla. This government is entirely diſtinct from Rangoon, on the eaſt ſide. The city of Dalla, from which the province takes its name, is ſaid to be on the weſt ſide of the China Buckier river, and was formerly a place of conſiderable importance. The town of Maindu is compoſed of one long ſtreet; at the eaſt end is a creek, which goes all the way to Baſſein, and has twelve feet depth of water, at high tide; on the weſt ſide is a ſmaller creek, on the bank of which ſtands a village called Mima-Shunrua, or the village of proſtitutes, being wholly inhabited by women of that deſcription. Rangoon lies in N. lat. 16° 47′. E. long. 96° 9′. Symes's Embaſſy to Ava, in 3 vols. 8vo. See BIRMAN *Empire*.

RANGSIO, a town of Sweden, in Helſingland; 15 miles W.N.W. of Soderhamn.

RANGUANA, a ſmall iſland in the bay of Honduras, near the coaſt of Mexico. N. lat. 16° 25′. W. long. 88° 52′.

RANHADOS, a town of Portugal, in the province of Beira; 18 miles N.W. of Caſtel Rodrigo.

RANINA, *Arteria et Vena*, in *Anatomy*, the artery and vein ſituated on the inferior ſurface of the tongue. See ARTERY and VEIN.

RANINAL VESSELS, *Bleeding from*. See FRÆNUM LINGUÆ, *Diviſion of*.

RANISH, in *Geography*, a ſmall iſland near the W. coaſt of Scotland. N. lat. 57° 55′. W. long. 5° 5′.

RANK, a due order, or a place allotted a thing ſuitably to its nature, quality, or merit.

Kings are perſons of the firſt rank on earth. In cavalcades, proceſſions, &c. every perſon is to obſerve his rank.

RANK, in *Military Diſcipline*, denotes a ſeries, or row of ſoldiers, placed ſide by ſide; a number of which ranks form the depth of the ſquadron or battalion, as a number of files does the width.

When infantry is drawn up three deep, the firſt rank is called the *front* rank; the ſecond, the *centre* rank; and the third, the *rear* rank.

To *cloſe the rank*, is to bring the men nearer; to *open* it, is to ſet them farther apart. To *double the ranks*, is to throw two into the ſpace of one, by which the files are thinned. See DOUBLING.

RANK, in the *Army* and *Navy*, is uſed for the order of *precedence*; which ſee.

In the army the officers in the life-guards are entitled to the rank of lieutenant-colonel, when they obtain or purchaſe a majority, provided they are of ſeven years ſtanding. Their commiſſions in this caſe run major and lieutenant-colonel. But if an officer ſhould not have completed either of thoſe periods, he obtains the rank of major only until its completion. A lieutenant-colonel attains to the rank of full colonel if he has been ſeven years major, or twenty-one years in the Britiſh ſervice. Cornets in the life-guards rank as ſub-lieutenants in their own corps, and as firſt lieutenants in the army. The Engliſh fuzileers enjoy the ſame privilege. Sub-lieutenants in the Welſh fuzileers, rank only as ſecond lieutenants in the army. Marines do the ſame.

Officers of the regular forces command the officers of equal degree belonging to the other ſervices. Officers of the militia, fencibles, yeomanry cavalry, and volunteer corps, rank together, according to the dates of their reſpective commiſſions. Theſe regulations are ſubject to ſome exceptions, ſpecified in the articles of war. Officers of the militia rank generally with the regular forces as junior of their reſpective commiſſions. An enſign in the guards ranks no higher than an enſign in the regulars. The chief of the engineers ranks as colonel; director, as lieutenant-colonel; ſub-director, as major; engineer in ordinary, as captain; engineer extraordinary, as captain-lieutenant; ſub-engineer, as lieutenant; practitioner-engineer, as enſign.

In the navy the admiral or commander-in-chief of his majeſty's fleet has the rank of a field-marſhal; admirals, with the flags on the top-maſt-head, rank with generals of horſe and foot; vice-admirals, with lieutenant-generals; rear-admirals, as major-generals; commodores with broad pendants, as brigadier-generals; captains of poſt-ſhips, after three years from the date of their firſt commiſſion, as colonels; other captains, commanding poſt-ſhips, as lieutenant-colonels; captains, not taking poſt, as majors; and lieutenants, as captains.

RANK, *Brevet*, rank without pay, nominal diſtinction, which ſometimes entitles the holder of it to command in mixed ſervice. The brevet rank in the militia is confined to the colonels and adjutants of the ſeveral corps in that eſtabliſhment. The former receive the brevet rank of colonels in the army whilſt actually embodied for ſervice, and command all lieutenant-colonels in the line when they do duty together. Adjutants in the militia may have the brevet rank of captain, provided they have ſerved five years as lieutenants in the militia, or in other forces on the Britiſh eſtabliſhment. In the line, an adjutant who has the rank of captain, may command as ſuch when there is no ſuperior officer on the parade, or for duty. This is not the caſe in the militia. No adjutant, let his brevet rank of captain be ever ſo ancient, can command the youngeſt captain of a company. The ſame difference prevails with reſpect to the captain-lieutenancy; which is literally brevet rank. In the regulars, a captain-lieutenant, the inſtant he is promoted to a company, takes rank according to the date of his firſt commiſſion, and, as we have obſerved, may be major by brevet; but no captain-lieutenant can ever avail himſelf of that ſeniority to the prejudice of a captain of a company in the militia; nor can an officer in the latter eſtabliſhment take advantage of his ſtanding, when he quits one regiment to ſerve in another, even in time of war, although he may have the requiſite qualifications in both counties.

Brigade majors rank with captains, provided they have

that

that rank in the army, independent of their ſtaff appointment. But aids-de-camp do not poſſeſs any rank in that capacity with regard to the army. The latter conſtitute a part of the general's family, and are paid out of his allowance; they are in fact the mere carriers of his orders in the field, and his domeſtic inmates at home, &c. The former belong to the brigade, and are a neceſſary part of its effective force. It has been judiciouſly ordained, that both the one and the other ſhould be regular officers.

There is likewiſe a ſort of brevet rank which exiſts in the ſeveral regiments belonging to the Britiſh ſervice, and is confined to the rank and file, or corporals and private ſoldiers. Thus a lance-ſerjeant is a corporal who does the duty of ſerjeant without the pay or emoluments of the latter; and a lance-corporal is a private ſoldier who does the duty of corporal. So that *lance*, which comes from *lanſquenet*, and ought therefore to be written lans-ſerjeant, &c. is the abbreviation of that word, which ſignifies a private ſoldier, and is derived from the German, and when put before ſerjeant or corporal, points out, that a private ſoldier has the brevet rank of one of thoſe ſituations. Captains of companies appoint or reduce lance-ſerjeants or corporals, according to their judgment.

RANK, in reſpect of ſhips. See RATE.

RANK *and File*, denote men carrying the fire-lock and ſtanding in the ranks. Thus corporals are included in the return which is made under that head.

RANKS *and Files*, are the horizontal and vertical lines of ſoldiers, when drawn up for ſervice.

RANK *Keel*, in *Ships*. See KEEL.

RANK *Modus*, in *Law*. See MODUS.

RANK is alſo a term provincially applied to ſignify any ſort of crop of large growth, ſtanding thick or cloſe on the ground, as corn, peaſe, beans, &c. and even trees in woods. The term is often uſed to denote corn or graſs crops, which are of ſuch ſtrong growths as to be laid down or lodged.

RANKAH, in *Geography*, a town of Bengal; 25 miles W.N.W. of Palamow.

RANKERAH, a town of Hindooſtan, in Candeiſh; 25 miles S. of Burhanpour.

RANKNESS *in Cheeſe*, in *Rural Economy*, a term ſignifying its ſtrong pungent quality ariſing from the impurity of the rennet or ſteep, either in conſequence of neglect of the veſſels holding it, the want of ſalt, or the imperfect ſeparation of the curdy matter from the whey, by which fermentation and partial putrefaction occur and produce this taſte. See CHEESE and DAIRYING.

RANKPORE, in *Geography*, a town of Hindooſtan, in Guzerat; 45 miles E. of Radunpour.

RANNEE, a town of Hindooſtan, in Oriſſa; 30 miles S.S.W. of Balaſore.

RANNEL-BAUK, in *Rural Economy*, a word provincially uſed to ſignify the wooden bar or bauk laid acroſs the cottage chimney, for hanging the pot-hooks on, &c.

RANNIGUNGE, in *Geography*, a town of Bengal; 76 miles N.N.E. of Dacca.

RANNING, a town of the duchy of Wurzburg; five miles N. of Schweinfurt.

RANNISERAI, a town of Hindooſtan, in Allahabad; 35 miles N.W. of Gazypour.

RANNUTSCH, a town of Thibet; 36 miles E. of Jemlah. N. lat. 30° 42′. E. long. 82° 15′.

RANNY, in *Rural Economy*, a provincial word, applied to the ſmall field-mouſe.

RANNY *Bednore*, in *Geography*, a town of Hindooſtan, in the circar of Sanore; 20 miles W. of Biſnagur. N. lat. 15° 18′. E. long. 75° 37′.

RANNYCOTTA, a town of Thibet; 35 miles S. of Gangotri.

RANNYDEE, a town of Bengal; 11 miles S. of Curruckdeagh.

RANNYGONG, a town of Hindooſtan, in Dowlatabad; 15 miles S.S.W. of Amednagur.

RANNYGUNGE, a town of Bengal; 35 miles N. of Dinagepour.

RANNYPOOKRA, a town of Bengal; 30 miles W.N.W. of Rogonatpour.

RANO, a ſmall iſland in the N. part of the gulf of Bothnia. N. lat. 65° 43′. E. long. 22° 52′.

RANRAN, a town of Cochinchina, and the capital of a province. N. lat. 12° 30′. E. long. 108° 56′.

RANSACKEN, a town of the duchy of Wurzburg; 3 miles S. of Wurzburg.

RANSOM, a ſum of money paid for the redemption of a perſon out of ſlavery, or for the liberty of a priſoner of war.

With regard to priſoners of war, it is allowed that there is no obligation of releaſing thoſe who are detained as ſuch, till after ſatisfaction has been obtained. Whoever makes a juſt war has a right, if he thinks proper, to detain his priſoners till the end of the war; and then, in releaſing them, he may juſtly require a ranſom, either as a compenſation at a peace, or, if the war continue, for diminiſhing his enemy's priſoners, at the ſame time that he ſtrengthens him with the return of ſoldiers. Priſoners of war, among European nations, are exchanged or ranſomed during the war; and this is generally ſtipulated in a previous cartel. If ſovereigns at war have agreed on a cartel for the exchange or ranſom of priſoners, they are faithfully to obſerve it no leſs than every other convention; but if, as was formerly the general practice, the ſtate leaves to every priſoner, at leaſt during the war, the care of redeeming himſelf, ſuch particular conventions offer many queſtions, of which ſome of the principal are the following. He who has acquired a lawful right of demanding a ranſom from his priſoner, may transfer his right to a third perſon. This was practiſed in the laſt ages. But as the perſon taking a priſoner is obliged, for the ſake of his reputation, to treat him with juſtice and humanity, he is not to transfer his right, in an unlimited manner, to one who might probably abuſe it. When he has agreed with his priſoner, concerning the price of the ranſom, he may transfer the right to whom he pleaſes. On the concluſion of an agreement made with a priſoner for the price of his ranſom, it becomes a perfect contract, and cannot be receded from, under a pretence that the priſoner is diſcovered to be richer than was imagined; for there is no manner of neceſſity that he ſhould be rated according to the wealth of a priſoner, becauſe that is not the ſcale for meaſuring the right of detaining a priſoner of war. But it is natural to proportion the price of the ranſom to the priſoner's rank and character; the liberty of an officer of diſtinction being of greater conſequence than that of a private man, or inferior officer. If the priſoner has not only concealed, but diſguiſed his rank, it is a ſordid fraud, and gives a right for annulling the agreement. If a priſoner, having agreed on the price of his ranſom, dies before payment, it has been queried whether this price be due, and whether the heirs are obliged to diſcharge it? Unqueſtionably, ſays Vattel, they are obliged to it, if the priſoner died in the poſſeſſion of his liberty; for, from the moment of his releaſe, in conſideration of which he had promiſed a ſum, this ſum becomes due, and does not at all belong to his heirs; but if he had

not

not obtained his liberty at the time of his death, it can be no debt to him, or to his heirs, unleſs the agreement was otherwiſe: and he is not reputed to have received his liberty, till he is abſolutely permitted to depart free; when neither he whoſe priſoner he was, nor the ſovereign, oppoſed his releaſe and departure. If indeed he has only been permitted to take a journey for applying to his friends, or his ſovereign, in order to obtain the means of ranſoming himſelf, and he dies before he is poſſeſſed of his full liberty, before his final diſcharge from his parole, nothing is due for his ranſom. If, after agreeing on the price, he is detained in priſon till the time of payment, and he dies before, the debt is paid by his death, and does not affect his heirs; ſuch an agreement on the part of him, who detains his priſoner, being no more than a promiſe of giving him his liberty for a certain ſum paid down. A promiſe of buying and ſelling does not ſuppoſe the purchaſer to pay the price of a thing, if it happen to periſh before the bargain is concluded. But if the contract of ſale be perfect, the purchaſer ſhall pay the price of the thing ſold, though it ſhould happen to periſh before the delivery of it, provided there was no fault or delay in the ſeller. For this reaſon, if the ſeller has abſolutely concluded the agreement of the ranſom, and from that time owns himſelf a debtor for the ſtipulated ſum, remaining no longer as a priſoner, but for the ſecurity of the payment, his intervening death does not extinguiſh the debt: the ranſom agreed on remains ſtill due. If the agreement ſays, that the ranſom ſhall be paid on a certain day, and the priſoner happens to die before that day, then the heirs are bound to diſcharge it; for the ranſom was due, and the day was aſſigned, only, as the term for payment. Upon the ſame principles, ſtrictly ſpeaking, it follows, that a priſoner, releaſed on condition of procuring the releaſe or diſcharge of another, ſhould return to priſon, in caſe the latter happens to die before he could procure him his liberty. Such an unfortunate caſe, however, is entitled to regard, and equity ſeems to require that this priſoner ſhould continue in the enjoyment of liberty, provided he pays a juſt equivalent; it being now out of his power to purchaſe it preciſely at the price agreed on. If a priſoner fully ſet at liberty, after having promiſed, but not paid, his ranſom, happen to be taken a ſecond time, it is evident that, without being exempted from paying his firſt ranſom, if he is willing to be ſet at liberty, he muſt pay a ſecond ranſom. On the contrary, though the priſoner has agreed for the price of his ranſom, if before the execution of the compact, before he is ſet at liberty in virtue of it, he be retaken by his party, he owes nothing. It is here evidently ſuppoſed, that the finiſhing hand was not put to the compact, and that the priſoner had not acknowledged himſelf debtor for the rate of his ranſom. He whoſe priſoner he was, had, as it were, only made him a promiſe of ſelling, and he had promiſed to purchaſe; but the purchaſe and ſale had not actually paſſed into effect; the property was not actually transferred. The property belonging to a perſon does not paſs to him who takes him priſoner, unleſs at the ſame time he ſeizes on ſuch things. Of this there is no doubt, eſpecially in our times of moderation, when priſoners of war do not fall into ſlavery. And even by the law of nature, the property of a ſlave's goods does not, without ſome other reaſon, paſs to the maſter of a ſlave. There is nothing in ſlavery of which this can itſelf be the natural effect. If a man obtain a power over the liberty of another, does it follow that he has likewiſe a right over his property? Therefore, if an enemy has not ſtripped his priſoner, or the latter has found means to conceal ſomething from his ſearch, what he has preſerved ſhould belong to him, or he may employ it towards the payment of his ranſom. At preſent even priſoners are not always ſtripped. The death of a priſoner puts a period to the right of him who had taken him; therefore an hoſtage, given for the procuring of a perſon's liberty, is to be releaſed the moment the priſoner expires; and if the hoſtage dies, the priſoner is not releaſed by ſuch death. The reverſe of this is true, if one, inſtead of being an hoſtage for the other, had been ſubſtituted in his ſtead. Vattel's Law of Nations, b. iii. ch. 17.

Formerly it was a common practice to ranſom Britiſh ſhips, when captured by an enemy, by delivering to the enemy what was called a ranſom-bill, which ſecured to the captor the price agreed upon, and operated as a bill of ſale of the ſhip and cargo to the original owners, and as a protection to the ſhip againſt other cruiſers of the enemy during the remainder of the voyage. A hoſtage was delivered to the captor, for ſecuring to him the punctual payment of the ſtipulated ſum. This ranſom-bill, independent of the hoſtage, was conſidered as a contract of the law of nations, and obligatory upon the owners, as well as upon the captain and hoſtage who ſigned it; and actions have been often brought upon them in our courts of common law. And where the ſhip or goods were inſured, the amount of the ranſom was uſually taken to be the meaſure of the demand of the inſured upon the underwriters, in reſpect of the capture. But this practice of ranſoming ſhips captured by the enemy being found to operate more to the diſadvantage than for the benefit of this country, it was thought proper at length to prohibit it altogether. And therefore by ſtat. 22 Geo. III. c. 25. § 1. it is enacted, that it ſhall not be lawful for any of his majeſty's ſubjects to ranſom, or to enter into any contract or agreement for ranſoming, any ſhip or veſſel belonging to any of his majeſty's ſubjects, or any merchandizes or goods on board the ſame, which ſhall be captured by the ſubjects of any ſtate at war with his majeſty, or by any perſon committing hoſtilities againſt his majeſty's ſubjects. By § 2. all contracts and agreements which ſhall be entered into, and all bills, notes, and other ſecurities, which ſhall be given by any perſon or perſons for ranſom of any ſuch ſhip or veſſel, or of any merchandize or goods on board the ſame, ſhall be abſolutely void in law, and of no effect whatever. And by § 3. a penalty of 500*l.* is given to the informer, for every offence againſt the act. This ſtatute has put an end to all queſtions on the law of ranſoms. Marſhall's Treatiſe on the Law of Inſurance, vol. ii.

In our *Law Books*, ranſom is alſo uſed for a ſum paid for the pardoning of ſome notorious crime.

Horn makes this difference between *ranſom* and *amerciament*, that ranſom is the redemption of a corporeal puniſhment due to any crime.

It is never uſual to aſſeſs a larger fine than a man is able to pay, without touching the implements of his livelihood, but to inflict corporal puniſhment, or a limited impriſonment, inſtead of ſuch fine as might amount to impriſonment for life. And this is the reaſon why fines in the king's court are frequently denominated *ranſoms*, becauſe the penalty muſt otherwiſe fall upon a man's perſon, unleſs it be redeemed or ranſomed by a pecuniary fine (Mirr. c. 5. § 3. Lamb. Eirenarch. 57.); according to an ancient maxim, "qui non habet in crumena luat in corpore." Yet, when any ſtatute ſpeaks both of fine and ranſom, it is holden, that the ranſom ſhall be treble to the fine at leaſt. Dyer. 232.

RANSTADT, in *Geography*, a town of Germany, in the principality of Stolberg; 17 miles N.E. of Frankfort on the Maine.

RANSTADT, or *Mark Ranſtadt*, a town of Saxony, in the

the territory of Merſeburg; 10 miles S.S.E. of Merſeburg. N. lat. 51° 18'. E. long. 12° 14'.

RANT, in the *Drama*, an extravagant flight of paſſion, overſhooting nature and probability.

Lee's tragedies abound with rants; yet the wildeſt of them, it is obſerved, have frequently met with applauſe on the ſtage.

We find inſtances of rants, even in our ſevereſt poets. Such, *e. gr.* is that in the beginning of Ben Johnſon's Cataline, where the parricide, in ſpeaking to Rome, ſays, "I'd plow up rocks, ſteep as the Alps in duſt; and lave the Tyrrhene waters into clouds, but I would reach thy head!"

RANTAMPOUR, in *Geography*, a circar of Hindooſtan, in the country of Agimere, bounded on the N. by Jyenagur, on the E. by Agra, on the S. by Kottah, and on the W. by Oudipour and Sirowy.—Alſo, a town and fortreſs, being the capital of the above named circar; 86 miles E. of Agimere. N. lat. 28° 35'. E. long. 76° 58'.

RANTZAU, John, in *Biography*, a general in the Daniſh ſervice, was born in 1492, and at the age of 13 he entered into the army. In 1515 he began to travel into foreign countries, viſiting in ſucceſſion England, Spain, Germany, Italy, Greece, Syria, Paleſtine, and other parts of the Eaſt. In 1517 he was knighted at Jeruſalem; and upon his return to Denmark, was appointed to accompany duke Chriſtian, afterwards Chriſtian III., on his tour to Brandenburg, and other towns of Germany. When Frederic I. accepted the crown of Denmark, he was promoted to be a general in 1553, and entruſted with the command of the troops in Holſtein. He became greatly diſtinguiſhed in his military character, and on various diplomatic concerns, and died in 1565. As an author he is known by the following works: "A true and brief Account of the Wars carried on in 1559, by Frederic king of Denmark, and Adolphus duke of Holſtein," &c.; "Deſcriptio Cimbriæ," printed in Weſtphalen's Monumenta inedita, tom. i. Gen. Biog.

Rantzau, in *Geography*, a county of Germany, in the duchy of Holſtein, about ten miles long and ſix broad. It takes its name from a ſeat ſeven miles N. of Eutyn.

RANTZEN, a town of the duchy of Stiria; 6 miles N.W. of Muckrau.

RANTZENBACH, a town of Auſtria; 6 miles S.S.W. of St. Polten.

RANVILLE, a town of France, in the department of the Calvados; 5 miles N.E. of Caen.

RANULA, dim. of *rana, a frog*. This term is, in *Surgery*, applied to a ſwelling of the ſalivary ducts under the tongue. Whether the tumour is ſo named from a whimſical ſuppoſition that it bears a reſemblance to a frog, or from its being fancied to oblige the patient to make a croaking noiſe, in attempting to articulate, is a point which ſurgical writers leave undetermined. The ſwelling is round, of a greyiſh colour like an hydatid, ſoft, compreſſible, indolent, and, in the early ſtage, almoſt tranſparent. At firſt, it is of about the ſame ſize as a nut, or cherry; but, by degrees, its volume becomes much more conſiderable. It is very frequently met with in young children: its occurrence in adults is more uncommon. It conſiſts of a ſucceſſive dilatation of the excretory tube of the ſubmaxillary, or elſe of the ſublingual gland, the orifice of which duct is by ſome cauſe or another ſtopped up, or obliterated; ſo that the confined ſaliva accumulates, becomes viſcid, and ceaſes to flow in the uſual manner. In proportion as the ranula increaſes, the incipient ſtate of it having been neglected, its enlarged ſize raiſes up the tongue, and forces it backward; the conſequence of which is, that maſtication, deglutition, and reſpiration, are obſtructed. The voice becomes indiſtinct, and hoarſe; the motion of the tongue is reſtrained: this organ cannot be put out of the mouth. By degrees, the inciſor and canine teeth of the lower jaw are looſened; the layer of muſcles, compoſing the lower parietes of the mouth, is depreſſed; and the ſwelling, having attained a conſiderable ſize, makes a very manifeſt prominence beneath the chin. In this advanced ſtage, that is to ſay, when the ranula has exiſted ten or twelve years, as practitioners occaſionally ſee inſtances of, the appearance of the ſwelling is quite altered from what it originally was. The tumour is now hard, elaſtic, painful, ulcerated, and, as it were, ſarcomatous: it is as large as a turkey's egg, and not ſituated at the ſide of the frænum, but anteriorly under the tongue, to which it is cloſely adherent. The mouth emits a very fetid ſmell; and the breathing is ſo much obſtructed, that the patient, through fear of ſuffocating, is obliged to lie with his mouth wide open, when he goes to ſleep.

While a ranula is recent, the fluid which it contains is a viſcid ſaliva, reſembling the white of egg, and ſometimes of rather a yellow colour. In time it is gradually changed, becoming turbid and puriform; and, in certain inſtances, ſoft, friable, greyiſh concretions, from the ſize of a pea to that of an almond, commonly called ſalivary calculi, are found in the kind of cyſt, which is produced by the dilatation of the ſalivary duct. Theſe calculi eſſentially conſiſt of a large proportion of the phoſphate of lime, united with a mucilaginous ſubſtance; and concretions of the ſame kind frequently occur in the tonſils, and in the ſalivary glands themſelves, as well as their excretory ducts. Foreſtus, lib. xiv. obſ. 26. p. 112. Blegney, Nouvelles Découvertes, &c. tom. i. ann. 1679, p. 230. Mém. de l'Acad. de Chirurgie, tom. v. p. 464. Petit, Œuvres Poſthumes, &c. tom. i. p. 188. Blaſius, Obſ. 14. p. 81.

A ranula, whether recent or inveterate, cannot be cured except by a ſurgical operation. The curative indication, in the firſt of theſe ſtates, is to make an outlet for the fluid accumulated in the tumour, and to make an opening ſufficiently capacious to let the ſaliva readily paſs into the mouth. Merely making an inciſion into the ſwelling, or opening it with a trocar, or a ſeton drawn through it, are ſtated to be ineffectual methods. The tumour does indeed ſubſide as ſoon as the aperture is made; but the edges of the wound grow together again, and the diſeaſe recurs. There is an abſolute neceſſity for firſt making an inciſion the whole length of the ſwelling, and then removing, with the aid of ſciſſors and a pair of diſſecting forceps, a portion of the edges of the recent wound. This ſlight loſs of ſubſtance prevents the return of the complaint, and always inſures a free paſſage for the ſaliva; an advantage of which there is no certainty in any other mode of proceeding. By this ſlight operation, ranulæ in children may be cured in the courſe of a few days, without the leaſt occaſion for the application of any dreſſings whatſoever. It has been propoſed to dilate the contracted orifice of the ſalivary duct with a probe. (Mém. de l'Acad. de Chirurgie, tom. iii. p. 460.) But this orifice is difficult of detection, and the ſwelling cannot be in this manner eaſily emptied. M. Laſſus ſeems to entertain doubts whether Warton's canal can ever be made to reſume its original ſtate, after once being cloſed. Pathologie Chirurg. tom. i. p. 405.

When a ranula has exiſted a long while, is attended with conſiderable hardneſs, and is of large ſize, it is a tumour which requires to be completely extirpated. A tranſverſe inciſion, parallel to the opening of the mouth, is to be made in it through its whole extent. The ſurgeon is then to cut out

out the upper portion of the ſwelling, ſituated in front of the frænum of the tongue, to which it is alſo adherent, and next the inferior portion, which ſometimes extends into the interſpace betwixt the genio-hyoidei and genio-gloſſi muſcles, with which it becomes confounded. A pair of forceps, a hook, ſciſſors, and a ſtraight biſtoury, are the inſtruments neceſſary for this operation. A degree of hemorrhage always enſues. The uſe of a detergent gargle, made of barley-water and honey of roſes, will ſerve to finiſh the cure in a very moderate ſpace of time.

In confirmation of the latter obſervation, Laſſus adduces the following caſe. A young man, aged 22, had a ranula, which had continued ever ſince he was born, and was equal in ſize to a turkey's egg. The inciſor tecth of the lower jaw were looſened, and forced forward by the ſucceſſive increaſe of the ſwelling. A ſeton had been paſſed quite through it, without any uſeful effect. The breath of the patient and his ſaliva were intolerably fœtid. The tumour was cloſely adherent to the lower and anterior part of the tongue; and extending laterally, confounded itſelf with this organ, of which it impeded the motion. A ſtraight, narrow biſtoury was introduced into one of the openings at the ſide of the tumour, and carried completely acroſs to the oppoſite aperture. Thus a tranſverſe inciſion was made into the cavity of the diſeaſe. By means of the ſame inſtrument and a hook, the lateral portions of the ſwelling were removed. A profuſe hemorrhage enſued, cauſed by the total diviſion of the frænum, the raninal veins, and one of the raninal arteries. It was ſtopped by putting under the tongue a large quantity of dry lint, and by compreſſing the dorſum of the tongue ſeveral hours with the fingers, while the thumb was employed in compreſſing the parts behind the chin from below upwards. This double ſort of preſſure anſwered the purpoſe. No cautery was found neceſſary, and, by the uſe of detergent gargles, the patient was cured in about a fortnight.

When a ranula of long duration, ſituated at the ſide of the tongue, and of conſiderable ſize, forms a tumour, that makes its appearance outwardly towards the baſe of the jaw, Laſſus ſeems to diſapprove of making a free inciſion through the ſkin, for the purpoſe of extirpating that part of the ſwelling which cannot be removed through the mouth; a plan which was, in one inſtance, practiſed by Marchettis. Obſ. Med. Chirurg. obſ. 31. p. 48. See Laſſus' Pathologie Chirurgicale, tom. i. chap. 61.

RANULARES, in *Anatomy*. See RANINA.

RANUNCULACEÆ, in *Botany*, the 61ſt natural order in Juſſieu's ſyſtem, or the firſt of his 13th claſs, for whoſe character ſee GERANIA. The *Ranunculaceæ* are defined as follows.

Calyx of many leaves, ſometimes wanting. *Petals* definite, moſtly five. *Stamens* indefinite, except in *Myoſurus*; their anthers incorporated with the filaments. *Germens* ſeveral, indefinite or definite, rarely ſolitary, placed on a common receptacle; each of them furniſhed with a ſtyle, which is rarely wanting, and a ſimple ſtigma. *Capſules*, or rarely *berries*, as many as the germens; in ſome inſtances ſingle-ſeeded, and not burſting; in others many-ſeeded, ſplitting half way down, at their inner margin, into two valves, bearing the ſeeds at the edges. *Corculum* minute, lodged in a cavity at the upper part of the large horny *albumen*. *Stem* generally herbaceous. *Leaves* alternate; rarely (in *Clematis* and *Atragene*) oppoſite; ſome of them half ſheathing the ſtem; ſome compound, pinnate or fingered; ſome, as is more frequently the caſe, ſimple, and theſe are moſtly palmate or lobed, their ſinuſes often pale at the baſe. See RANUNCULUS.

Juſſieu divides the order in queſtion into four ſections.

Sect. 1. *Capſules ſingle-ſeeded, not burſting; berries in Hydraſtis.*

This ſection conſiſts of *Clematis*, *Atragene*, *Thalictrum*, *Hydraſtis*, *Anemone*, *Hamadryas* of Commerſon, *Adonis*, *Ranunculus*, *Ficaria*, and *Myoſurus*.

Sect. 2. *Capſules many-ſeeded, ſplitting at the inner edge. Petals irregular.*

The calyx in this ſection is often coloured, being what Linnæus terms corolla; that author conſidering the petals of Juſſieu as nectaries. The genera are *Trollius*, *Helleborus*, *Iſopyrum*, *Nigella*, *Garidella*, *Aquilegia*, *Delphinium*, and *Aconitum*. Some ſpecies of *Delphinium* have but a ſingle capſule.

Sect. 3. *Capſules many-ſeeded, ſplitting at the inner edge. Petals regular.*

Caltha, *Pæonia*, *Zanthorrhiza*, *Cimicifuga*.

Sect. 4. *Germen ſolitary. Berry of one cell, with many ſeeds, affixed to a ſingle lateral receptacle.*

The only genera are *Actæa* and *Podophyllum*, and theſe we feel diſpoſed to remove to Juſſieu's next order, PAPAVERACEÆ. See that article.

We cannot but remark that the *petals*, as Juſſieu terms them, in *Trollius* and *Helleborus* are by no means definite, and that they greatly exceed the number five. Neither are they irregular in *Trollius*. As to the other genera of his 2d ſection, the parts in queſtion are ſuch obvious nectaries, that they can have no other function to perform, except poſſibly in *Aquilegia*, where their limb partakes of the nature of petals.

RANUNCULOIDES, a genus of Vaillant's, founded on the *Ranunculus hederaceus* and *aquatilis* of Linnæus, and named from its reſemblance or affinity to RANUNCULUS; ſee that article. No one has followed Vaillant in this inſtance, nor is there any real mark of diſtinction for his ſuppoſed genus. *Ranunculoides* is, beſides, the ſpecific name of a rare Britiſh *Anemone*, but *ranunculina* would have been better Latin; as in *Helleborus ranunculinus*, Sm. Pl. Ic. faſc. 2. t. 37. Willd. Sp. Pl. v. 2. 1336. See HELLEBORUS.

RANUNCULUS, an ancient name, whoſe origin is as obvious as its ſenſe is obſcure. The word is, no doubt, derived from *rana*, and means a little frog. The Greeks call the ſame plant βατραχιον, which is nearly ſynonimous. Moſt etymologiſts ſuppoſe this name to allude to the native ſtation of the plant, in bogs and watery places, ſuch as frogs frequent. But the original βατραχιον of Dioſcorides is the beautiful *Ranunculus aſiaticus* of Linnæus, or Garden Ranunculus, which inhabits corn-fields, and does not grow in wet places; though indeed the other three ſpecies, deſcribed by that ancient writer, do; theſe are our *lanuginoſus*, *muricatus*, and *aquatilis*. It ſeems poſſible that the diviſions of the leaves in all theſe plants may have ſuggeſted the idea of a frog's foot, which ſuppoſition is confirmed by the Engliſh name, Crowfoot. Ambroſinus hints at a reſemblance between the root and the foot of a frog, which is not, to us, by any means apparent.—Linn. Gen. 281. Schreb. 377. Willd. Sp. Pl. v. 2. 1307. Mart. Mill. Dict. v. 4. Sm. Fl. Brit. 587. Prodr. Fl. Græc. Sibth. v. 1. 380. Ait. Hort. Kew. v. 3. 351. Purſh v. 2. 391. Juſſ. 233. Poiret in Lamarck Dict. v. 6. 97. Lamarck Illuſtr. t. 498. Gærtn. t. 74. (Ficaria; Dill. Gen. 108. t. 5. Hudſ. Angl. 244. Juſſ. 233. Ranunculoides; Vaill. Mem. de l'Acad. des Sciences for 1719, German edition, 321.)—Claſs and order, *Polyandria Polygynia*. Nat. Ord. *Multiſiliquæ*, Linn. *Ranunculaceæ*, Juſſ.

Gen. Ch. *Cal.* Perianth of five ovate, concave, ſome-

what coloured, deciduous leaves. *Cor.* Petals five, obtuſe, poliſhed; with ſmall claws. Nectary a cavity in each petal, juſt above the claw. *Stam.* Filaments very numerous, half the length of the corolla; anthers firmly united therewith, erect, oblong, obtuſe, of two ſeparate lobes. *Piſt.* Germens numerous, collected into a head; ſtyles none; ſtigmas reflexed, very ſmall. *Peric.* none. *Receptacle* beſet with extremely minute ſtalks, to which the ſeeds are attached. *Seeds* numerous, naked, irregular, uncertain in figure, with a reflexed point.

Obſ. The eſſential mark of this genus conſiſts, as Linnæus remarks, in the nectary, the reſt of the parts being uncertain; hence he takes occaſion to point out the uſe of adverting to that organ, which before his time had been neglected, and which his opponents accuſe him of ſometimes making of too much importance. The great Juſſieu will not, in this obvious caſe, uſe the language, though he adopts, unacknowledged, the idea of Linnæus; nor will he allow the manifeſt nectaries of ſome of his RANUNCULACEÆ (ſee that article) to be other than petals. "Such," to uſe his own words, in his preface, p. 26, "is the love of undivided praiſe!"

The nectary in *Ranunculus*, ſays Linnæus, is, in ſome ſpecies, a naked pore; in ſome it is bordered with a cylindrical margin; in others cloſed with a notched ſcale. *Ficaria* of authors has only a three-leaved calyx, with a ſuperabundance of petals. The ſeeds in ſome ſpecies are roundiſh; in others depreſſed, prickly, and fewer in number. *R. hederaceus* has but five ſtamens; *falcatus* has a ſword-ſhaped point to each ſeed, and appendages to the baſe of the calyx; *ſceleratus*, and a few beſides, have an awl-ſhaped receptacle, and conſequently a ſpiked fruit.

Eſſ. Ch. Calyx of five leaves. Petals from five to eight, with a honey-bearing pore in the claw of each. Seeds naked.

This extenſive genus is divided into two ſections, by the form of the leaves. The ſpecies are all herbaceous, generally of an acrid quality. The prevailing colour of the flowers is yellow; we know of none that are blue, except by accidental variation in *R. aſiaticus*. They are plants of temperate or cold climates; ſome of them alpine. Linnæus, in Sp. Pl. ed. 2, enumerates twenty-eight ſpecies; the 14th edition of Syſt. Veg. has forty-four, and Willdenow reckons up ſixty-one. Fifteen are natives of Britain, as mentioned in Fl. Brit.; but the 11th ſpecies in that work, *parvulus* of Linnæus, muſt be expunged, as a mere variety of *hirſutus*, n. 8. The original number is, however, made up, by a new-diſcovered Scottiſh ſpecies, the *alpeſtris*, figured in Engl. Bot. v. 34. t. 2390.

So many additions have been made to this genus by the labours of Poiret in Lamarck's Dict. v. 6, and the diſcoveries of Michaux and Purſh, that, with ſome neceſſary corrections, and a few communications of our own, the whole ſubject requires to be detailed.

Sect. 1. *Leaves ſimple and undivided.*

1. R. *Flammula.* Leſſer Spear-wort. Linn. Sp. Pl. 772. Willd. n. 1. Ait. n. 1. Fl. Brit. n. 1. Engl. Bot. t. 387. Curt. Lond. faſc. 6. t. 37. (R. flammeus minor; Ger. Em. 961, and R. flammeus ſerratus; ibid. 962.)—Leaves ovato-lanceolate, bluntiſh, ſtalked. Stem declining.—Native of watery places throughout Europe, flowering moſt part of the ſummer. *Root* perennial, of long ſimple fibres. *Herb* ſhining, not quite ſmooth, very various in ſize and luxuriance. *Stems* ſpreading in every direction, round, leafy, hollow. *Leaves* many-ribbed, either entire or variouſly ſerrated. *Flowers* numerous, ſolitary, on long ſtalks, of a bright golden yellow, half an inch or more in diameter. The whole plant is of an exceſſively acrid burning quality, ſaid to produce inflammation in the viſcera of ſheep, whence the name *flammula*, a little flame. Dr. Withering recommends the diſtilled water, as preferable to all other medicines, for procuring inſtantaneous vomiting in caſes of poiſon.

2. R. *reptans.* Creeping Spear-wort. Linn. Sp. Pl. 773. Fl. Lapp. ed. 2. 198. t. 3. f. 5. Lightf. 289; fig. in frontiſpiece to v. 1. Fl. Dan. t. 108.—Leaves linear-lanceolate. Stem creeping.—About the margins of alpine lakes, on a ſandy ſoil; common in Scotland, flowering in June and July. We have always thought this a variety of the former, as mentioned in Fl. Brit.; but Willdenow contends for the contrary. He truly aſſerts that it differs in having a thread-ſhaped creeping *ſtem*; linear entire *leaves*, tapering down into their *footſtalks*; *flower-ſtalks* ſolitary, erect, ſingle-flowered; and much ſmaller *flowers*. Nevertheleſs, we have ſeen ſo many intermediate varieties, and ſuch a diſpoſition in weak plants of the *Flammula* to take root at their joints, that we moſt incline to our original opinion, ſuggeſted firſt by Linnæus himſelf in his Sp. Pl.

3. R. *Lingua.* Great Spear-wort. Linn. Sp. Pl. 773. Willd. n. 3. Ait. n. 3. Fl. Brit. n. 2. Engl. Bot. t. 100. Fl. Dan. t. 755. (R. flammeus major; Ger. Em. 961. R. longifolius, lingua Plinii dictus, foliis ſerratis; Ambroſ. Phyt. 459.)—Leaves lanceolate, pointed. Stem erect, many-flowered. In marſhes and muddy ditches, chiefly in the northern parts of Europe; rare in England; flowering in July. Thrice the ſize of *R. Flammula*, and quite erect. *Leaves* more nearly ſeſſile, and taper-pointed; occaſionally ſerrated, as in the rude cut of Ambroſinus, but not commonly ſo. *Calyx* hairy. The whole *herb* is more or leſs covered with cloſe-preſſed hairs, viſible alſo in *Flammula*. *Flowers* large and brilliant, very conſpicuous.

4. R. *nodiflorus.* Knot-flowered Crowfoot. Linn. Sp. Pl. 773. Willd. n. 4. Ait. n. 4. Waldſt. et Kitaib. Hung. v. 2. 192. t. 176. *Ait.* (R. pariſienſis pumilus, plantaginellæ folio; Petiv. Gazoph. v. 1. 6. t. 25. f. 4. Vaill. Mem. de l'Acad. for 1719, Germ. ed. 324. t. 17. f. 4. R. ſiculus, &c.; Petiv. Gaz. t. 24. f. 9, is a variety.)—Leaves ovate, ſtalked. Flowers ſeſſile.—In marſhy places about Paris; alſo in Sicily; flowering in ſummer. A ſmall, ſmooth, annual plant, varying in luxuriance, and having much the appearance of *Limoſella aquatica*. *Leaves* about an inch long, various in breadth, on very long ſtalks. *Flowers* ſmall, ſolitary, ſeſſile, axillary. *Seeds* taper-pointed.

5. R. *filiformis.* Slender Creeping Crowfoot. Michaux Boreal-Amer. v. 1. 320. Purſh n. 4. Lamarck Dict. n. 4.—"Stem thread-ſhaped, creeping, jointed, almoſt naked. Leaves linear-awlſhaped, obtuſe. Flowers axillary, ſolitary, ſtalked."—In inundated places, on the banks of the river St. Lawrence; at Hudſon's bay and Labradore; flowering in June and July. This is deſcribed as a very ſmall, ſlender, ſmooth ſpecies, very much reſembling *R. reptans*, n. 2. We have ſeen no ſpecimen.

6. R. *puſillus.* Diminutive Crowfoot. Purſh n. 3. (R. Flammula; Walt. Carol. 159. Michaux Boreal-Amer. v. 1. 321; according to Purſh.)—"Smooth. Leaves ſtalked; lower ones ovate, toothed; upper linear-lanceolate, toothed at the end; uppermoſt linear, like bracteas. Stalks alternate, ſolitary, ſingle-flowered."—Native of North America. Perennial, flowering from June to Auguſt. A ſmall ſpecies, with exceeding ſmall *flowers*. *Petals* pale yellow. *Purſh.* A ſpecimen from Kalm, unnamed, in the Linnæan herbarium, anſwers nearly to the above characters, and yet ſeems a variety of *R. abortivus*, hereafter mentioned.

7. R.

7. R. *gramineus*. Graſſy Crowfoot. Linn. Sp. Pl. 773. Willd. n. 5. Ait. n. 5. Fl. Brit. n. 3. Engl. Bot. t. 2306. Curt. Mag. t. 164. Bulliard. t. 123.—Leaves linear-lanceolate, glaucous, many-ribbed, ſeſſile. Stem erect, very ſmooth throughout, with few flowers. Fruit globoſe.—Native of mountainous ſituations in the ſouth of France. *Gerard.* In Italy, Column. Ecphr. 314. Withering ſays it was brought from North Wales by Mr. Pritchard. Willdenow mentions moiſt meadows in France as its native ſtation, for which we can find no authority. The plant thrives in England in rather dry gardens, flowering in May or June, and is perennial. The graſſy, broadiſh, glaucous *leaves*, and large golden *flowers*, readily diſtinguiſh this ſpecies. The *root* is tuberous and round. *Stem* twelve or eighteen inches high. *Calyx* very ſmooth, ſpreading, not deflexed. The *fruit* is deſcribed as globoſe. We have not ſeen it ripe.

8. R. *pyrenæus*. Pyrenean Crowfoot. Linn. Mant. 248. Willd. n. 6. Jacq. Miſc. v. 1. 154. t. 18. f. 1. (R. pumilus, gramineis foliis; Bauh. Hiſt. v. 3. append. 850. R. n. 1180; Hall. Hiſt. v. 2. 77.) β. R. plantagineus; Allion. Pedem. n. 1445. v. 2. 48. t. 76. f. 1.—Leaves linear-lanceolate, many-ribbed, ſtalked. Stem erect, with one or two flowers; woolly at the top. Fruit ſomewhat cylindrical. Seeds with recurved beaks.—Native of the Pyrenees, as well as of the Alps of Switzerland, Dauphiny, and Carinthia. Linnæus, for a long while, confounded this with the laſt, and many botaniſts have conſidered them as hardly to be diſtinguiſhed, but by the colour of the *flowers*. The *leaves* of the preſent vary greatly in breadth, being ſometimes quite narrow and linear; but in variety β they are elliptical, and an inch wide. They appear to be green, not glaucous. The upper part of the *ſtem*, quite ſmooth in *R. gramineus*, is always hairy, and under the flower is denſely woolly, in the preſent ſpecies. The *petals* are pure white. *Fruit* nearly cylindrical. *Seeds* with elongated, remarkably recurved, points. Few plants vary more in luxuriance.

A moſt remarkable variety, as Haller and Villars eſteem it, is the *R. lacerus*, Bellardi Append. ad Flo. Pedem. 27. t. 6, of which we have a ſpecimen from the author himſelf. In this the *ſtem* is branched, bearing thirteen or fourteen *flowers*, but its chief ſingularity conſiſts in the jagged, and partly almoſt palmate, *leaves*, which nevertheleſs bear all the marks of caſual luxuriance. We have a ſpecimen of Allioni's *plantagineus*, our variety β, which, by a tooth or two in ſome of the leaves, evinces an approach towards this *lacerus*; and we have another of the ſame with four flowers on one ſtem.

9. R. *parnaſſifolius*. Parnaſſia-leaved Crowfoot. Linn. Sp. Pl. 774. Willd. n. 7. Ait. n. 6. Curt. Mag. t. 386. Wulf. in Jacq. Coll. v. 1. 191. t. 9. f. 3, without leaves. (R. n. 1179; Hall. Hiſt. v. 2. 77. Herb. Davall.)—Leaves many-ribbed; radical ones roundiſh-ovate, ſomewhat heart-ſhaped, on long ſtalks; ſtem-leaves ovato-lanceolate, pointed, ſeſſile.—Native of the Alps of Switzerland, Dauphiny and Carinthia, as well as of the Pyrenees, from all which countries we have received ſpecimens. The plant is eſteemed very rare, and Wulfen regrets that he loſt the root and leaves of his only ſpecimen; ſo that Mr. Curtis has rendered a valuable ſervice to botaniſts by his excellent figure. This is a ſingularly elegant ſpecies, on account of its *leaves*, which reſemble our *Parnaſſia*, as well as for its large and brilliant white *flowers*, with their roſe-coloured *calyx*. Their *ſtalks* are woolly. *Fruit* ovate. *Seeds* obovate, obtuſe, with ſhort incurved beaks. The *root* is perennial, formed of copious, very long, pale fibres, as if it grew in watery places, but Haller ſays it inhabits ſtony alpine ſituations, being quite common in his own territory of Aigle.

10. R. *ophioglоſſoides*. Serpent's-tongue Crowfoot. Willd. n. 8. (R. ophioglоſſifolius; Villars Dauph. v. 3. 731. t. 49.)—Stem ſimple, erect, leafy. Lower leaves ovate, or heart-ſhaped, many-ribbed, on long ſtalks; upper linear-lanceolate, ſeſſile.—Found between Toulon and Hyeres in Provence, by M. Villars, who mentions having ſeen a drawing of the ſame plant, in the royal collection at Paris, marked R. leſbius paluſtris, ophioglоſſi folio; Tourn. Cor. 20. The *root* is deſcribed by Villars as ſomewhat bulbous, or tuberous, with many whorls of fibres. *Stem* erect, a foot high. *Leaves* ſmooth, rather fleſhy. *Flowers* ſmall, yellow, with ſhining *petals*. *Seeds* in a ſmall round head. He conceives it ſomewhat allied to *R. Flammula*. The reſemblance of the *leaves*, in his plate, to *parnaſſifolius*, ſeems to have induced Willdenow to range it here. We have ſeen no ſpecimen.

11. R. *amplexicaulis*. Plaintain-leaved Crowfoot. Linn. Sp. Pl. 774. Willd. n. 9. Ait. n. 7. Curt. Mag. t. 266. (R. folio plantaginis; Ger. Em. 963.)—Leaves ovate, pointed, glaucous, claſping the many-flowered ſtem. Root faſciculated.—Native of the Apennine and Pyrenæan mountains, but not, as far as we know, of the Swiſs Alps, Haller having miſtaken his n. 1179, which is *parnaſſifolius*, for this ſpecies. It is a hardy perennial in our gardens, not difficult of culture, yet not common, flowering in May. The *herbage* is glaucous. *Stem* erect, leafy, twelve or fifteen inches high, branched above. *Leaves* generally more or leſs fringed with ſoft hairs. *Calyx* green, ſmooth, concave, partly membranous and white at the edge. *Petals* of a pure and brilliant white. *Anthers* yellow, as in other ſpecies. We have never ſeen the ripe *ſeeds*.

12. R. *heterophyllus*. Various-leaved Slender Crowfoot. (R. bonarienſis; Lamarck Dict. n. 9.)—Leaves ſtalked, toothed, heart-ſhaped or ovato-lanceolate, with three central ribs. Stem erect. Flowers ſtalked, ſolitary, oppoſite to the leaves. Seeds obtuſe, granulated.—Gathered by Commerſon at Buenos Ayres, in marſhy places. *Root* fibrous. *Stem* erect, a foot or more in height, ſlender, ſmooth, ſtriated, branched, leafy. *Leaves* alternate, on long ſtalks; the lower ones ovate, or heart-ſhaped; the upper lanceolate, or ovate; all obtuſe, more or leſs crenate or toothed, about an inch long, ſmooth, furniſhed with three central ribs, and ſeveral lateral branching veins. *Footſtalks* bordered at their baſe; the lowermoſt much the longeſt. *Flowers* very ſmall, whitiſh, on ſolitary, ſtraight, ſimple, lateral ſtalks, an inch or an inch and half long, oppoſite to the leaves. *Fruit* ovate. *Seeds* obtuſe, or obovate, rough with minute points. The *calyx* is ſmooth and reflexed, often remaining till the ſeeds are ripe.

13. R. *flagelliformis*. Long-ſtalked Crowfoot.—Leaves on long ſtalks, heart or kidney-ſhaped, wavy or crenate. Stem creeping, thread-ſhaped. Flowers ſtalked, ſolitary, oppoſite to the leaves. Petals ovate. Seeds obtuſe, dotted.—Native of Chili and New Granada. We have ſpecimens from Mutis and Cavanilles, but this ſpecies does not ſeem to be any where deſcribed. The *ſtems* are long, thread-ſhaped, much branched, proſtrate, creeping or perhaps floating, ſending out from each joint long fibrous radicles, and one or more ſmooth, roundiſh, heart-ſhaped or kidney-ſhaped *leaves*, hardly an inch wide; their *footſtalks* meaſuring from two to three inches. *Flowers* very ſmall, white, ſolitary, oppoſite to the leaves, on ſlender *ſtalks*, rather ſhorter than thoſe of the foliage. *Stamens* few. *Fruit* rather oblong. *Seeds* obovate, obtuſe, compreſſed, minutely dotted. This *Ranunculus* is perhaps moſt nearly akin to our Britiſh *hederaceus*, hereafter deſcribed, though very certainly diſtinct, and as the ſpecies are at preſent arranged, they muſt remain

at a diſtance. In habit and general reſemblance they cloſely accord.

14. R. *Cymbalaria.* Small Trailing Crowfoot. Purſh n. 5.—"Leaves heart or kidney-ſhaped, with five blunt teeth. Stem creeping, thread-ſhaped. Flower-ſtalks ſolitary, moſtly two-flowered. Petals linear. Fruit oblong."—In ſaline marſhes, near the ſalt-works of Onondago, New York, flowering in June and July. Perennial, ſomewhat reſembling the following. *Flowers* ſmall, pale yellow, ſometimes white. *Purſh.*

15. R. *ſalſuginoſus.* Salt-marſh Crowfoot. "Pallas's Travels, ſmall edition, v. 3. 173." Willd. n. 11. (R. ruthenicus; Jacq. Hort. Vind. v. 3. 19. t. 31. R. repens, flore in caule ſingulari, foliis variè ſectis; Amm. Ruth. 81. t. 13. f. 2.)—Leaves ovate, ſomewhat heart-ſhaped; toothed at the extremity. Stem creeping, thread-ſhaped. Flower-ſtalks ſolitary, moſtly ſingle-flowered. Petals obovate. Fruit nearly globoſe.—Found by Gmelin, on the banks of the Neva; *Ammann;* by Pallas in the ſalt plains of Siberia, beyond the lake Baical. The *flowers* are yellow, as big as our common Crowfoots, being more than ten times the ſize of the laſt. Their *petals* are about ten, obovate. The *root* ſends out long runners, like a garden ſtrawberry. Gmelin's ſpecimen is much ſmaller than Jacquin's figure.

16. R. *bullatus.* Portugal Crowfoot. Linn. Sp. Pl. 774. Willd. n. 10. Ait. n. 8. (R. luſitanicus; Dod. Pempt. 429. R. autumnalis Cluſii; Ger. Em. 954. R. luſitanicus Cluſii; ib. 955.)—Leaves ovate, ſerrated. Flower-ſtalks radical, ſingle-flowered, hairy.—Native of Portugal and the north of Africa, cultivated in England before 1640, but now ſcarcely ſeen. It flowers in May and June, and has a perennial fibrous *root*, more like Gerarde's fig. 10 than 11. *Leaves* all radical, ſtalked, ovate, ribbed and veiny, ſomewhat hairy, ſtrongly and unequally ſerrated, an inch or an inch and half long; ſometimes, according to Cluſius, bliſtered. *Flowers* yellow, on ſimple, hairy, upright, radical *ſtalks*, three or four inches long. *Petals* more than five, narrow-obovate. The old authors delineate two kinds, generally ſuppoſed to be varieties, but which may poſſibly be ſpecies. We have not ſeen either, except in a dried ſtate.

17. R. *Ficaria.* Pilewort, or Leſſer Celandine. Linn. Sp. Pl. 774. Willd. n. 12. Ait. n. 9. Fl. Brit. n. 4. Engl. Bot. t. 584. Curt. Lond. faſc. 2. t. 39. Mart. Ruſt. t. 21. Bulliard t. 43. (Chelidonium minus; Matth. Valgr. v. 1. 578. Fuchſ. Hiſt. 867. Ger. Em. 816.)—Leaves heart-ſhaped, angular, ſmooth, ſtalked. Petals numerous.—Native of waſte ground throughout Europe, in moiſt, ſhady, or buſhy places, flowering in the early ſpring. Dr. Sibthorp found it common in Greece; and there can be no doubt of its being, as all botaniſts have judged, χελιδονιον το μικρον, the Leſſer Celadine, of Dioſcorides. *Root* perennial, fibrous, with many fleſhy, pear-ſhaped, annual knobs, whoſe appearance gave riſe to the Latin, as well as Engliſh, name of this ſpecies, and to an idea that the plant might be ſerviceable in the piles, which thoſe who believe, may conſult Gerarde for the mode of application. The *ſtems* are leafy, and moſtly ſingle-flowered. *Leaves* ſmooth and ſhining. *Flowers* ſtalked; with three, ſometimes five, leaves to the *calyx;* and eight, occaſionally ten, elliptic-oblong, highly poliſhed *petals*, which fade to white in bright ſunſhine.

18. R. *frigidus.* Alpine Siberian Crowfoot. Willd. n. 13.—Radical leaves wedge-ſhape-ovate, five-toothed at the extremity; thoſe of the ſtem ſeſſile, palmate.—Native of the alps of Siberia. Willdenow ſays he received this by the name of *gracilis*, meaning *glacialis*, "with which it agrees in the ſize, and perhaps colour, of the *flower*, but is abundantly diſtinct in the *leaves*." Several Siberian unnamed ſpecimens, in the Linnæan herbarium, anſwer exactly to Willdenow's deſcription. The radical leaves are ſeveral, ſtalked, between half an inch and an inch in length, ſmooth; rounded and entire at the baſe; abrupt and variouſly cut into broad blunt teeth, we might almoſt ſay lobes, at the ſummit. *Stem* erect, uſually ſingle-flowered, with two or three, alternate, ſeſſile, more deeply lobed, or palmate, *leaves*. *Calyx* brown, hairy. *Petals* five, inverſely heart-ſhaped, apparently white. The *flower* is ſo like *glacialis*, that we cannot but ſuſpect the difference of the *leaves*, however great, to be but caſual. At any rate, they are ſometimes ſo deeply cut, that this ſpecies might perhaps, without violence, have been placed in the following ſection, next to *glacialis*.

19. R. *Thora.* Kidney-leaved Crowfoot. Poiſon-root of the Swiſs. Linn. Sp. Pl. 775. Willd. n. 14. Ait. n. 10. Jacq. Auſtr. t. 442. Obſ. faſc. 1. 25. t. 13. (Thora major et minor; Camer. Epit. 825, 826. Th. valdenſis, et montis Baldi; Ger. Em. 966. Pſeudo aconitum pardalianches; Matth. Valgr. v. 2. 430.)—Leaves kidney-ſhaped, abrupt, crenate, reticulated; the radical ones on long ſtalks. Stems with one or two flowers. Bracteas lanceolate.—Native of the alps of Switzerland, Auſtria, and Greece, as well as of mount Baldus, near Verona, flowering rather early in ſummer. It is ſaid to have been formerly in the Engliſh gardens, but has never fallen under our obſervation. *Root* perennial, of thick, tapering, fleſhy fibres or rather knobs. *Stem* ſolitary, ſmooth, ſimple, near a ſpan high; terminating in one, rarely more, long-ſtalked golden *flowers*, about half an inch wide; its *calyx-leaves* lanceolate, coloured, ſmooth, like every other part of the plant. *Leaves* about two inches wide, and one long, rather coriaceous, ſtrongly reticulated with veins, neatly crenate, terminating either abruptly, with a notch, or elongated into three acute, entire, triangular, central lobes; the uppermoſt, or floral, ones, lanceolate and entire; the radical ones only on long ſlender ſtalks. *Fruit* globular, of a few, large, tumid, ovate *ſeeds*, with hooked points. The *root* of this plant is reported to be extremely acrid and poiſonous, its juice having been uſed formerly, by the Swiſs hunters of wild beaſts, to envenom their darts, whoſe wound by that means becomes ſpeedily fatal and incurable. Hence the name, from φθορα, *corruption*, or *venom*. We can ſee no poſſible reaſon for diſtinguiſhing the greater and ſmaller kinds, even as permanent, or well-marked, varieties.

Section 2. *Leaves diſſected and divided.*

20. R. *creticus.* Cretan Crowfoot. Linn. Sp. Pl. 775. Willd. n. 15. Ait. n. 11. (R. creticus latifolius; Cluſ. Hiſt. v. 1. 239. Ger. Em. 963.)—*β.* R. macrophyllus; Desfont. Atlant. v. 1. 437. Lamarck Dict. n. 19.—Radical leaves kidney-ſhaped, crenate, ſomewhat lobed; ſtem-leaves in three deep, lanceolate, entire ſegments. Stem many-flowered.—Native of Crete; cultivated in the Oxford garden in 1658, but perhaps now loſt. The *root* is perennial, of many thick, tapering, fleſhy fibres. *Stem* thick, moderately branched, eighteen inches, or more, in height, hairy as well as the reſt of the herbage. *Radical leaves* from two to four inches long, and more in breadth, kidney-ſhaped, reticulated with ſtrong veins, light green, downy, unequally divided into about ſeven three-cleft, or coarſely notched, ſhallow lobes: *ſtem-leaves* alternate, in three deep, oblong, obtuſe, entire lobes; the baſe tapering or wedge-ſhaped. *Flowers* ſeveral, yellow, nearly as large as *R. Lingua*, n. 3. *Calyx* reflexed, ovate, looſely hairy. *β* appears, by the account of M. Desfontaines, to differ merely in having the

lower

lower *leaves* more deeply lobed than uſual, and ſomewhat leſs hairy.

21. R. *caſſubicus*. Caſſubian Crowfoot. Linn. Sp. Pl. 775. Willd. n. 16. Ait. n. 12. (R. aconitifolius, folio rotundo, ad radicem præſtolante; Loeſ. Pruſſ. 225. t. 72.) —Radical leaves roundiſh-heartſhaped, crenate, undivided; ſtem-leaves in ſeveral deep, lanceolate, toothed and jagged ſegments. Stem many-flowered.—Native of Pruſſia and Siberia, flowering in May. Meſſrs. Loddiges are ſaid to have introduced it into England, in 1794. Though the character of this approaches the laſt, the two plants are very different. The radical *leaves* of the preſent, though heart-ſhaped, are almoſt orbicular, their two lobes meeting each other; their margin ſharply crenate, but not at all divided; their ſurface minutely downy. *Stem* much branched; ſmooth below; downy above; bearing ſeveral fingered, veiny, ſmooth, ſeſſile *leaves*; the lower ones largeſt, many-lobed, and jagged; the upper with only three lanceolate, entire lobes. *Flowers* rather ſmall, deep yellow. *Calyx* hairy towards the baſe. *Fruit* ovate. *Seeds* hairy, roundiſh, ſlightly compreſſed, each with a ſtrongly revolute beak.

22. R. *auricomus*. Wood Crowfoot, or Goldilocks. Linn. Sp. Pl. 775. Willd. n. 17. Ait. n. 13. Purſh n. 9. Fl. Brit. n. 5. Engl. Bot. t. 624. Curt. Lond. faſc. 2. t. 41. Fl. Dan. t. 665. Ger. Em. 954. (R. prima ſpecies ſylveſtris; Fuchſ. Hiſt. 156. Dalech. Hiſt. v. 1. 1029.) —Radical leaves kidney-ſhaped, deeply three-cleft, crenate; ſtem-leaves divided to the baſe into linear ſegments. Stem many-flowered. Calyx coloured.—Native of woods and ſhady places, throughout Europe; alſo in Pennſylvania; flowering in April and May. *Root* fibrous, perennial. *Herb* of a pale pleaſant green, and deſtitute of the acrimony uſual in this genus. *Stems* a foot high, erect, branched, ſcarcely downy, except near the top. *Leaves* generally a little downy; the radical ones on long ſtalks, deeply divided into three or five, wedge-ſhaped, crenate, or cut lobes; the reſt in many linear, entire, or partially cut, ſpreading diviſions. *Flowers* terminal, erect, ſolitary at the top of each branch, of a bright golden hue. *Calyx* pale yellow, hairy, ſcarcely at all reflexed. *Nectary* a naked pore in each petal, not cloſed by any ſcale. In cold backward ſeaſons the *petals* are ſometimes wanting, or rather identified with the *calyx*, which is then dilated, and more coloured than uſual.

23. R. *abortivus*. Small-flowered Virginian Crowfoot. Linn. Sp. Pl. 776. Willd. n. 18. Ait. n. 14. Purſh n. 6.—Radical leaves heart-ſhaped, undivided, crenate; lower ſtem-leaves pedate; upper in three deep linear ſegments. Calyx reflexed, coloured. Petals obſolete.—In wet places, by the ſides of ponds and ditches, from New York to Carolina, flowering in July and Auguſt. *Purſh*. In ponds at Buenos Ayres. *Commerſon*. This ſpecies appears to have been cultivated in Chelſea garden 100 years ago, but it has, long ſince, diſappeared, nor has any author given a figure of the plant. Its habit is moſt like *ſceleratus*, n. 26. *Root* perennial, of many long fibres. *Herb* ſmooth. *Stem* from ſix to eighteen inches high, branched, leafy. *Radical leaves* like thoſe of a violet, not an inch long, crenate, ſmooth; their *ſtalks* two inches, or more, in length: lower *ſtem-leaves* ternate, their lateral leaflets deeply divided, all cut or crenate: uppermoſt *leaves* nearly ſeſſile, in three deep, lanceolate, entire diviſions. *Flowers* ſmall; yellow according to Purſh, but Commerſon, in his MSS. calls them fleſh-coloured; each ſtands on a ſimple ſolitary ſtalk, half an inch or an inch long, either from the forks of the branches, or at their ſummits. The *calyx* is reflexed, large, membranous and coloured. We find ſcarcely any certain traces of *petals*, but the plant may be variable in thoſe parts, like *auricomus*. *Stamens* few. *Germen* large, globoſe.—Linnæus took his ſpecific character, *caule ſubtriflоro*, from ſpecimens not fully grown; yet he had an authentic one by him, with above thirty flowers. In Commerſon's the upper *leaves* are more ſtalked than uſual.

24. R. *nitidus*. Varniſhed American Crowfoot. Walt. Carol. 159. Lamarck n. 68. Purſh n. 7.—"Very ſmooth. Stems hollow. Radical leaves roundiſh-kidney-ſhaped, bluntly crenate; ſtem-leaves ſeſſile, digitate; their leaflets cut, with blunt ſegments. Seeds nearly globoſe, very ſmooth."—In inundated grounds, from New York to Carolina, flowering in July and Auguſt.—*Root* perennial. *Flowers* ſmall. *Petals* white. This and the foregoing one are probably only varieties. *Purſh*.

25. R. *trilobus*. Three-lobed Barbary Crowfoot. Deſfont. Atlant. v. 1. 437. t. 113. Willd. n. 19.—Stem erect, much branched. Leaves ſmooth, deeply three-lobed, cut; uppermoſt linear, obtuſe, undivided. Flower-ſtalks ſtriated. Seeds compreſſed, tuberculated.—Gathered by Desfontaines, in moiſt fields, near Mayane, in Barbary. He deſcribes it as akin to *R. parviflorus*, except in its upright growth, and ſmooth, deeply three-lobed *leaves*. The loweſt *leaf* of all is undivided and crenate. *Flowers* very ſmall, yellow, ſituated as in the two laſt. *Seeds* in a round head, ſmall, compreſſed, orbicular with a point, covered with tubercles on both ſides. To us this ſpecies ſeems, by its *ſeeds*, allied to *parvulus* of Linnæus, which is a variety of *hirſutus*, hereafter deſcribed.

26. R. *ſceleratus*. Celery-leaved Water Crowfoot. Linn. Sp. Pl. 776. Willd. n. 20. Ait. n. 15. Purſh n. 8. Fl. Brit. n. 6. Engl. Bot. t. 681. Curt. Lond. faſc. 2. t. 42. Fl. Dan. t. 571. (R. paluſtris rotundifolius; Ger. Em. 962.)—Stem erect, much branched. Lower leaves palmate, ſmooth; upper ones fingered. Fruit oblong. Seeds very numerous, minute.—Found about ditches and in watery places by road ſides, in moſt parts of Europe and North America, flowering in ſummer. *Root* annual. *Herb* various in ſize and luxuriance, of a pale ſhining green, juicy, very ſmooth, except occaſional hairineſs on the flower-ſtalks. *Stem* round, thick and hollow. Lower *leaves* larger, broader, leſs divided, and more ſtalked, than the upper; the floral ones moſtly lanceolate, ſimple, and entire. *Flowers* numerous, ſmall, yellow. *Calyx* deflexed, ſhaggy. *Nectary* ſomewhat tubular. *Stamens* few. *Seeds* very ſmall, but exceſſively numerous, making a denſe, oblong, obtuſely rounded head. This is one of the moſt acrid of its tribe, raiſing bliſters and dangerous ſores in the ſkin.

27. R. *aconitifolius*. Aconite-leaved White Crowfoot. Linn. Sp. Pl. 776. Willd. n. 21. Ait. n. 16. Curt. Mag. t. 204. (R. montanus quartus; alſo R. pleno flore albo; Cluſ. Hiſt. v. 1. 236. R. aconiti folio; Ger. Em. 954. R. albus multiflorus; ib. 957. R. albus, flore denſo; Bauh. Hiſt. v. 3. 844, not 860.)—Leaves veiny, ſmooth, in five deep, pointed, toothed lobes; the middle one three-cleft: floral leaves ſeſſile, fingered, lanceolate, cut. Stem branched, many-flowered.—Native of the alps of Switzerland, France, Auſtria, &c.; a hardy and long-eſtabliſhed perennial in our gardens, flowering in May and June; generally in a double ſtate, as figured by Curtis. He remarks that it requires moiſture, ſhade, and a pure air. The *ſtem* is one and a half or two feet high, partly purpliſh, ſmooth, with ſpreading branches. *Leaves* dark green, with a glaucous hue beneath; the radical ones on long ſtalks; the reſt nearly ſeſſile; all compoſed of more or leſs diſtinctly ſeparate, often ſtalked, leaflets, ſtrongly veined and coarſely toothed; the uppermoſt ſmaller, more ſimple, quite ſeſſile.

Flowers

Flowers white, three-quarters of an inch in diameter, not very ornamental in their ſingle wild ſtate, but much admired when double, and formerly called Fair Maids of France. Their pearly whiteneſs is enhanced by the violet *calyx*.

28. R. *platanifolius*. Plane-tree-leaved White Crowfoot. Linn. Mant. 79. Willd. n. 22. Ait. n. 17. Fl. Dan. t. 111. (R. albus, flore ſimplici; Lob. Ic. 668. R. alpinus albus; Ger. Em. 951.)—Leaves veiny, ſmooth, deeply palmate, five-lobed, cut and toothed; the middle ones three-cleft: floral leaves ſeſſile, fingered, linear-awlſhaped, entire. Stem branched, many-flowered.—Native of the Alps of Germany, Norway, Switzerland, Italy, and of the Pyrenees, in ſhady places. Said to have been introduced into the Engliſh gardens in 1769, by Meſſrs. Kennedy and Lee. This is very diſtinct from the laſt, with which Linnæus originally confounded it. The *leaves* are larger, not divided quite to the baſe, though their lobes are more cut and jagged: the floral ones are remarkably long, ſlender, and entire. *Flowers* twice as large, and rather more abundant. The radical *leaves* of both have occaſionally ſeven or nine lobes, inſtead of five.

29. R. *ſpicatus*. Spike-fruited Crowfoot. Desfont. Atlant. v. 1. 438. t. 115. Willd. n. 23.—Leaves radical, five-lobed, toothed. Stem nearly ſimple, hairy. Fruit cylindrical, thrice as long as the calyx.—Gathered by Desfontaines in marſhes at Algiers. *Root* perennial, of numerous, oblong, fleſhy, tapering knobs. *Stem* ſolitary, erect, a ſpan high, hairy, ſimple, except at the top, where it divides into two or three ſimple ſingle-flowered ſtalks; ſometimes accompanied by a few *bracteas*, in three or four deep linear ſegments; ſometimes naked. *Leaves* all radical, on hairy ſtalks, heart-ſhaped, rounded, five-lobed, ſtrongly toothed, villous, about an inch and a half broad. *Calyx* of five ovate-oblong, coloured, hairy, ſpreading leaves. *Petals* five, obovate, yellow, the ſize of *R. acris*. *Fruit* cylindrical, ſlender, an inch and a half or two inches long. *Seeds* very numerous, ovate, compreſſed, bordered each with a hooked, prominent beak.

30. R. *paludoſus*. Marſh Crowfoot. Poiret Voy. en Barb. v. 2. 184. Lamarck n. 22. Desfont. Atlant. v. 1. 439.—"Downy. Lower leaves in three deep, many-cleft, fan-ſhaped ſegments; upper ſimple, linear, entire. Stem branched, many-flowered. Calyx erect."—Gathered by Poiret, in the borders of extenſive marſhes, near la Calle, and in ſome other parts of Barbary. *Root* fibrous, denſely faſciculated. *Herb* downy, with ſhort, cloſe-preſſed hairs. *Stems* ſeveral, eight or ten inches high, with ſpreading leafy branches, bearing abundance of widely-ſpreading, deep-yellow *flowers*, the ſize of the foregoing, on ſlender ſtalks of various lengths. Radical *leaves* ſtalked; the earlieſt ones ovate, undivided, deeply toothed; the reſt almoſt pinnate, with three long, narrow, deeply cut, fan-ſhaped ſegments; thoſe on the lower part of the ſtem leſs compound: the uppermoſt linear, undivided, acute, entire. *Fruit* oval, or almoſt elliptical, obtuſe. *Seeds* oblong, ſmooth, compreſſed, ſcarcely pointed.

31. R. *illyricus*. Illyrian Silky Crowfoot. Linn. Sp. Pl. 776. Willd. n. 24. Ait. n. 18. Jacq. Auſtr. t. 222. Ger. Dod. Pempt. 428. Em. 953. (R. grumoſâ radice quartus; Cluſ. Hiſt. v. 1. 240.)—Leaves ſhaggy with ſilky hairs, linear-lanceolate, ternate, entire. Calyx ſilky, reflexed. Stem branched. Flower-ſtalks woolly.—Native of Hungary, France, Italy, Auſtria, Thrace, and of the Swediſh iſle of Oeland; cultivated here in Gerarde's time. Cluſius received his ſpecimens, from a phyſician of Ferrara, with the name of *R. illyricus*, which has been retained, abſurdly enough, for a plant found in ſo many different countries, and for which ſo many expreſſive appellations might eaſily have been contrived. The *root* is perennial, compoſed of numerous, ſmall, round granulations. Whole herb more or leſs clothed with ſnow-white, ſilky, or partly cottony, down. *Stem* a foot high, or more, ſomewhat branched, bearing ſeveral bright lemon-coloured *flowers*, nearly the ſize of *R. Lingua*, their *calyx-leaves* ovate, reflexed, externally ſilky. *Leaves* all linear-lanceolate, entire, ſeldom divided; the radical ones on long ſtalks, ternate or pinnate; thoſe about the middle of the ſtem ternate, almoſt ſeſſile; upper ones ſimple: the uſual length of each leaf or leaflet is two or three inches.—Dodonæus takes this for the ſecond Βάτραχιον, or *Ranunculus*, of Dioſcorides, with whoſe deſcription it in ſome meaſure accords. That ſpecies is ſaid to be extremely acrid. Hence Dodonæus, who is copied by Gerarde, ſuppoſes our plant may be the *Gelotophyllis* of Pliny, which cauſed thoſe who took it to dye laughing. But this opinion depends on too many conjectures to deſerve attention; even if any benefit could accrue from aſcertaining the point. We muſt obſerve however that Dr. Sibthorp thought the above *Ranunculus* of Dioſcorides to be our *lanuginoſus*, which is a common Greek plant, and anſwers better to his deſcription.

32. R. *flabellatus*. Fan-leaved Crowfoot. Desfont. Atlant. v. 1. 438. t. 114. Willd. n. 25. Sm. Fl. Græc. Sibth. t. 520, unpubliſhed. (R. alter ſaxatilis, aſphodeli radice; Column. Ecphr. 312. t. 313.)—Radical leaves undivided or twice ternate, toothed or deeply cut, ſtalked; upper ones ternate or ſimple. Stem hairy, ſimple below, few-flowered. Fruit elliptical.—Found by Desfontaines, near Algiers, on moiſt uncultivated hills, flowering in winter: by Sibthorp on the northern mountains of Greece. *Root* perennial, of many oblong, tapering, cluſtered fibres, rather than knobs. *Stem* a ſpan high, hairy, ſomewhat divided above, and bearing two or three yellow *flowers*, the ſize of our common *R. bulboſus*, accompanied by deeply two or three-cleft *bracteas*. *Leaves* chiefly radical, on longiſh ſtalks; ſeveral of the earlieſt undivided, fan-ſhaped, ſtrongly toothed; the reſt deeply three-cleft, and ſubdivided.

33. R. *aſiaticus*. Perſian Crowfoot, or common Garden Ranunculus. Linn. Sp. Pl. 777. Willd. n. 26. Ait. n. 19. Mill. Ic. t. 216. Sm. Fl. Græc. Sibth. t. 518, unpubliſhed. (R. aſiaticus, grumoſâ radice; Cluſ. Hiſt. v. 1. 240—243. Ranunculi varii; Ger. Em. 958—960. Βάτραχιον; Dioſc. book 2. chap. 206.)—Leaves once or twice ternate; leaflets three-cleft, cut. Stem hairy, branched. Petals thrice as long as the calyx. Fruit cylindrical.—Found by Dr. Sibthorp wild in various parts of Aſia Minor, but moſt plentifully in the iſle of Cyprus, where it ſtill retains one of its ancient names, mentioned by Dioſcorides, αγριο-σέλινον, or Wild Parſley. In the gardens of Europe it has been cultivated, ever ſince the latter part of the ſixteenth century, under the form of innumerable varieties, chiefly double, of every variegated hue. In a wild and ſingle ſtate the large and ſplendid *petals* are of a moſt vivid crimſon, occaſionally varying to yellow. The *root* is perennial, of numerous, brown, fleſhy, tapering knobs. *Stem* twelve or fifteen inches high, erect, round, downy, hoary, leafy, branched from the middle or lower part, and bearing from three to five large long-ſtalked *flowers*, whoſe *calyx* is brown, hairy, and reflexed, but one-third the length of the broad, obovate, concave *petals*. *Leaves* rather hairy, moſtly ſtalked, variouſly three-cleft and notched, more or leſs compound; the floral ones, as uſual, narrower and moſt ſimple. *Fruit* cylindrical. *Seeds* oblong, with recurved points.

34. R. *japonicus*. Japan Crowfoot or Ranunculus. Thunb. Tr. of Linn. Soc. v. 2. 337. Willd. n. 27. (R. aſiaticus;

aſiaticus; Thunb. Jap. 241.)—"Leaves deeply three-cleft, cut and toothed, hairy as well as the ſtem."—Common in ditches about Nagaſaki, Jedo, and elſewhere in Japan, flowering from February to May. It is hairy in every part, except the *corolla*. The radical *leaves* are rounded; the uppermoſt divided into lanceolate ſegments; all three-cleft, their ſegments cut, toothed, acute, hairy on both ſides. *Footſtalks* from an inch to a foot in length. *Stems* ſtriated, ſcarcely leafy, zigzag, branching into flower-ſtalks at the top. *Thunberg.* The above character and deſcription are not ſufficient to diſtinguiſh this ſpecies from the laſt, with which Thunberg originally confounded it. Something is neceſſary to be known reſpecting the *calyx*, and its relative proportion to the *petals*, as well as the form of the *fruit* and *ſeeds*.

35. R. *rutæfolius*. Rue-leaved Crowfoot. Linn. Sp. Pl. 777. Willd. n. 28. Ait. n. 20. Jacq. Coll. v. 1. 186. t. 6, 7. Allion. Pedem. v. 2. 49. t. 67. f. 1. (R. præcox rutaceo folio; Cluſ. Hiſt. v. 1. 232. Ger. Em. 965. Ranoncolo alpino, con foglia di Coriandro; Pon. Bald. 197.) —Leaves pinnate, ternate, many-cleft, glaucous, ſmooth; their ſegments elliptic-oblong. Stem nearly ſimple. Petals numerous. Calyx ſmooth. Seeds ovate, with ſtraight points.—Native of the loftieſt alps of Switzerland, Dauphiny, Auſtria, and the north of Italy, flowering early in July. The *root* is tuberous, with long, ſimple, ſtout fibres, perennial. *Herb* glaucous and ſmooth. *Stem* from two to five inches high, moſtly ſimple and ſingle-flowered, ſometimes bearing two, rarely three, flowers. *Leaves* ſtalked, elegantly decompounded; their leaflets wedge-ſhaped, many-cleft; the ultimate ſegments oblong, ſlightly elliptical, bluntiſh. *Flowers* of a brilliant white, at firſt tinged with red, on long ſtalks. *Calyx* purpliſh, five-leaved, ſmooth. *Petals* eight or ten, very erroneouſly repreſented in the figure of Cluſius and Gerarde, ſo as to look like a ſyngeneſious flower. *Seeds* few, large, ovate, pitted, pointed, ſtraight, ſpreading every way, ſtalked, in a round head.

36. R. *glacialis*. Alpine Hairy-cupped Crowfoot. Linn. Sp. Pl. 777. Fl. Lapp. ed. 196. t. 3. f. 1. Willd. n. 29. Ait. n. 21. Fl. Dan. t. 19. (R. montanus purpureus, calyce villoſo, Felicis Platerii; Bauh. Hiſt. v. 3. b. 846. Scheuchz. Alp. v. 1. 399, and 139. t. 20. f. 1.)—Leaves ternate, three-cleft, cut; their ſegments elliptical. Stem nearly ſimple. Calyx very hairy.—Native of the higheſt alps of Lapland, Switzerland, Dauphiny, Germany, &c. in the neighbourhood or ice and ſnow, flowering in June and July. *Root* perennial, with very long ſtrong fibres. *Stem* from three to ſix inches high; ſimple and naked in its lower part; leafy near the top, bearing one or two, very rarely three, *flowers*, on long, ſmooth ſtalks. *Leaves* green, ſcarcely hairy, rather fleſhy; the radical ones more or leſs compound, on long ſtalks; their ſegments broader, more elliptical, and blunter than in the former. *Flowers* large and handſome, of five broad, roundiſh, white *petals*, roſe-coloured or purple underneath; the *calyx* purpliſh-brown, ſingularly rough, with ſhining tawny hairs. When we contemplate the great diverſity of ſubdiviſion in the foliage of this ſpecies, we are diſpoſed to believe our *frigidus*, n. 18, may poſſibly be a mere variety. Their *flowers* preciſely agree, as well as their general habit.

37. R. *Seguieri*. Sharp-leaved Alpine Crowfoot. Villars Dauph. v. 3. 737. t. 49. Willd. n. 30. (R. Columnæ; Allion. Pedem. v. 2. 50. t. 67. f. 3, 4. Wulf. in Jacq. Coll. v. 4. 345. R. alpinus apii folio, flore albo magno; Pont. Comp. 117. Seguier Veron. v. 1. 490. t. 12. f. 2, 3.) —Leaves ternate; ſegments wedge-ſhaped, ſubdivided, decurrent, acute. Stem branched, about three-flowered. Calyx ſmooth.—Native of mount Baldus, where it was firſt found by Pontedera; as well as of the mountains of Dauphiny, Piedmont, and Carniola; in ſtony ſituations. This reſembles ſome of the moſt luxuriant varieties of *glacialis*, but differs in the acute and decurrent ſegments of its *leaves*, as well as its ſmooth pale *calyx*; for Villars is incorrect in deſcribing that part "externally downy." It is quite ſmooth, in his own and Allioni's ſpecimens; the hairineſs being confined to the top of the *flower-ſtalk*, where it is very denſe and conſpicuous; while the ſame part in *glacialis* is ſmooth, up to the baſe of the hairy *calyx*. The *petals*, and even the *nectary*, are white. Villars is ſurely right in removing the ſynonym of Columna, cited by Allioni, which we refer, with hardly any ſcruple, to *ſlabellatus*, n. 32, a very different plant.

38. R. *nivalis*. Palmate Alpine Crowfoot. Linn. Sp. Pl. 778. Fl. Lapp. ed. 2. 195. t. 3. f. 2. Willd. n. 31. (Excluding the variety.) — Leaves palmate, five-lobed, ſpreading, entire; thoſe of the ſtem ſeſſile. Stem ſingle-flowered, ſmooth. Calyx hairy, half the length of the petals.—Found by Linnæus in Lapland, by the alpine rivulets on the ſnowy mountains of that country. Martens had previouſly gathered it at Spitzbergen. The *root* is fibrous, and ſlender. *Stem* ſimple, erect or aſcending, ſmooth, leafy, about ſix inches high. *Radical leaves* two or three, on long ſlender ſtalks, heart-ſhaped at the baſe, rather deeply palmate, in five broad, divaricated, obovate, entire lobes, veiny and quite ſmooth: *ſtem-leaves* one or two, ſeſſile, with five deeper, longer, more lanceolate lobes; the uppermoſt only three-lobed, or occaſionally quite undivided. *Flower* ſolitary, on a long, terminal, hairy ſtalk. *Calyx* of five ovate yellowiſh leaves, rough with blackiſh hairs. *Petals* yellow, obovate, twice the length of the calyx.

39. R. *pygmæus*. Dwarf Small-flowered Alpine Crowfoot. Purſh n. 10. (R. nivalis pygmæus; Linn. Fl. Lapp. ed. 2. 196. t. 3. f. 3. R. lapponicus; Fl. Dan. t. 144.)—Leaves palmate, ſomewhat pedate, five-lobed, ſpreading entire; the upper ones almoſt ſeſſile. Stem ſingle-flowered. Calyx nearly ſmooth, rather longer than the petals.—Native of Lapland and Labrador. Perennial, flowering in May and June. Much ſmaller than the foregoing. Middle lobe of the *radical leaves* very deeply ſeparated. *Stem-leaves* leſs perfectly ſeſſile, and with narrower ſegments, than in *nivalis*. *Flower* not a quarter the ſize of that ſpecies; its *petals* yellow, roundiſh, ſcarcely ſo long as the *calyx*, which is likewiſe ſmall, and very ſlightly hairy.

40. R. *montanus*. Yellow Mountain Crowfoot. Willd. n. 32. Ait. n. 22. (R. nivalis; Jacq. Auſtr. t. 325, 326. Sibth. in Prodr. Fl. Græc. n. 1272? Villars Dauph. v. 3. 742. Crantz Auſtr. faſc. 2. 92. t. 4. f. 3, 4. R. n. 1168; Hall. Hiſt. v. 2. 71, excluding the references to Linnæus. R. minimus alpinus luteus; Bauh. Hiſt. v. 3. 845, two upper figures.)—Leaves five-lobed, rounded, cut; thoſe of the ſtem ſeſſile, with deep, lanceolate, entire ſegments. Stem ſingle-flowered, rough with erect hairs. Calyx hairy. —Very abundant on the alps of Switzerland, Dauphiny, and Germany; not of Lapland. It was one of thoſe many alpine plants, introduced into the Engliſh gardens in 1775, by a perſon ſent on purpoſe to collect them, at the expence of Dr. Fothergill and Dr. Pitcairn. This ſpecies has been confounded with the Linnæan *nivalis*, by all writers previous to Willdenow; yet they are truly diſtinct. The *montanus* has remarkably long, ſubdivided, tuberous *roots*, with very long ſtrong fibres. *Stem* hairy throughout, the hairs erect; ſometimes quite leafleſs. Lobes of the radical *leaves* un-

equally cut and toothed, not entire. *Calyx-leaves* narrower, and leſs hairy. *Petals* larger, and of a deeper yellow. This is the *nivalis* of moſt botaniſts, few having ſeen the true Linnæan Lapland plant. The variety of *montanus* with a leafleſs *ſtem*, figured in Jacquin's t. 326, at the right hand, was taken for a new ſpecies, and called *acaulis*, by Favrod and Reynier, as appears by their dried ſpecimens.

41. R. *Gouani*. Gouan's Pyrenean Crowfoot. Willd. n. 33. (R. pyrenæus; Gouan Illuſtr. 33. t. 17. f. 1, 2.) —Leaves five-lobed, rounded, cut; thoſe of the ſtem ſeſſile, deeply palmate; the uppermoſt with acute, entire lobes. Stem ſingle-flowered, rough with deflexed hairs. Calyx hairy.—Gathered by Gouan on the Pyrenees, where it flowers ſoon after the melting of the ſnow. We have a ſpecimen from the late M. Brouſſonet. This is a larger plant than the preceding, eſpecially in its *flower*, and differs, as Willdenow remarks, in having the *ſtem-leaf* toothed or cut; but that character applies only to the lower one. The upper *ſtem-leaves*, if there be more than one, conſiſt of entire, acute lobes. The moſt deciſive mark of diſtinction appears to us in the hairs of the *ſtem*, below the leaves, which in Gouan's plant are either widely extended or bent downwards; in the *montanus* the hairs of every part of the *ſtem* are erect, or cloſe-preſſed. To this no perſon has hitherto adverted.

42. R. *alpeſtris*. Alpine White Crowfoot. Linn. Sp. Pl. 778. Willd. n. 34. Ait. n. 23. Sm. Tr. of Linn. Soc. v. 10. 343. Engl. Bot. t. 2390. Jacq. Auſtr. t. 110. (R. n. 1167; Hall. Hiſt. v. 2. 71. R. montani ſpecies prima et ſecunda; Cluſ. Hiſt. v. 1. 234. R. montanus, flore minore, & majore; Ger. Em. 964. R. minimus alpinus albus; Bauh. Hiſt. v. 3. 845, two lower figures.) —Leaves very ſmooth; radical ones ſomewhat heart-ſhaped, obtuſe, in three deep, lobed ſegments; ſtem-leaf lanceolate, entire. Stem moſtly ſingle-flowered.—Native of the higheſt alps of Auſtria and Switzerland, and of the mountain of Clova, in Angusſhire, Scotland, in which laſt place it was diſcovered by the late Mr. George Don, by the ſides of little rills, flowering, though ſparingly, in the ſpring of 1809. The *roots* are perennial, with long fibres. Whole *herb* very ſmooth, and rather glaucous. *Stem* erect, from one to four inches high, almoſt always ſimple and ſingle-flowered, naked, except one or two ſimple, linear-lanceolate, obtuſe, entire *leaves*, apparently of the nature of *bracteas*. Radical *leaves* ſeveral, ſtalked, in three deep, ſubdivided, acute lobes. *Calyx-leaves* oval, ſmooth, edged with white. *Petals* of a pure and brilliant white. Haller ſays this is one of the moſt acrid of its tribe, bliſtering the ſkin; and yet the alpine hunters chew it, by way of refreſhment.

43. R. *lapponicus*. Long-ſtalked Lapland Crowfoot. Linn. Sp. Pl. 778. Fl. Lapp. ed. 2. 194. t. 3. f. 4. Lapland Tour, v. 1. 156, 252.)—Leaves ſmooth, in three very deep, dilated, blunty notched lobes. Flower-ſtalks elongated, naked, ſingle-flowered. Petals the length of the ſmooth calyx.—This rare ſpecies, not known out of the limits of Lapland, was diſcovered by Linnæus in two or three different places, near the river Juchtan, flowering in June. Profeſſor Swartz alſo gathered it, many years after, near Luloa. It grows in watery ſituations, and is very different from all others of this genus. The aſpect of the plant, at firſt ſight, recalls the idea of *Adoxa Moſchatellina*. The *root* is long, thread-ſhaped, and creeping, throwing up here and there, from its joints, a little, ſhort, ſimple, ſolitary, ſmooth *ſtem*, ſometimes an inch or two high, ſometimes ſcarcely diſtinguiſhable. *Leaves* one from the baſe, and another from the top, of the ſtem, on ſlender, weak *foot-ſtalks*, two or three inches in length; each *leaf* an inch or an inch and half wide, ſmooth, veiny, rather fleſhy, ſomewhat kidney-ſhaped, in three very deep, almoſt diſtinct, broad wedge-ſhaped lobes, having a few broad and rounded, blunt notches, each tipped with a minute glandular point. *Flower-ſtalks* from three to five or ſix inches high, terminating the ſtem, ſolitary, ſimple, naked, ſmooth, each bearing a ſmall yellow *flower*, ſcarcely half an inch in diameter. *Calyx* of three elliptical, concave, ſmooth, pale, reflexed leaves. *Petals* five or ſix, obovate, ribbed, about the length of the calyx; their nectary cloſed by a ſcale. *Stamens* from nine to twelve. *Piſtils* from ſix to twelve. *Seeds* in a round head, ovate, ſmooth, with ſtrongly recurved points.

44. R. *hyperboreus*. Arctic Crowfoot. Retz. Scand. ed. 2. 131. Willd. n. 36. "Rottb. in Copenh. Tranſ. v. 10. 458. t. 4. f. 16." (R. Fl. Dan. t. 331, excluding the ſynonym of Ammann, which belongs to *ſalſuginoſus*, n. 15. R. n. 50; Gmel. Sib. v. 4. 204. t. 83, b, excluding the Linnæan ſynonyms.)—Leaves ſmooth, in three deep divaricated lobes; the lateral ones cloven. Stem creeping. Flower-ſtalks the length of the leaves. Petals ſcarcely longer than the ſmooth calyx.—Native of Iceland, Greenland, Norway, and Siberia, in watery places. Gmelin and Linnæus confounded this with *hederaceus* hereafter mentioned; Gunner miſtook it for *ſalſuginoſus*, which he called *R. Ammanni*, Fl. Norv. n. 826. From both, as well as from *lapponicus*, it is very diſtinct. The *ſtems* are long and creeping, or floating, throwing out from each joint, ſeveral ſimple, very long, fibrous *radicles*, with a ſtalked *leaf*, not a quarter the ſize of *lapponicus*, whoſe lobes are by no means toothed or crenate, the lateral ones only being ſimply cloven. The *flowers* are ſmall, pale yellow, ſolitary, each on a lateral, but not axillary, *ſtalk*, whoſe length is about equal to the adjoining leaf with its foot-ſtalk. *Calyx-leaves* only three or four, ſmooth, coloured. *Petals* about the ſame number, and ſcarcely longer, obovate. *Seeds* ovate, gibbous, with a hooked, but very ſhort, beak.

45. R. *monſpeliacus*. Montpellier Crowfoot. Linn. Sp. Pl. 778. Willd. n. 37. (R. ſaxatilis, magno flore; Bauh. Prodr. 96. Sauv. Monſp. 181.)—"Leaves in three deep crenate ſegments. Stem ſimple, villous, nearly naked, ſingle-flowered."—Native of rocky places about Montpellier, according to Bauhin, who thus deſcribes his plant. "*Root* compoſed of long capillary fibres. *Leaves* from the root ſeveral; on long, ſomewhat woolly, ſtalks, each leaf hardly ſo broad as the nail, in three ſmall ſegments, which are again divided into two or three acute ones. The *ſtem* is about three inches high, ſlender, woolly, bearing one large *flower*, of a brilliant golden yellow, compoſed of five petals, with many reddiſh *ſtamens*." We know no authentic ſpecimen nor figure of this plant. Linnæus has marked it as never ſeen by him; but a ſpecimen ſent him by Gouan, from the Pyrenees, marked *R. alpinus humilis, magno flore*, which we have been diſpoſed therefore to conſider as *R. Gouani*, n. 41, anſwers very well to Bauhin's deſcription, and it is not impoſſible that theſe ſuppoſed two ſpecies are one and the ſame. Yet Poiret, who profeſſes to have gathered *R. monſpeliacus* at Montpellier, and in Barbary, ſpeaks of them as diſtinct, though, it muſt be confeſſed, his deſcription is hardly ſufficient to eſtabliſh the point in diſpute.

46. R. *penſylvanicus*. Penſylvanian Crowfoot. Linn. Suppl. 272. Willd. n. 38. Ait. n. 24. Purſh n. 11. (R. canadenſis; Jacq. Ic. Rar. t. 105. Miſc. v. 2. 343.) —Stem erect, hairy, branched. Leaves ternate; leaflets ſtalked, deeply three-cleft, jagged, toothed; hairy beneath. Calyx reflexed, rather longer than the round petals. Fruit cylindrical.

cylindrical. Seeds compreſſed, with ſtraight beaks.—Native of low meadows, from Canada to Penſylvania, but rare, flowering in July and Auguſt. This ſpecies was ſent by profeſſor Thunberg, in 1785, to Kew garden, from whence we procured a ſpecimen the ſame year. Mr. Aiton makes it biennial; Jacquin and Purſh perennial. The *ſtem*, like the *footſtalks*, is very hairy. Whole *herb* of a light green, two feet or more in height, branched, many-flowered. *Leaflets* one and a half or two inches long, ſtrongly veined, with ſpreading ſegments. *Flower-ſtalks* terminal, longiſh, furrowed, rough with cloſe-preſſed hairs. *Flowers* ſmall, their little, round, yellow *petals* not ſo long as the *calyx*, which is ſmooth and bent downward. *Seeds* in a cylindrical head, numerous, ovate, gibbous, compreſſed, ſmooth, very minutely dotted, each tipped with a ſhort, ſharp, erect, or ſlightly inflexed, beak. *Receptacle* hairy. Mr. Purſh's deſcription does not, in every circumſtance, anſwer to the Linnæan plant; for the *flowers* are not near ſo big as *R. acris*, nor are their *ſtalks* round.

47. R. *ternatus*. Ternate-leaved Japaneſe Crowfoot. Thunb. Jap. 241. Willd. n. 39.—"Calyx reflexed. Leaves all ternate; leaflets three-cleft. Stem many-flowered."—Native of the Japaneſe iſland of Nipon, flowering in May. Nothing more is known of this ſpecies, concerning whoſe peculiar characters, or affinities, we can form no preciſe opinion.

48. R. *biternatus*. Twice-ternate Magellanic Crowfoot.—Leaves ſmooth, twice ternate, cut; ſegments ovate, acute. Stem creeping. Stalks ſingle-flowered, the length of the leaves. Petals obovate, the length of the ſmooth calyx.—Gathered by Commerſon, in the ſtraits of Magellan. No author appears to have taken up this ſpecies, of which a ſpecimen, from Commerſon's herbarium, was given by Thouin to the younger Linnæus. The whole *plant* is ſmooth. The *leaves* bear a conſiderable reſemblance to thoſe of *R. Seguieri*, but are rather ſmaller, and diſtinctly twice ternate. The habit of the plant more accords with *lapponicus* and *hyperboreus*, however unlike at firſt ſight. The *ſtem* is thread-ſhaped and creeping, ſending forth, from every joint, a few fibrous *radicles*, a pair of upright, ſtalked *leaves*, two or three inches in height, and one *flower*, whoſe ſimple, naked *ſtalk* is about as tall as the *leaves*. This *flower* appears to be extremely like that of *lapponicus*, though ſcarcely more than half ſo large. The dried *petals* have the ſame opaque whiteneſs as is obſervable in that ſpecies, and others, on their upper ſurface, and are probably yellow when freſh.

49. R. *pedunculariſ*. Long-ſtalked Magellanic Crowfoot.—Leaves ternate, deeply cut, ſomewhat hairy. Stems hairy, taller than the leaves, two-flowered. Calyx reflexed, nearly ſmooth. Seeds globoſe, ſmooth, with recurved, hooked beaks.—Gathered by Commerſon in the ſtraits of Magellan, with the preceding. This has a general likeneſs to ſeveral common European kinds, which we ſhall next deſcribe, but is eſſentially diſtinct. The radical *leaves* are ſeveral, on hairy ſtalks, four inches long, their circumſcription roundiſh, meaſuring an inch, or inch and half, acroſs; the leaflets almoſt always quite diſtinct, with ſhort partial ſtalks, their form wedge-like, or fan-ſhaped, more or leſs deeply cut, ſeldom regularly three-cleft. *Stems* ſeveral, erect, ſtriated, rough, with ſpreading hairs; ſimple and naked to the height of four or ſix inches, then dividing into two upright, hairy, ſimple *flower-ſtalks*, greatly elongated, (from one to ſeven or eight inches), after flowering, and accompanied at their baſe by a ſolitary, ſtalked, deeply divided, palmate or fingered, *leaf*, an inch long. The *flowers* are much like thoſe of *bulboſus*, or *acris*. *Calyx-leaves* ovate, concave, reflexed, bearing a few external hairs. *Petals* yellow, wedge-ſhaped, ſtriated, nearly twice as long as the calyx. *Fruit* globoſe. *Seeds* globoſe, tumid, keeled, even and ſmooth; their beaks rather ſpreading, hooked at the tip.

50. R. *bulboſus*. Bulbous Crowfoot, or Butter-cups. Linn. Sp. Pl. 778. Willd. n. 40. Ait. n. 25. Fl. Brit. n. 7. Engl. Bot. t. 515. Purſh n. 12. Curt. Lond. faſc. 1. t. 38. Mart. Ruſt. t. 28. Ger. Em. 953. Lob. Ic. 666.—Leaves hairy, ternate, three-cleft, cut. Stem many-flowered. Calyx reflexed. Seeds compreſſed, ſmooth. Root bulbous.—Very common in Europe, as well as North America, in meadows and paſtures, flowering throughout the ſummer. The *root* is a round, ſolid, perennial bulb, about an inch in diameter, increaſing by offsets from the top, and ſending out from its baſe many long ſtout fibres. *Stems* ſeveral, erect, a foot high, branched, leafy, round, hairy, many-flowered, deſtitute of trailing ſhoots or runners. *Leaves* ſtalked, variouſly cut, more or leſs hairy. *Flowers* terminal, ſolitary, on angular furrowed ſtalks, rough with erect, briſtly hairs. *Calyx* hairy, bent back to the ſtalk. *Petals* nearly equal in ſize to *R. Linguæ*, of a deep ſhining yellow. *Nectary* covered by a notched ſcale. *Fruit* globoſe. *Seeds* orbicular, greatly compreſſed, bordered, ſmooth, and even, tipped with a ſhort blunt beak.—This is one of the moſt acrid, and even cauſtic, ſpecies. Villars ſays the root may be uſed as a bliſter, inſtead of cantharides, but not ſo ſafely. It is moſt active in the ſpring, and muſt not then be left on the ſkin more than four or ſix hours, for fear of leaving a dangerous ſpreading ſore.

51. R. *hirſutus*. Pale Hairy Crowfoot. Curt. Lond. faſc. 2. t. 40. Fl. Brit. n. 8. Engl. Bot. t. 1504. Ait. n. 26. (R. Philonotis; Ehrh. Beitr. faſc. 2. 145. Herb. 116. Willd. n. 41. Lamarck Dict. n. 48. Purſh n. 13. R. ſardous; Crantz Auſtr. faſc. 2. 84. Lamarck Dict. n. 47. R. pallidior; Villars Dauph. v. 2. 751. R. bulboſus β; Hudſ. Angl. 241. R. rectus foliis pallidioribus, hirſutis; Bauh. Hiſt. v. 3. p. 2. 417. R. ſecundus; Matth. Valgr. v. 1. 559. R. paluſtris, apii folio lanuginoſus; Bauh. Pin. 180. Moriſ. ſect. 4. t. 29. f. 27 and 28.) —β. R. parvulus; Linn. Mant. 79. Fl. Brit. n. 11. Willd. n. 50. Ait. n. 31. Lamarck Dict. n. 73. R. agrarius; ib. n. 46? R. minimus ſaxatilis hirſutus; Bauh. Prodr. 96. R. minimus apulus; Column. Ecphr. 314. t. 316. f. 1.—Leaves ternate, notched. Stem erect, branched. Calyx reflexed. Seeds orbicular, compreſſed with a ſhort aſcending beak, bordered; tuberculated at the ſides.—Native of moiſt ground, in various parts of Europe, from Britain to Greece, flowering from June to October. The *root* is fibrous and annual. *Stem* erect, generally much branched, leafy, ſpreading, many-flowered, ſtriated, clothed with ſoft, widely ſpreading hairs; in variety β ſmaller, ſmoother and weaker, ſometimes, in a very ſtarved ſtate, bearing but one or two flowers. *Leaves* on longiſh, more or leſs hairy, *footſtalks*, pale green, hairy, ternate, varying much in ſize; their leaflets wedge-ſhaped, ſometimes deeply three-lobed, ſometimes only bluntly notched; upper ones narrower and more ſimple, nearly ſeſſile. *Stipulas* membranous, hairy, ſomewhat dilated, attached to the baſe of the footſtalks. *Flowers* on long, terminal, furrowed, hairy ſtalks, ſolitary, ſmaller than in *bulboſus*. *Calyx* hairy, reflexed. *Petals* roundiſh; of a bright ſhining yellow above; paler and opaque beneath. *Nectary* cloſed by an abrupt ſcale. *Fruit* globoſe. *Seeds* lenticular, compreſſed, brown, with a triple-ribbed greeniſh border; their beaks ſhort, aſcending, very obſcurely hooked; their ſides ſtudded with minute ſharp tubercles, eſpecially towards the margin, where they are often circularly arranged, as Poiret (or Lamarck)

Lamarck) deſcribes them in his *R. agrarius*, cited above.—This ſpecies has been very little underſtood. It is remarkable that any botaniſt ſhould confound it with *bulboſus*, or with *ſceleratus*, and that Mr. Curtis, in labouring to diſtinguiſh it, did not advert to the deciſive character of the tuberculated ſeeds, by which it approaches a very different tribe, hereafter deſcribed, conſiſting of *parviflorus*, *muricatus*, &c. Even Ehrhart has not noticed this circumſtance. We are obliged to Mr. Edward Forſter, F.L.S. for tracing out the identity of *R. parvulus* and *hirſutus*, and we cannot but prefer Curtis's original name for the ſpecies, rather than Ehrhart's pedantic one of later date. On the account of priority *ſardous* perhaps ought to have been retained; but this name is founded on a very dubious opinion, that the plant of which we are ſpeaking cauſed the Sardonic laugh. Valerius Cordus, indeed, ſays it grows copiouſly in Sardinia, and it has certainly the appearance of Smallage, *Apium*; ſo far anſwering to the ancient hiſtory. But the account of Cordus ſeems taken from Dioſcorides, whoſe "ſecond *Ranunculus*" is more probably the Linnæan *lanuginoſus*, a ſtill more general plant of the ſouth of Europe than that of which we are ſpeaking. After all, the famous Sardinian herb, compared to Smallage, may be actually wild Smallage or Celery, *Apium graveolens*, which is ſufficiently acrid and poiſonous to warrant our ſuppoſition, though it becomes ſweet and wholeſome by culture. In this uncertainty it is ſurely beſt to call our plant *R. hirſutus*.

52. R. *paluſtris*. Oriental Marſh Crowfoot. Linn. MSS. (R. orientalis paluſtris, apii folio, caule ſubhirſuto; Tourn. Cor. 20.)—Leaves hairy, in three or five deep ſegments, bluntly notched, with rounded dilated ſinuſes. Stem erect, branched, almoſt leafleſs. Calyx ſpreading. Seeds ovate, compreſſed, very ſmooth, with a ſhort recurved beak.—Native of the Levant. An oriental ſpecimen, with Tournefort's ſynonym, is preſerved in the Linnæan herbarium, and named *paluſtris*, but we can find no mention of it elſewhere. This is certainly a moſt diſtinct ſpecies, though not taken up by any recent author. The *root* conſiſts of many fleſhy knobs, tapering into fibres, and reſembling thoſe of *R. aſiaticus*, though not ſo thick. *Stem* two feet or more in height; hairy below; much branched, and almoſt leafleſs above; the branches ternate. *Leaves* chiefly radical, on long hairy ſtalks; their outline ſomewhat pentagonal; heart-ſhaped at the baſe; hairy on both ſides, about two inches wide; their three principal lobes ſpreading, deeply ſeparated by wide rounded ſinuſes, and notched unequally at the extremity with broad, rounded, abrupt teeth; the upper or floral leaves are ſmall, ſhort, linear, undivided. *Flowers*, as far as we can judge, yellow, not large. *Calyx* hairy, ſpreading widely, but ſcarcely reflexed. *Seeds* in a round head, brown, ſhining, quite ſmooth, compreſſed, moſt like thoſe of *bulboſus*, but more ovate, and with a longer, more recurved, and ſomewhat hooked, beak. Their edge is green, ſimple, not triple-ribbed as in the laſt.

53. R. *polyrhizos*. Many-rooted Siberian Crowfoot. Willd. n. 42. Lamarck Dict. n. 38.—Radical leaves palmate, with wedge-ſhaped, three-toothed ſegments; ſtem-leaves ſeſſile, fingered. Stems many-flowered. Root faſciculated. Calyx ſpreading. Seeds ovate, compreſſed, ſmooth, with a blunt beak.—Native of Siberia. *Root* faſciculated, perennial. *Radical leaves* like *R. ſceleratus*, three-lobed; their lateral lobes two-lobed, wedge-ſhaped like the leaf itſelf, their ſegments bluntly three-toothed. *Stems* a finger's length, ſimple, erect or aſcending, two or three from one root. *Stem-leaves* ſeſſile, fingered, wedge-ſhaped at the baſe; their ſegments linear, bluntiſh, entire. *Flower-ſtalks* two, three, or four, long, ſingle-flowered, round, not furrowed, very finely downy like the ſtem. *Calyx-leaves* coloured, ſmooth, obtuſe, ſpreading. *Petals* yellow, the ſize of *R. Flammula*. *Fruit* roundiſh. *Seeds* ovate, compreſſed, ſmooth, crowned with the permanent blunt *ſtigma*. *Willdenow*. By the above deſcription this ſpecies appears related, in many points, to the laſt, though they can hardly be the ſame.

54. R. *repens*. Common Creeping Crowfoot. Linn. Sp. Pl. 779. Willd. n. 43. Ait. n. 27. Purſh n. 14. Fl. Brit. n. 9. Engl. Bot. t. 516. Curt. Lond. faſc. 4. t. 38. Mart. Ruſt. t. 29. (R. pratenſis, etiamque hortenſis; Ger. Em. 951.)—Leaves ternate, three-cleft, cut, hairy. Stems aſcending. Runners creeping. Flower-ſtalks furrowed. Calyx hairy, ſpreading. Seeds ovate, compreſſed, even.—Very common in meadows, waſte ground, church-yards, neglected gardens and fields, throughout Europe. Mr. Purſh obſerved it in ſhady wet woods, particularly on the mountains, from Penſylvania to Virginia. It flowers from June to Auguſt, and is perennial, being often a troubleſome weed. *Root* fibrous. Beſides the upright *ſtems*, which are of humble growth, leafy, branched, bearing ſeveral flowers, the root ſends forth long trailing creeping ſhoots, whoſe joints produce leaves, and ſome ſhorter ſimpler ſtems. The whole *herb* is rough and hairy, of a dark green. *Leaves* ſtalked, ternate, more or leſs three-cleft, ſharply cut or toothed; often marked with dark purple, or black, ſometimes pale, ſpots; the uppermoſt linear-lanceolate and entire. *Calyx* hairy, ſpreading, not reflexed. *Petals* deep yellow, generally emarginate. *Nectary* covered by a heart-ſhaped ſcale. *Fruit* globoſe. *Seeds* ovate, compreſſed, ſmooth at the ſides, often hairy at the edge, their beak ſhort and blunt.

55. R. *proſtratus*. Proſtrate Crowfoot. Lamarck Dict. n. 35. Fl. Francoiſe, n. 3. 197.—Leaves ternate, three-cleft, very hairy. Stems entirely proſtrate, creeping, zig-zag. Calyx ſmooth.—Native of dry hilly places about Paris. Lamarck and Poiret eſteem this a diſtinct ſpecies from the laſt, not only becauſe its herbage is much ſmaller and more hairy, but becauſe the *ſtems* are, even when in flower, entirely proſtrate. We have never met with any thing anſwering to this deſcription in England. The *flowers* are ſaid to reſemble *repens*, having likewiſe a ſmooth *calyx*. Our *repens* has hairs on that part.

56. Q. *intermedius*. Intermediate Crowfoot. Lamarck Dict. n. 44.—Lower leaves three-lobed, cut; upper ſomewhat fingered. Flower-ſtalks moſtly ſolitary. Calyx reflexed. Seeds compreſſed, ſmooth. Root fibrous.—Found at the borders of ponds in France, about Paris and at Fontainebleau. This plant, according to Poiret, is, as it were, intermediate between *bulboſus* and *repens*, having, beſides, many characters in common with *proſtratus*. The *root* is fibrous, faſciculated. *Stems* ſeveral, low, ſcarcely branched, almoſt leafleſs except at the bottom, weak, ſtriated, ſlightly downy, often forked above. *Radical leaves* on long ſtalks, almoſt ſmooth, in three rounded, often cut, lobes; the *ſtem-leaves* have three linear or lanceolate irregular lobes; the uppermoſt are very narrow, almoſt fingered. *Flowers* axillary, or terminal, two or three on each branch, on very long and ſlender, nearly ſmooth, ſtalks. *Calyx-leaves* reflexed at the time of flowering, as in *bulboſus*, coloured, concave, bearing ſome very fine long hairs. *Petals* of a fine yellow, ſtriated, middle-ſized. *Fruit* oval or globoſe. *Seeds* ſmooth, compreſſed, roundiſh, with a green border. We know nothing of this ſpecies but from the above deſcription.

57. R. *lucidus*. Shining-leaved Crowfoot. Lamarck Dict. n. 36.—Leaves with three or five lobes, ſomewhat pinnatifid, ſhining, ſmooth. Stem erect, many-flowered. Calyx reflexed.—Suppoſed to be a native of the Levant; cultivated

in

in the botanic garden at Paris. *Root* perennial. *Stems* one or two feet high, branched, leafy, very ſmooth, tender, ſtriated. *Leaves* alternate, ſtalked, widely ſpreading, ſmooth, ſhining as if varniſhed on their upper ſurface, divided into three or five diſtant dilated lobes, the two lowermoſt contracted at their baſe, unequally cut, obtuſe. *Footſtalks* long, ſomewhat downy, dilated at their baſe into a broad membranous expanſion. *Flowers* numerous, ſituated at the ends, as well as in the forks, of the *branches*, on long, ſimple, cylindrical, rather downy *ſtalks*. *Calyx-leaves* coloured, ſmooth, concave, reflexed after the flower expands. *Petals* rather large, roundiſh, of a fine ſhining yellow. This plant has ſome agreement with *R. repens*, from which it differs in having entirely upright *ſtems* and a reflexed *calyx*, as well as ſhorter more dilated lobes to the *leaves*. Such is Poiret's account. This ſurely cannot be our *paluſtris*, n. 52, which has hairy *leaves*, and no reſemblance or affinity to *repens*; neither could the intelligent author have overlooked Tournefort's ſynonym for that plant.

58. R. *polyanthemos*. Many-flowered Crowfoot. Linn. Sp. Pl. 779. Fl. Suec. ed. 2. 196. Willd. n. 44. Ait. n. 28. Lamarck n. 41. Lob. Ic. 666. (R. ſylveſtris ſecundus; Dod. Pempt. 427. R. ſurrectis cauliculis; Ger. Em. 951, as to the figure. R. ſylveſtris; Tabern. Kreuterb. 107. Ic. 42. R. napellifolius; Crantz faſc. 3. 90. t. 4. f. 1, 1?)—Leaves in five deep, repeatedly ſubdivided lobes; ſegments all linear. Stem erect, many-flowered. Flower-ſtalks furrowed. Calyx ſpreading. Seeds ovate, bordered, compreſſed, ſmooth.—Native of moiſt, elevated, rich meadows, in Upland, and elſewhere in Sweden, but rarely. *Linnæus*. In Germany, and perhaps in Switzerland, on the authority of various writers. *Root* perennial. *Stem* erect, two or three feet high, branched, many-flowered; leafy, clothed with upright, or ſomewhat ſpreading, hairs. *Radical* and lower *ſtem-leaves* three inches wide, on long very hairy ſtalks, divided to the very baſe into three lobes, the lateral lobes again divided almoſt to the baſe, ſo that the leaf may truly be called, in the firſt inſtance, five-lobed; each lobe is deeply, more or leſs repeatedly, cut, into three-cleft or alternate, linear, bluntiſh, entire, ſingle-ribbed, ſpreading ſegments, looſely hairy on both ſides, paler beneath: the uppermoſt leaves are nearly ſeſſile, in about three deep, linear, entire diviſions. *Flower-ſtalks* long, terminal, angular or furrowed, rough with upright hairs. *Flowers* large, yellow, drooping, not cloſing, in wet weather, according to Linnæus. *Calyx* ſpreading, pale, externally hairy. *Fruit* globoſe. *Seeds* ovate, ſhort, compreſſed, ſmooth at the ſides, bordered and roughiſh at the edges, tipped with a broad, ſhort, recurved beak. We have deſcribed this from the authentic Linnæan ſpecimen, which ſeems diſtinct from the following, and anſwers extremely well to the figure of Tabernæmontanus more eſpecially, nor does it ill accord with that of Dodonæus, reprinted in Gerarde's herbal. The laſt-named author however certainly applies that figure to the common Engliſh *R. acris*, which he ſays he found double. Hence ſome doubt may ariſe whether the true *polyanthemos* was ever cultivated in England, as it ſeems to depend on Gerarde's authority only for a place in Hort. Kew. We have never ſeen it alive. Poſſibly it may be found in a double ſtate in ſome old garden. The above deſcription of the *leaves*, and the greater ſize of the whole plant, will diſtinguiſh it from *acris*. The *calyx* is hairy in both, notwithſtanding Willdenow's remark to the contrary.

59. R. *acris*. Upright Meadow Crowfoot. Linn. Sp. Pl. 779. Willd. n. 45. Ait. n. 29. Purſh n. 15. Fl. Brit. n. 10. Engl. Bot. t. 652. Curt. Lond. faſc. 1. t. 39. Mart. Ruſt. t. 30. Woodv. Suppl. t. 246. Bulliard. t. 109. Curt. Mag. t. 215. (R. hortenſis ſecundus; Dod. Pempt. 426. R. pratenſis, ſurrectis cauliculis; Lob. Ic. 665. R. luteus; Trag. Hiſt. 94.)—Leaves in three deep, wedge-ſhaped, many-cleft, jagged lobes; the lateral ones deeply divided. Stem erect, many-flowered. Flower-ſtalks round. Calyx ſpreading. Seeds ovate, bordered, compreſſed, ſmooth. —Native of meadows and paſtures in all the more northern countries of Europe, very common in England, flowering in June and July. The double-flowered variety is frequent in gardens. The *root* is perennial, tuberous, with long ſimple fibres. *Stem* erect, two feet high, round, ſtriated, rough with ſpreading hairs below, and with cloſe-preſſed ones above, branched, ſlightly leafy. *Leaves* hairy, far leſs divided than in the laſt, and with broader, wedge-ſhaped, by no means linear, ſegments: the upper ones linear, either deeply three-cleft, or ſimple. *Flower-ſtalks* round, not furrowed. *Calyx* green, ſpreading, hairy. *Petals* bright ſhining yellow. *Fruit* globoſe. *Seeds* much like the laſt.

A dwarf alpine variety was brought by Mr. Dawſon Turner from wet rocks, near the ſummit of Snowdon, whoſe *ſtem* is but three or four inches high, and bears but one or two *flowers*. This when cultivated in a garden gradually aſſumes the ſize and habit of the common kind.

60. R. *Breyninus*. Woolly-fruited Alpine Crowfoot. Crantz Auſtr. faſc. 2. 91. t. 4. f. 2. (R. Breyniſius, by miſtake; Lamarck Dict. n. 59. R. n. 1170; Hall. Hiſt. v. 2. 72.)—Leaves deeply three-lobed, cut and toothed, very hairy beneath. Stems ſpreading, few-flowered. Calyx ſpreading. Seeds ſmooth. Receptacle woolly.—Native of the Auſtrian and Swiſs Alps. Haller ſays it is the ſmalleſt of all the ſpecies. The *ſtems* are ſeveral, two or three inches high, oblique, ſimple or ſomewhat branched, hairy, bearing one or two *flowers*, which are of a varniſhed yellow. *Radical leaves* numerous, leſs deeply divided than in *acris*, very hairy beneath. *Fruit* globular. *Seeds* ſmooth, hooked. *Receptacle* woolly, which Crantz ſays he had not obſerved in other ſpecies, and by which we preſume this is moſt eſſentially diſtinguiſhed, particularly from the above alpine variety of *acris*. We have not met with a ſpecimen, nor was Mr. Davall acquainted with the plant of Haller.

61. R. *lappaceus*. Bur Crowfoot.—Leaves ternate; leaflets ſtalked, three-lobed, ſharply cut, hairy. Stem erect, many-flowered. Calyx ſpreading. Seeds ovate, keeled, reticulated, with elongated, revolute-pointed beaks.—Native of Port Jackſon, New South Wales; communicated by Dr. White. This has much of the habit of *R. acris*, but is very diſtinct. The *ſtems* are a foot, or more, in height, branched, roundiſh, rough with cloſe-preſſed hairs. *Radical leaves* numerous, on long hairy ſtalks, very hairy, about the ſize of *acris* or *repens*, but remarkable for the partial ſtalks, ſometimes an inch or two long, that ſupport the leaflets, eſpecially the terminal one; the *leaflets* are broad, wedge-ſhaped, more or leſs deeply three-lobed, coarſely and ſharply cut. The lower *ſtem-leaves* are narrower and leſs cut; the upper entire and lanceolate; the uppermoſt of all ſimple and linear. *Flowers* larger than in *acris*, white in the dried ſpecimen, but perhaps yellow when freſh, finely veined, on long, hairy, angular, terminal ſtalks. *Calyx* ſpreading, clothed with long hairs. *Nectary* covered with a wedge-ſhaped ſcale. *Fruit* globoſe. *Seeds* ovate, turgid, keeled, reticulated with veins, ſmooth, each tipped with a prominent angular beak, nearly its own length, whoſe point is ſtrongly recurved, and even revolute.

62. R. *cappadocicus*. Cappadocian Crowfoot. Willd. n. 46. Lamarck Dict. n. 39. (R. orientalis dulcis, doronici radice; Tourn. Cor. 20.)—"Calyx ſpreading. Flower-

ſtalk round. Stem ſimple or divided. Leaves heart-ſhaped, three-lobed, toothed."—Native of Cappadocia. *Root* perennial, hard, the thickneſs of a goofe-quill, and reſembling the root of *Doronicum*. *Radical leaves* roundiſh-heart-ſhaped, with three very ſhort lobes, all pointed, furniſhed with a few coarſe teeth, and clothed on both ſides with ſcattered cloſe-preſſed hairs. *Stem-leaf* ſolitary, ſtalked as well as the radical ones; and in the middle of the flower-ſtalk is a ſmall, ſeſſile, lanceolate, entire leaf. *Stem* a ſpan high, clothed with cloſe-preſſed hairs, either ſimple, or divided above the leaf, each ſtalk ſingle-flowered. *Corolla* yellow, the ſize of *R. polyanthemos*. *Fruit* roundiſh. *Seeds* compreſſed, hooked. *Willdenow*, from a dried ſpecimen.

63. R. *lanuginoſus*. Broad-downy-leaved Crowfoot. Linn. Sp. Pl. 779. Willd. n. 47. Ait. n. 30. Purſh n. 16. Fl. Dan. t. 397. Sm. Fl. Græc. Sibth. t. 519, unpubliſhed. (R. montanus ſubhirſutus latifolius; Bauh. Prodr. 96. R. nemoroſus hirſutus, foliis caryophyllatæ; Loeſ. Pruſſ. 220. t. 71. R. magnus valdè hirſutus, flore luteo; Bauh. Hiſt. v. 3. 417. R. n. 1172; Hall. Hiſt. v. 2. 73. Βαλραχιον ἱερον; Dioſc. book 2. chap. 206.)—Leaves heart-ſhaped, five-cleft, lobed, notched, ſilky. Stem erect, many-flowered, hairy. Flower-ſtalks round. Calyx ſpreading. Seeds ovate, compreſſed, with elongated, revolute-pointed beaks.—Native of Germany, France, Switzerland, Carniola, Greece, and North America. Mr. Purſh obſerved it in old fields and meadows, from Penſylvania to Carolina, flowering from June to October. Dr. Sibthorp found it in ſhady watery ſituations in the Peloponneſus, but moſt plentifully in the north of Greece, and with great reaſon concluded it to be the ſecond *Ranunculus* of Dioſcorides, with whoſe deſcription it ſufficiently well agrees, except being mild, rather than very acrid, in ſenſible qualities, if we may truſt modern authors. Linnæus diſtinguiſhes two varieties, between which we can diſcover no difference, and Haller unites them. The opinion of this great Swiſs botaniſt however loſes ſome of its weight, by the doubt he expreſſes whether this plant be diſtinct from *R. repens*, n. 54, to which it has indeed a ſlight general reſemblance, though differing totally in its upright *ſtem*, deſtitute of runners; its very ſoft ſilky *leaves*, by which this plant is known at once from every other European *Ranunculus*; and the revolute taper points of its *ſeeds*, which nearly agree with *lappaceus* in that reſpect; but the *ſeeds* themſelves are compreſſed, and, as far as we can ſee, deſtitute of reticulated veins. The *root* is perennial, with many long, ſtout, cylindrical, fleſhy fibres, or perhaps ſlender knobs, intermixed with capillary branched radicles. *Stem* 12 or 18 inches high, branched, leafy, round, clothed with long, ſpreading or deflexed, hairs; its baſe purpliſh, as are alſo the long hairy *footſtalks* of the radical *leaves*. Theſe and the lower *ſtem-leaves* are three inches wide, divided about half way down into five or ſeven broad, ſharply notched lobes, whoſe cloſe ſinuſes have a pale ſpot, with a purple ſtain, adjoining to their termination. The upper *leaves* are deeply three-cleft, with ovate and toothed, or lanceolate and entire, lobes. *Flowers* yellow, much like thoſe of *acris*. *Calyx* hairy, ſpreading. *Fruit* globoſe. *Seeds* with awl-ſhaped, ſtrongly revolute beaks, by which this ſpecies is clearly diſtinguiſhable from *repens*, *polyanthemos*, *acris*, if ſuch a mark were neceſſary, and by which it forms a chain of affinity between thoſe ſpecies and our *lappaceus*. It is ſomewhat remarkable that *R. lanuginoſus* has not been found in Britain, and ſtill more ſo, that any obſcurity ſhould envelope the botanical hiſtory of ſo diſtinct a ſpecies.

64. R. *ſericeus*. Silky Crowfoot. Lamarck Dict. n. 26.—Leaves ternate, very ſilky; leaflets wedge-ſhaped, deeply three-cleft, jagged and toothed. Stem erect, many-flowered, ſilky. Calyx ſpreading. Seeds ovate, compreſſed, with ſhort erect beaks.—Gathered in the iſle of Bourbon by Commerſon, from whom we have ſpecimens. *Root*, as well as the general habit and ſize of the *plant*, like the laſt, but the whole herb is much more denſely clothed with ſhining ſilky hairs. The *leaves* are ternate, ſome of them almoſt twice ternate; their lobes deeply and repeatedly cut, in a radiant manner, with ſharp teeth. *Flowers* like the laſt. *Fruit* ovate. *Seeds* with broad ſtraight beaks, longer, and not ſo much curved or hooked, as even thoſe of *acris*.

65. R. *tomentoſus*. Shaggy Crowfoot. Lamarck Dict. n. 70. Purſh n. 17.—Leaves downy, three-lobed or notched; the uppermoſt oval, entire. Stem reclining, ſomewhat creeping, ſhaggy, one or two-flowered. Calyx hiſpid, ſlightly reflexed.—Gathered in North Carolina, by M. Boſc. A ſmall, almoſt creeping, very hairy plant, with fibrous *roots*. The *ſtems* are very low, and nearly proſtrate, aſcending at their extremities, two or three inches long, tender, covered with whitiſh tufted hairs, diſpoſed in two rows. *Leaves* ſtalked, thick, downy, generally with three lobes, which are either diſtinct or confluent; ſome leaves are merely crenate and rounded. *Footſtalks* long and hairy. The uppermoſt *ſtem-leaf* is ſeſſile, oval, acute, entire. *Flowers* one or two, on terminal, unequal, ſimple *ſtalks*, clothed with two rows of hairs. *Calyx* hiſpid, a little reflexed. *Petals* white or yellowiſh, rounded at the end. *Poiret*. We have ſeen no ſpecimen, nor did Mr. Purſh meet with the plant himſelf.

66. R. *marylandicus*. Maryland Crowfoot. Lamarck Dict. n. 69. Purſh n. 18. Leaves ternate, three-lobed, acute, cut, pale and nearly ſmooth beneath. Stem ſimple, almoſt naked, downy. Calyx ſmooth, reflexed.—Found in ſhady woods, from Penſylvania to Virginia, flowering from May to July. *Purſh*. *Root* fibrous, perennial. *Stems* ſimple, erect, downy, ſlender, about ten inches high; Poiret by miſtake, as we preſume, ſays ten feet. *Leaves* radical, on long downy ſtalks, ternate; the two lateral ones oppoſite, ſtalked; all with three confluent, lanceolate, acute, cut lobes; their upper ſurface green; the under paler and whitiſh, almoſt ſmooth. There are no other *ſtem-leaves* than what ſtand almoſt ſeſſile, at the baſe of the flower-ſtalks, and either have three or five ſhallow irregular lobes, or are ſimply cut. *Flowers* two or three, terminal, on ſhort, ſcarcely downy, ſtalks. *Calyx* ſmooth, reflexed. *Petals* rather large, oval, rounded at the end, pale yellow. *Poiret*.

67. R. *recurvatus*. Recurved Crowfoot. Lamarck Dict. n. 65. Purſh n. 19.—Leaves in three deep, acute, cut, wedge-ſhaped lobes. Stem many-flowered. Calyx and corolla reflexed. Petals nearly linear. Seeds compreſſed, dotted, with revolute, awl-ſhaped beaks.—Native of ſhady woods, from New York to Carolina, flowering from June to Auguſt. *Purſh*. We received ſpecimens from the Rev. Dr. Muhlenberg, of Lancaſter, Penſylvania. The *root* is perennial. *Stems* a ſpan high, very hairy; branched and leafy at the upper part. *Leaves* two or three inches wide, rather hairy, on very hairy ſtalks; their ſide-lobes for the moſt part deeply cloven. *Flowers* ſtalked, ſmall. *Calyx* pale-purpliſh, ribbed, clothed with fine long hairs. *Petals* ſmall, narrow, almoſt white. *Fruit* globoſe. *Seeds* ovate, lenticular, minutely dotted, ſmooth, with ſlender, revolute-pointed beaks.

68. R. *ſeptentrionalis*. Smooth North-American Crowfoot. Lamarck Dict. n. 64. Purſh n. 20.—Leaves ternate, membranous, ſmooth, deeply lobed, acute, cut. Stem two-flowered, hairy, like the baſe of the footſtalks. Calyx

 reflexed.

reflexed.—Native of North America. Deſcribed by Poiret from Lamarck's herbarium, and adopted by Purſh. *Root* perennial, fibrous, faſciculated. *Stems* nearly ſimple, hollow, eight or ten inches high, almoſt leafleſs; downy in their lower part. *Leaves* ſtalked, thin, ſmooth, compoſed of three ſtalked leaflets, the central one having three deep ſpreading lobes, the others often but two; all ſharp, cut and toothed. There is uſually but one *ſtem-leaf*, which is nearly ſeſſile, ternate, with narrower ſegments. *Footſtalks* long, ſlender, moſt hairy towards their baſe. *Flower-ſtalks* two, terminal, unequal, very ſlender, ſmooth, each bearing, about half way up, one ſmall linear leaf. *Calyx* reflexed, coloured, ſmooth, except a few terminal hairs, deciduous. *Petals* pale yellow, rounded. *Fruit* ſmall, globular. *Seeds* nearly orbicular, lenticular, with ſharp ſtraight beaks. *Poiret.*

69. R. *hiſpidus*. Hiſpid American Crowfoot. Michaux Boreal-Amer. v. 1. 321. Lamarck Dict. n. 27. Purſh n. 21.—Very hairy, erect. Leaves ternate, ſharply lobed. Stems few-flowered; leafleſs below. Calyx cloſe-preſſed. Seeds obovate, with awl-ſhaped, inflexed beaks. Found in wet fields, and on the banks of ditches, from Virginia to Carolina, flowering from June to Auguſt. *Root* perennial. *Flowers* ſmall, pale yellow. *Purſh.* A ſpecimen ſent by Gronovius to Linnæus, as akin to his *lanuginoſus*, but diſtinct, anſwers very well to the characters of Michaux, and we have taken from that ſpecimen the above account of the *ſeeds*. The *flower* is nearly as big as *acris*. Whole herbage, eſpecially the *footſtalks*, very hairy.

70. R. *pinnatus*. Pinnated Indian Crowfoot. Poiret in Lam. Dict. n. 66.—"Downy. Leaves pinnated; leaflets lobed and cut. Branches ſpreading. Seeds tuberculated."—Gathered in India by Sonnerat. *Stems* with lax, ſpreading, downy, ſtriated, leafy *branches*. *Leaves* alternate, ſtalked, downy, of five or ſeven oppoſite *leaflets*, divided into irregular, ſharp, cut, almoſt lanceolate, lobes. *Flowers* numerous, on long, downy, ſingle-flowered ſtalks. *Calyx* coloured, not reflexed. *Petals* yellowiſh, of a middling ſize. *Seeds* orbicular, convex, moderately tuberculated on each ſide, and tipped with a ſmall, thick, ſtraightiſh beak. *Poiret.*

71. R. *multifidus*. Many-cleft Arabian Crowfoot.—Forſk. Ægypt-Arab. 102. Lamarck Dict. n. 67.—"Leaves many-cleft; the lower ones pinnated. Stem many-flowered. Calyx the length of the corolla. Seeds ovate, acute.—Gathered by Forſkall, in ditches near the town of Taes. He deſcribes the *ſtem* two feet high, erect; round in the lower part; ſtriated above; hairy. *Fruit* oval. We have no other authority, than the authors quoted, for this ſpecies or the laſt.

72. R. *pedatifidus*. Radiating-leaved Crowfoot.—Leaves deeply pedatifid, with linear, obtuſe, divided or three-cleft, radiating, entire ſegments. Stem one or two-flowered. Seeds ovate, hairy, with ſmall recurved beaks.—Native of Siberia. Four ſpecimens from that country are in the Linnæan herbarium, but the ſpecies, though very diſtinct, appears never to have been deſcribed. *Root* perennial, of many long, cylindrical, fleſhy fibres, and crowned with numerous capillary remains of old footſtalks. *Stem* a ſpan high, erect, round, ſtriated, leafy, ſimple or divided, clothed with long, ſoft, lax hairs. *Radical leaves* on long hairy ſtalks, deeply cut, in a pedate manner, into five, ſeven, or more, narrow, linear, obtuſe, elegantly radiating ſegments, ſome of which are deeply three-cleft, and their lobes again cloven, others merely divided, and others undivided; all entire at the edges, and ſomewhat hairy on both ſides, with long, lax, white hairs. The *ſtem-leaves* are moſtly ſeſſile, leſs divided; the uppermoſt in three, rarely more, deep, linear, ſimple ſegments. *Flowers* apparently yellow, the ſize of *R. acris*. *Calyx* woolly at the baſe; its ſegments partly dilated and coloured, all ſhorter than the *petals*, and cloſely preſſed to their under ſide. *Fruit* ovate. *Seeds* not very numerous, ovate, tumid, hairy, with ſhort, awl-ſhaped, reflexed beaks.

73. R. *chærophyllos*. Chervil Crowfoot. Linn. Sp. Pl. 780. Willd. n. 48. Lamarck Dict. n. 32. (R. tenuifolius luteus, grumoſâ radice, ſoractenſis ſeu italicus; Barrel. Ic. t. 581? bad.)—Leaves thrice compound, with linear ſegments. Stem ſilky, with few flowers. Calyx reflexed, hairy. Root with tapering fleſhy fibres.—Native of the ſouth of Europe. The only certain ſpecimen of this plant, that has ever come under our obſervation, exiſts in the Linnæan herbarium. The *root* conſiſts of numerous, long, fleſhy, gradually tapering, downy fibres. *Stem* erect, about a ſpan high, ſlender, ſilky, ſlightly leafy, branched, bearing three or four flowers. *Radical leaves* ſeveral, ſtalked, repeatedly ternate, with numerous linear, or ſomewhat lanceolate, entire ſegments, hairy beneath. *Footſtalks* an inch and half long, hairy; dilated, membranous, and ribbed at the baſe. *Stem-leaves* few, much leſs compound, and often nearly ſeſſile. *Flowers* ſolitary, on long, terminal, ſimple, hairy, quadrangular ſtalks. *Calyx* ſtrongly reflexed, coloured; externally hairy. *Petals* yellow. *Fruit* not ſufficiently advanced to be deſcribed. At the back of this ſpecimen Linnæus has written *Ranunculus lybicus, pulſatillæ folio, T. Cor.*; but there is no ſuch paſſage in Tournefort's *Corolla*, nor any thing to which it can refer, except *R. leſbius, pulſatillæ folio, flore parvo*, a ſpecies unknown to us. A very different plant from the true *R. chærophyllos*, was given by the abbè Pourret to the younger Linnæus, under that name. It ſeems rather to be *flabellatus*, n. 32, a ſpecies allied, in many points, to what we are deſcribing.

74. R. *millefoliatus*. Milfoil Crowfoot. Vahl. Symb. v. 2. 63. t. 37. Desfont. Atlant. v. 1. 441. t. 116. Willd. n. 49. Lamarck Dict. n. 33. Sm. Fl. Græc. Sibth. t. 521, unpubliſhed. (R. montanus leptophyllon, aſphodeli radice; Column. Ecphr. 312. t. 311.)—Leaves thrice compound, with elliptic-linear ſegments. Stem ſilky, with few flowers. Calyx erect, ſomewhat hairy. Root with ovate knobs.—Native of Italy, Greece, Syria, and Barbary. The *root*, in Dr. Sibthorp's ſpecimens, conſiſts of many oval fleſhy knobs, ſcarcely half an inch long, intermixed with fibres. Columna deſcribes and delineates the fibres as terminating the knobs; a very material difference. The *ſtems*, in the Greek and Italian ſpecimens, are ſimple and ſingle-flowered; in the more luxuriant ones from Aleppo and Tunis, ſomewhat branched, bearing two or three flowers. The *ſtem-leaves* are more numerous, as well as more compound, than in the laſt. *Flowers* large. *Calyx* cloſely preſſed to the corolla; ſometimes nearly ſmooth. *Fruit* oblong. *Seeds* with ſmall recurved beaks. We can ſcarcely doubt, notwithſtanding the above-mentioned diverſity reſpecting the *root*, that the ſynonym of Columna belongs to the preſent, rather than the foregoing, ſpecies.

75. R. *oxyſpermus*. Sharp-ſeeded Crowfoot. Willd. n. 51. Lamarck Dict. n. 37.—"Radical leaves oblong, obtuſe, deeply and unequally toothed; ſtem-leaves ſeſſile, fingered, cut. Seeds awned."—Native of Siberia, near the river Tereck. *Root* apparently annual. *Radical leaves* ſtalked, ovate, obtuſe, with unequal deep teeth; hairy, like their *footſtalks*, on both ſides. *Stem* erect, branched, hairy, a foot or more in height. *Stem-leaves* digitate; the ſegments of the lower ones unequally pinnatifid; of the upper linear and entire. *Calyx* reflexed. *Corolla* yellow, the ſize of *R. bulboſus*. *Fruit* elliptical. *Seeds* rather compreſſed, acute,

acute, with upright, awl-ſhaped, briſtly points. *Willdenow.*

76. R. *arvenſis.* Corn Crowfoot. Linn. Sp. Pl. 780. Willd. n. 52. Ait. n. 32. Fl. Brit. n. 12. Engl. Bot. t. 135. Curt. Lond. faſc. 6. t. 36. Mart. Ruſt. t. 56. Fl. Dan. t. 219. Bulliard. t. 117. Brugnon Mem. de l'Acad. de Turin, v. 4. 108. t. 3. (R. arvorum; Ger. Em. 951.)—Leaves ternate, three-cleft, with linear ſegments. Seeds prickly at each ſide. Stem erect.—Frequent in corn-fields throughout Europe, flowering in the middle of ſummer. *Root* fibrous, annual. *Stem* one or two feet high, much branched, many-flowered, leafy, nearly ſmooth. *Leaves* of a light green, ſlightly hairy, ſtalked, once or twice ternate, as well as deeply three-cleft; the ultimate ſegments almoſt linear, entire, or rarely notched. *Flowers* ſmall, lemon-coloured, ſtalked, lateral and terminal. *Calyx* ſpreading, hairy. *Petals* obovate, veined. *Fruit* depreſſed. *Seeds* very large, compreſſed, with erect, awl-ſhaped, hooked beaks; their ſides armed with numerous, prominent, awl-ſhaped prickles, largeſt towards the margin. From the obſervations of M. Brugnon, this appears to be one of the moſt virulent of its genus, eſpecially when young, cauſing ſpeedy inflammation and gangrene in the ſtomachs of ſheep and oxen; who nevertheleſs eat it with avidity. Vinegar much diluted with water, poured down their throats, proved a quick and certain remedy. The expreſſed juice of the plant, given to dogs, is no leſs fatal.

77. R. *muricatus.* Spreading Prickly-ſeeded Crowfoot. Linn. Sp. Pl. 780. Willd. n. 53. Lamarck Dict. n. 75. Ait. n. 33. Purſh n. 24. Sm. Fl. Græc. Sibth. t. 522, unpubliſhed. (R. creticus echinatus latifolius; Alpin. Exot. 263. t. 262. R. Apulei quibuſdam; Cluſ. Hiſt. v. 1. 233. R. parvus echinatus; Ger. Em. 965. R. paluſtris echinatus; Bauh. Hiſt. v. 3. 846. Feuill. Peruv. 58. t. 18. f. 1.)—Leaves ſimple, three-lobed, notched, bluntiſh, ſmooth. Stipulas diſtantly fringed. Seeds prickly at each ſide. Stem diffuſe.—Native of watery places in various parts of the ſouth of Europe; frequent in Greece. It occurs alſo in North Ameriea, in old fields, from Virginia to Carolina, flowering in June and July, according to Mr. Purſh. The *root* is annual, conſiſting of numerous long fibres. *Herb* ſmooth and ſucculent, bright green. *Stems* ſeveral, various in length, ſpreading, and moſtly procumbent, leafy, round, ſhining; purpliſh in the lower part. *Leaves* an inch and a half to three inches wide, veiny, in three rather deep lobes, broadly and irregularly notched. *Footſtalks* from one to four inches, or more, in length, with a concave ſheathing baſe, bordered with a membranous *ſtipula*, whoſe edges are regularly fringed with diſtant hairs. *Flowers* the ſize of the laſt, yellow, ſolitary, on axillary ſtalks, rather ſhorter than the leaves. *Calyx* reflexed, nearly, or quite, ſmooth. *Petals* obovate, almoſt twice as long as the calyx, at leaſt in the European ſpecimens, though they appear to be but of the ſame length in American ones. *Fruit* capitate. *Seeds* large, ovate, compreſſed, with broad, awl-ſhaped, angular, ſomewhat recurved beaks; their ſides covered with ſmaller, more uniform prickles, than in *R. arvenſis.* Commerſon gathered, by the ſea-ſhore at Monte Video, a variety of this with more luxuriant herbage, and ſmaller flowers, of which Ventenat makes a ſpecies of the name of *ventricoſus*, founding its character on the inflated baſes of the *footſtalks*, of which, however, we can ſee nothing, in our original ſpecimens from Thouin's herbarium. Its *ſtipulas* are fringed preciſely as in our European *muricatus*, to which we agree with Poiret in referring it, though we can ſcarcely do the ſame by the following.

78. R. *echinatus.* Dwarf Prickly-ſeeded Crowfoot. Venten. Jard. de Cels t. 73. Purſh n. 25. (R. muricatus γ; Lamarck Dict. n. 75.)—Leaves ſimple, three-lobed, notched, ſmooth. Stipulas bearded at the ſummit. Seeds prickly at each ſide. Stem erect, branched.—Found by M. Boſc, near Charleſtown, South Carolina. This ſeems to differ from the laſt, in its ſimple, ſhort, upright *ſtem*; but more eſpecially, if Ventenat's plate and deſcription be correct, which we cannot doubt, in having each *ſtipula* crowned with a tuft of hairs, inſtead of being diſtantly fringed throughout. The *petals* are ſaid to be larger than thoſe of the American variety, at leaſt, of *muricatus*; but that circumſtance is of ſmall moment here, as to a ſpecific diſtinction.

79. R. *parviflorus.* Small-flowered Crowfoot. Linn. Sp. Pl. 780. Willd. n. 54. Ait. n. 34. Fl. Brit. n. 13. Engl. Bot. t. 120. (R. hirſutus annuus, flore minimo; Raii Syn. 248. t. 12. f. 1. Pluk. Phyt. t. 55. f. 1.)—Leaves ſimple, three-lobed, notched, hairy. Seeds covered, at each ſide, with hooked prickles; their beaks recurved. Stem diffuſe.—Native of the more temperate parts of Europe. Found on banks, and in waſte as well as cultivated ground, in England, where the ſoil is gravelly; as alſo in Greece, flowering in the early part of ſummer. The *root* is annual. *Stems* proſtrate. Whole herb hairy, ſmaller in every part than *R. muricatus.* *Flower-ſtalks* oppoſite to the leaves. *Petals* pale yellow, ſcarcely longer than the ſpreading *calyx*, fugacious, and often imperfect. *Fruit* capitate. *Seeds* ovate, with a broad, ſhort, hooked beak, their flat brown ſides denſely covered with ſhort, hooked prickles. *R. trilobus*, Desfont. Atlant. v. 1. 437. t. 113. Lamarck Dict. n. 77, ſeems a variety, not of this, but of our *hirſutus*, n. 51.

80. R. *orientalis.* Spinous Oriental Crowfoot. Linn. Sp. Pl. 781. Willd. n. 55. Lamarck Dict. n. 71. (R. leſbius, pulſatillæ folio, flore magno; Tourn. Cor. 20.)—Leaves deeply laciniated, acute; all ſtalked. Stem branched. Calyx reflexed. Fruit cylindrical. Seeds dotted; their beaks recurved and ſpinous.—Native of the Levant. *Root* annual. *Stem* various in luxuriance, ſilky, leafy; in the Linnæan ſpecimen much branched and divaricated, with many flowers. *Leaves* ſtalked, compoſed in general of three deeply laciniated, often pinnatifid, acute, hairy leaflets. *Flowers* large, pale yellow, on long, ſtout, ſimple, lateral or terminal, ſolitary, ſpreading ſtalks. *Calyx* rather ſpreading than decidedly reflexed, nearly ſmooth. *Fruit* three quarters of an inch long, ſlightly elliptical, obtuſe. *Seeds* in many rows, compreſſed, minutely dotted at each ſide, gibbous at the baſe, each terminating in a very broad, rather ſhort, compreſſed, recurved, ſpinous-pointed beak. We know of no figure of this or the following.

81. R. *grandiflorus.* Large-flowered Oriental Crowfoot. Linn. Sp. Pl. 781. Willd. n. 56. Lamarck Dict. n. 63. (R. orientalis, aconiti folio, flore luteo maximo; Tourn. Cor. 20.)—"Stem erect, two-leaved. Leaves many-cleft; thoſe of the ſtem alternate, ſeſſile."—Gathered by Tournefort in the Levant. We have ſeen no ſpecimen. Willdenow marks this as a perennial ſpecies, and indicates his having ſeen it in a dried ſtate. We regret that he did not ſubjoin a deſcription of the plant, the Linnæan ſpecific character being very inſufficient. What Poiret has given is evidently compiled from the ſhort materials furniſhed by Linnæus and Tournefort. The Abbè Seſtini is ſaid to have gathered *R. grandiflorus* near Conſtantinople; on whoſe authority it finds a place in Prodr. Fl. Græc. v. 1. 385.

82. R. *falcatus.* Sickle-ſeeded Crowfoot. Linn. Sp. Pl.

Pl. 781. Willd. n. 57. Ait. n. 35. Jacq. Auſtr. t. 48. (Melampyrum luteum; Ger. Em. 90. Lob. Ic. 37.)—Leaves linear-wedge-ſhaped, in three deep many-cleft lobes. Seeds with ſickle-ſhaped beaks. Stalks radical, ſingle-flowered.—Native of corn-fields in the ſouth of Europe, and the Lêvant; cultivated by Miller at Chelſea in 1739. A ſmall annual, flowering in the early part of ſummer. *Root* thread-ſhaped, with a few fibres. *Stem* none. *Leaves* ſeveral, pale green, downy, about two inches long; their ſegments narrow and entire. *Stalks* ſimple, downy, taller than the leaves, each bearing a ſmall yellow *flower*, whoſe *calyx* is erect. *Fruit* large, ovate, or nearly cylindrical, beſet on all ſides with the long, prominent, aſcending, incurved, compreſſed, downy, ſpinous-pointed beaks of the ſeeds.

83. R. *polyphyllus*. Many-leaved Water Crowfoot. "Waldſt. et Kitaibel Hung." Willd. n. 58.—"Leaves under water oblong, ſtalked, capillary; floating ones wedge-ſhaped, three-lobed; thoſe above the water elliptical. Stem erect."—Native of the waters of Hungary. Annual. *Stem* nine inches high, erect; branched in the upper part. *Leaves* that are under water very numerous, entirely covering that part of the ſtem, oblong, the length of the nail, each ſupported by a capillary *footſtalk* an inch long; the floating leaves ſmall, wedge-ſhaped, three-lobed, entire, as long as the former, their *footſtalks* thicker and ſhorter. *Branches* an inch long, erect, riſing above the water, and bearing elliptical obtuſe leaves, tapering each way, from four to ſix lines long, on ſhort *footſtalks*. *Flowers* extremely ſmall, yellow. *Willdenow*.

84. R. *hederaceus*. Ivy Crowfoot. Linn. Sp. Pl. 781. Willd. n. 59. Ait. n. 36. Fl. Brit. n. 14. Engl. Bot. t. 2003. Curt. Lond. faſc. 4. t. 39. Fl. Dan. t. 321. Dalech. Hiſt. 1031. (R. hederaceus rivulorum ſe extendens, atrâ maculâ notatus; Bauh. Hiſt. v. 3. 774.)—Leaves ſmooth, roundiſh, kidney-ſhaped, with three or five entire lobes. Stem creeping. Stamens from five to ten. Seeds corrugated.—Native of watery places, on a ſandy or gravelly ſoil, in England, Germany, France, &c. flowering from May to Auguſt. *Roots* fibrous, perennial. *Stems* either creeping or floating, proſtrate, branched, round, ſmooth, and ſucculent. *Leaves* ſtalked, ſmooth, and ſhining, nearly uniform; often blackiſh in the diſk. *Flowers* very ſmall, on ſimple, axillary or lateral, ſtalks. *Petals* linear-oblong, rather exceeding the calyx in length, white, with yellow claws. *Stamens* ſcarcely ever more than ten. *Fruit* globoſe. *Seeds* ovate, incurved, ſomewhat compreſſed, with a very ſmall inflexed beak, and numerous, lateral, corrugated or reticulated veins.

85. R. *aquatilis*. White Floating Crowfoot. Linn. Sp. Pl. 781. Willd. n. 60. Ait. n. 37. Fl. Brit. n. 15. Engl. Bot. t. 101. Ger. Em. 829.—Leaves capillary under water; above ſomewhat peltate. Stamens numerous. Seeds corrugated.—Native of pools, ditches, and rivers, throughout Europe, mantling the ſurface with its copious white bloſſoms, in the early part of ſummer. The *roots* are long, fibrous, and perennial. *Stems* floating under water, long, round, branched, leafy. *Leaves* ſtalked, ſmooth; the uppermoſt floating, uſually peltate, with various blunt notches; the next deeply three-lobed, or even ternate; the lowermoſt immerſed, repeatedly three-cleft, with innumerable capillary ſegments. *Flowers* floating on long ſimple ſtalks, oppoſite to the leaves. *Petals* obovate, much longer than the calyx, white, with yellow claws. *Nectary* tubular. *Stamens* thirty or more. *Fruit* like the laſt, but the *ſeeds* more numerous, and generally briſtly, ſomewhat obovate.

Varieties, as we deem them, of this ſpecies are, 1ſt, that whoſe *leaves* are all immerſed, and entirely capillary, figured in Ger. Em. 827. f. 3: 2dly, the *circinatus* of Sibth. Oxon. 175, figured in Pluk. Phyt. t. 55. f. 2, whoſe leaves are all likewiſe in capillary diviſions, but finer and ſmaller than the former: 3dly, the *fluviatilis* of Willdenow, n. 61, *peucedanoides* of Desfont. Atlant. v. 1. 444, figured in Fl. Dan. t. 376, whoſe leaves are not only in capillary ſegments, but conſiderably elongated, by the influence, as we conceive, of the running water, in which this ſort is always found. The *ſeeds* indeed are not briſtly, in our ſpecimens of this laſt variety, but naked, as in *hederaceus*, which ſpecies agrees with every variety of *aquatilis*, in the corrugations of the ſeeds, as above deſcribed.

We have thus added twenty-four ſpecies to Willdenow's number, following his arrangement, for the preſent at leaſt; not only for the convenience of our readers, but becauſe it would be very difficult to make a perfect one on any known principles; the ſeveral ſpecies being allied by ſo many characters, and ſo diſſimilar in others, that nothing could be more precarious than to ſeek the clue of nature through ſuch a labyrinth. The *ſeeds* perhaps ought to form the baſis of a ſpecific arrangement, if they might not even lead to generic diſtinctions.

No ſmall curioſity in the hiſtory of this genus is the *R. alatus*, of Poiret in Lamarck's Dict. n. 72, which, by his deſcription, proves to be no other than *Gymnoſtyles pteroſperma* of Juſſieu. (See GYMNOSTYLES.) The *pumilus* of Poiret, n. 82, appears to us a variety of *aquatilis*, growing in ſhallow, and perhaps fluctuating, waters; whence, though its *leaves* are all deeply cut, their ſegments are not quite capilllary, but linear and obtuſe. We have Swiſs ſpecimens anſwering to this author's deſcription.

RANUNCULUS, in *Gardening*, contains plants of the hardy, herbaceous, perennial kind, of which the ſpecies cultivated are, the Perſian crowfoot, or garden ranunculus, (R. aſiaticus); the aconite-leaved crowfoot (R. aconitifolius); the upright meadow crowfoot (R. acris); the creeping crowfoot (R. repens); and the embracing-leaved crowfoot (R. amplexicaulis). But there are other ſpecies that may be cultivated for variety.

Of the firſt ſpecies the varieties are exceedingly numerous, being ſometimes divided into two claſſes, as the old Turkey kinds, and the Perſian kinds, the varieties of the latter amounting to many hundreds, and being conſiderably more various, rich, and beautiful in colour than thoſe of the others.

But in the former of theſe ſorts they riſe with a ſtrong generally unbranching ſtalk a foot high, terminated by one large double flower, ſometimes emitting one or two ſmaller ones from its ſides, and of which there are red-flowered, ſcarlet-flowered, yellow-flowered, and ſcarlet turban-flowered, &c.; but being ſeldom tinged with different colours, as in the Perſian kinds.

And in the latter kind the plants riſe eight or nine inches high, generally branching from the bottom, producing from five or ten to twenty or more flowers on each root, and of which there are ſingle-flowered, ſemi-double-flowered, full-double-flowered, large and full like a double roſe, being generally filled with petals to the very centre, forming a regular globular body, of admirable elegance, of all ſorts of the moſt beautiful colours in different varieties, and of numerous degrees of deeper and lighter ſhades, ſtripes, and tinges in the ſeveral colours. Indeed Martyn obſerves, that the varieties produced of late years from the ſeeds of ſemi-double flowers are unbounded; and that Mr. Maddock remarks that they are more numerous than of any

other flower. Accordingly his catalogue, he ſays, boaſts nearly eight hundred, all with their proper names: ranged under the heads of—dark and dark purple; light purple and grey, &c.; crimſon, &c.; reds, &c.; roſy, &c.; orange, &c.; yellow and yellow ſpotted, &c.; white and white ſpotted, &c.; olive, &c.; purple and coffee-ſtriped, &c.; red and yellow-ſtriped; red and white ſtriped.

And according to the above flower gardener a fine ranunculus ſhould have a ſtrong ſtraight ſtem from eight to twelve inches high. The flower ſhould be of an hemiſpherical form, at leaſt two inches in diameter, conſiſting of numerous petals gradually diminiſhing in ſize to the centre, lying over each other, ſo as neither to be too cloſe nor too much ſeparated, but having more of a perpendicular than horizontal direction, in order to diſplay the colours with better effect. The petals ſhould be broad, with entire well-rounded edges; their colours dark, clear, rich or brilliant, either of one colour or variouſly diverſified, on an aſh, white, ſulphur or fire-coloured ground, or elſe regularly ſtriped, ſpotted or mottled, in an elegant manner.

In the ſecond ſpecies there is a variety with double flowers, which has been obtained by ſeeds, and is preſerved in many curious gardens for the beauty of its flowers. It is by ſome gardeners called the *Fair Maid of France*. The root is perennial, and compoſed of many ſtrong fibres: the leaves are divided into fine lanceolate lobes: the four ſide-lobes are upon footſtalks coming from the ſide of the principal ſtalk, and the middle one terminates it; they are deeply ſerrate, and have ſeveral longitudinal veins. The ſtalks riſe a foot and half high, and branch out at the top into three or four diviſions, at each of which there is one leaf, of the ſame ſhape with the lower, but ſmaller. The flowers are pure white, and very double, each ſtanding upon a ſhort foot-ſtalk. The flowers come forth in May.

In the third ſort there is alſo a variety with double flowers, which is the ſort moſt generally cultivated in the garden. It is frequently among other herbaceous perennials, under the name of *Yellow Bachelor's Buttons*.

And in the fourth ſpecies there is a variety with double flowers, which is the ſort cultivated in the gardens for its ornamental effects.

Method of Culture.—The firſt ſort and different varieties may be readily increaſed by the off-ſets taken from the root, and new varieties may be raiſed from ſeed. In the firſt of theſe methods the off-ſets ſhould be ſeparated from the roots in dry weather, in the latter end of ſummer, when the flowering is over, and the ſtems and leaves are declining, being placed in bags or boxes, in a dry place, till the autumn, when they ſhould be planted out in rows ſix or eight inches apart, and ſix of them to each, in ſeparate beds, prepared with light ſandy earthy compoſt, to the depth of two or three feet; taking care to protect them carefully from the froſt during the winter. When the buds begin to break through the ground they ſhould be kept perfectly clear from weeds, protecting them from froſts; and when they have flowered and the ſtems are decayed, the root ſhould be taken up; cleared from dirt, and placed in bags or boxes till the autumn, when they muſt be planted again.

But in the ſecond mode, the ſeed ſhould be collected from the beſt plants of the ſemi-double kinds, and be ſown in flat pans or boxes, filled with light rich earth, in Auguſt, covering it in about a quarter of an inch thick with the ſame ſort of earth, placing them in a ſhady ſituation, ſo as to have a little of the morning ſun. The pots ſhould remain here till the beginning of October, when the plants ſometimes appear, though it is often later before this happens, when they ſhould have a more open expoſure with the full ſun; but when froſt is apprehended, they ſhould be removed under a common hot-bed frame, being only covered in the nights and bad weather with the glaſſes, guarding them well againſt rains and froſt. In the ſpring following they ſhould be expoſed to the open air, being very ſlightly refreſhed with water, having a ſituation to enjoy the morning ſun; and when their leaves and ſtems begin to decay, the roots may be taken up, dried in a proper place, and then put up in bags to be planted out in the ſame manner as the old roots in October.

In the following ſummer they will produce flowers; when ſuch as are good ſhould be marked, and the others removed from them. The plants intended to flower ſhould not be ſuffered to run to ſeed, as roots which have produced ſeeds ſeldom furniſh fine flowers afterwards. The diſappointments experienced in purchaſing theſe roots, chiefly depend upon this circumſtance.

It may be noticed that the roots intended for the borders ſhould be planted towards the ſpring in little clumps or patches, three, four, or five roots in each, putting them in either with a dibble or trowel, about two inches deep, and three or four aſunder in each patch, and the patches from about three to five or ten feet diſtance, placing them in a varied manner in the borders.

And in regard to their general culture after planting, ſuch of the forward autumnal-planted roots of the choice ſorts in beds as have ſhot above ground, ſhould in winter, where convenient, have occaſional ſhelter from hard froſts, by mats ſupported on low hoop arches; or in very ſevere weather be covered cloſe with dry long litter, removing all covering in open weather: and in the ſpring, when the flower-buds begin firſt to advance, ſhelter them in froſty nights with ſupported mats, ſuffering them, however, to be open to the full air every day; but the latter plantings, that do not come up in winter, or very early in ſpring, whilſt froſty nights prevail, will not require any protection, and all thoſe diſtributed in patches about the borders muſt alſo take their chance in all weathers: thoſe of the different ſeaſons of planting will ſucceed one another in flowering from the beginning of April until the middle of June, though the May blow generally ſhews to the greateſt perfection. After the blow is paſt, and the leaves and ſtalks withered, the roots ſhould be taken up and dried in the ſhade, then cleared from all off-ſets and adhering mould, putting them up in bags or boxes till next planting ſeaſon, when they muſt be planted again, as directed above.

But in each ſeaſon of planting, it is highly neceſſary, in the principal fine varieties, to put them either in entire new beds, or the old ones refreſhed with ſome freſh rich earth or compoſt, working the old and new well together, in order to invigorate the growth of the plants.

All the other ſpecies are capable of being eaſily raiſed by the roots, which ſhould be ſlipped or parted in autumn when paſt flowering, or in the ſpring before they begin to ſhoot, and the ſlips be either planted at once, where they are to remain, or in nurſery-rows for a ſeaſon, then planted out finally. They ſucceed in any common ſoil and ſituation, and may be diſperſed about the different flower-borders and clumps, where they conſtantly remain, only trimming them occaſionally; and once in a year or two, or when they have increaſed into large bunches, taking them up in autumn or ſpring, to divide them for further increaſe, replanting them again directly.

In ſaving ſeed for raiſing new varieties, it muſt be ſuffered to continue on the plant till it becomes brown and dry,

dry, then be cut off, with the heads, and ſpread upon paper, in a dry room, expoſed to the ſun, and when quite dry, be put into a bag, and hung in a dry place till it is wanted.

All theſe plants are highly ornamental; the firſt ſort in beds and pots, and the other in the borders, clumps, and other parts of pleaſure-grounds.

RANUNCULUS, *Globe*, in *Botany*. See HELLEBORE.

RANUNCULUS *Viridis*, in *Zoology*, the name of an animal common in many parts of the world, and uſually known by the name of the *tree-frog*, or *rana arborea*.

The creature is eaſily diſtinguiſhed from the common frog, by its being much ſmaller, and of a green colour. It uſually ſits upon the leaves of trees and ſhrubs, and makes a great noiſe in an evening; but that is rather like the ſinging of a ſmall bird than the croaking of a frog.

Theſe creatures have been kept alive many years together in glaſs veſſels, giving them flies and other ſmall inſects: and in winter, when theſe are ſcarce, they uſually become very lean and feeble; but in ſummer, when they are plentiful, they will grow fat again, as if at their liberty. This is eſteemed a poiſonous creature. Ray. See RANA.

RANZ *des Vaches*, a celebrated air among the Swiſs, played upon the bagpipe by the young cow-keepers on the mountains. The air will be found on our muſic-plates. In the article MUSIC, the powerful effects of this tune are mentioned, from Rouſſeau's Dict. de Muſique.

RAOLCONDA, in *Geography*, the ſcite of a diamond-mine in Hindooſtan, placed in Mr. Montreſor's map about 15 geographical miles to the weſt of Ralicotte, and 12 from the north bank of the Kiſtnah, but Mr. Rennell does not know what authority he has for this poſition. Tavernier, who viſited Raolconda, gives its diſtance from Golconda at 17 gos, of 4 French leagues each. He croſſed a river that formed the common boundary of Golconda and Viſiapour, about four gos, or more, before he came to Raolconda; and this river can be no other than the Beemah, which to this day forms the eaſtern boundary of Viſiapour, and paſſes about 80 or 82 miles to the weſt of Golconda, croſſing the road from it to Ralicotte. If we reckon the 82 miles at 13 gos, that is, forming a ſcale from the diſtance between Golconda and the river Beemah, each gos will be 6.3 geographical miles in horizontal diſtance (or nearer three than four French leagues); and Raolconda will be placed about 25 geographical miles on the W. of the Beemah, or 11 E. of Ralicotte.

RAON L'ETAPE, a town of France, in the department of the Voſges, and chief place of a canton, in the diſtrict of St. Dié, on the Meurte; 7 miles N. of St. Dié. The place contains 2528, and the canton 5300 inhabitants, on a territory of 70 kiliometres, in 5 communes.

RAOUDA, or ROUDDA, denoting *gardens*, an iſland of Egypt, in the Nile, in front of Old Cairo, about 500 yards in breadth, where is built the *Mekkias*, ſignifying meaſure, or Nilometer, a pillar, by the gradations on which the riſe of the Nile is meaſured.

This iſland is called Roudd, or gardens, becauſe it is laid out in gardens, and inhabited only by gardeners.

RAOUTTY, a town of Hindooſtan, in Malwa; 20 miles N.N.E. of Tandla.

RAPA, in *Botany*, (an ancient name, of whoſe etymology no plauſible account has come to our knowledge,) the Turnip. See BRASSICA, ſpecies 7.

RAPAAPO, in *Geography*, a town of America, in New Jerſey; 30 miles S. of Woodbury.

RAPACIOUS ANIMALS, in the general, are ſuch as live upon prey.

Naturaliſts divide birds into *rapacious*, *carnivorous*, and *frugivorous*.

The characteriſtic notes of rapacious birds, which are the Accipitres of Linnæus, are, that they have a great head, and a ſhort neck; hooked, ſtrong, and ſharp-pointed beak and talons, fitted for tearing of fleſh; ſtrong and brawny thighs, for ſtriking down their prey; a broad thick fleſhy tongue, like that of man; twelve feathers in their train; and twenty-four flag-feathers in each wing, and the two appendices, or blind guts, are always very ſhort.

Rapacious birds have a membranous ſtomach; and not a muſculous one, or a gizzard, ſuch as birds have which live on grain.

They are very ſharp-ſighted, and gather not in flocks; but, generally ſpeaking, are ſolitary; though vultures will fly fifty or ſixty in a company.

RAPAKIVI, in *Mineralogy*, a name given to the aggregate of felſpar and mica: its colour is brown, or browniſh-red; it moulders by expoſure to the air, but that is only when the mica is in exceſs. When the felſpar exceeds, it forms a durable ſtone, called in Italy "Granitone." Kirwan.

RAPALLO, in *Geography*, a town of the Ligurian republic, ſituated on a bay to which it gives name; 12 miles E.S.E. of Genoa.

RAPANEA, in *Botany*, according to De Theis, its vernacular name in Guiana; though Aublet ſays nothing to that effect.—Aubl. Guian. v. 1. 121. Juſſ. 288. Lamarck Illuſtr. t. 122.—Claſs and order, *Pentandria Monogynia*. Nat. Ord. *Berberides*, or rather perhaps *Rhamni*, or *Sapotæ*; Juſſ.

Gen. Ch. *Cal.* Perianth inferior, minute, of one leaf, with five or ſix teeth, permanent. *Cor.* of one petal; tube very ſhort; limb in five or ſix deep roundiſh ſegments. *Stam.* Filaments five or ſix, inſerted into the tube at the baſe of each lobe of the limb; anthers oblong, quadrangular, of two cells. *Piſt.* Germen ſuperior, roundiſh, of five or ſix cells; ſtyle very ſhort; ſtigma obtuſe. *Peric.* Drupa globular, of one cell. *Seed* ſolitary, globoſe.

Eſſ. Ch. Corolla in five or ſix deep ſegments, oppoſite to the ſtamens. Anthers quadrangular. Drupa ſuperior. Seed ſolitary, globoſe.

1. R. *guianenſis*. Aubl. Guian. t. 46. (Samara floribunda; Willd. Sp. Pl. v. 1. 665.)—Native of thickets, in the ſkirts of meadows, in Cayenne and Guiana, bearing flowers and fruit in December. A ſmall tree, whoſe *trunk* is five or ſix feet high, and four or five inches thick, crowned with branches; the wood white, not very compact. *Leaves* alternate, on ſhort ſtalks, obovate, bluntiſh, entire, ſmooth, two or three inches long, with one rib, and many tranſverſe veins ſcarcely viſible when freſh. *Flowers* copious, ſmall, white, in denſe lateral tufts. *Fruit* violet-coloured.—Mr. Brown, in his Prodromus Nov. Holl. v. 1. 533, ſpeaks of this ſhrub as belonging to the genus MYRSINE, ſee that article; conſequently Juſſieu was moſt correct in hinting its affinity to his *Sapotæ*, an order from which Ventenat and Brown have ſeparated their more recent one of MYRSINEÆ, to which we refer the reader.

RAPATEA, apparently a vernacular name of the plant in Guiana, Aubl. Guian. v. 1. 305. t. 118. Juſſ. 44. Lamarck Illuſtr. t. 226. See MNASIUM.

RAPAX, in *Ichthyology*, a name given by Schoneveldt to the *corvus piſcis* of ſome writers, a ſpecies of chub or cyprinus, called *rappe* by the Germans, and by Geſner and others *capito fluviatilis rapax*.

RAPE, RAPTUS, in *Law*, a *raviſhing*; or the having carnal knowledge of a woman by force, and againſt her will,

will. If the woman conceived, the law formerly eſteemed it no rape; from an opinion, that ſhe cannot conceive, unleſs ſhe conſented. But this opinion has been ſince queſtioned. Coke on Litt. lib. ii. cap. 11.

This crime, by the Jewiſh law, Deut. xxii. 25. was puniſhed with death, in caſe the damſel was betrothed to another man; and in caſe ſhe was not betrothed, then a heavy fine of fifty ſhekels was to be paid to the damſel's father, and ſhe was to be the wife of the raviſher all the days of his life; without that power of divorce, which was in general permitted by the Moſaic law.

The civil law (cod. 9. tit. 13.) puniſhes the crime of raviſhment with death and confiſcation of goods; including under this crime both the offence of forcible abduction, and alſo that of forcibly diſhonouring; either of which, without the other, is in that law ſufficient to conſtitute a capital crime. And the ſtealing away a woman from her parents or guardians, and debauching her, is equally penal by the emperor's edict, whether ſhe conſent, or is forced.

Rape was puniſhed by the Saxon laws, particularly thoſe of king Athelſtan, with death; which was alſo agreeable to the old Gothic or Scandinavian conſtitution. Inſtead of this, another puniſhment was inſtituted by William the Conqueror, *viz.* caſtration and loſs of eyes, which continued till after Bracton wrote in the reign of Henry III. But it was then the law, and ſtill continues in appeals of rape, that the woman ſhould immediately after go to the next town, and there make diſcovery to ſome credible perſons of the injury ſhe has ſuffered; and afterwards ſhould acquaint the high conſtable of the hundred, the coroners and the ſheriff, with the outrage; the time of limitation for this purpoſe was by ſtat. Weſtm. 1. cap. 13. extended to forty days. But there is now no time fixed; for as it is now uſually puniſhed by indictment at the ſuit of the king, the maxim of law takes place, *nullum tempus occurrit regi:* however, the jury will rarely give credit to a ſtale complaint. During the former period it was alſo held for law, that the woman (by conſent of the judge and her parents) might redeem the offender from the execution of his ſentence, by accepting him for her huſband, if he alſo was willing to agree to the exchange, but not otherwiſe.

In the 3 Edw. I. by the ſtat. Weſtm. 1. cap. 13. the puniſhment of rape was much mitigated: the offence being reduced to a treſpaſs; if not proſecuted by the woman within forty days; and ſubjecting the offender only to two years impriſonment, and a fine at the king's will. But in the 13 Edw. I. it was found neceſſary to make the offence of rape felony, by ſtat. Weſtm. 2. cap. 34. And by 18 Eliz. cap. 7. it was made felony without benefit of clergy; as is alſo the abominable wickedneſs of carnally knowing or abuſing any woman-child, under the age of ten years; in which caſe the conſent or non-conſent is immaterial, as, by reaſon of her tender years, ſhe is incapable of judgment and diſcretion. Sir Matthew Hale is indeed of opinion, that ſuch profligate actions committed on an infant under the age of twelve years, the age of female diſcretion by the common law, either with or without conſent, amount to rape and felony, as well ſince, as before the ſtatute of queen Elizabeth; but the law has in general been held only to extend to infants under ten. A male infant, under the age of fourteen years, is preſumed by law incapable of committing a rape; and, therefore, cannot be found guilty of it.

The civil law ſeems to ſuppoſe a proſtitute incapable of any injuries of this kind; not allowing any puniſhment for violating the chaſtity of her who hath indeed no chaſtity at all, or at leaſt hath no regard to it. But the law of England holds it to be felony to force even a concubine or harlot; becauſe the woman may have forſaken that unlawful courſe of life.

As to the material facts requiſite to be given in evidence and proved upon an indictment of rape, we ſhall here only obſerve, that the party raviſhed may give evidence upon oath, and is in law a competent witneſs; but the credibility of her teſtimony muſt be left to the jury, upon the circumſtances of fact that concur in that teſtimony: *e. gr.* if the witneſs be of good fame; if ſhe preſently diſcovered the offence and made ſearch for the offender; if the party accuſed fled for it: theſe and the like are concurring circumſtances, which give greater probability to her evidence. But, on the other ſide, if ſhe be of evil fame, and ſtands unſupported by others; if ſhe concealed the injury for any conſiderable time after ſhe had opportunity to complain; if the place, where the fact was alleged to be committed, was where it was poſſible ſhe might have been heard, and ſhe made no outcry; theſe and the like circumſtances carry a ſtrong, but not concluſive, preſumption, that her teſtimony is falſe or feigned. Moreover, if the rape be charged to be committed on an infant under twelve years of age, ſhe may ſtill be a competent witneſs, if ſhe hath ſenſe and underſtanding to know the nature and obligation of an oath; and, even if ſhe hath not, it is thought by ſir Matthew Hale that ſhe ought to be heard, without oath, to give the court information; though that alone will not be ſufficient to convict the offender. And, indeed, it is now ſettled, that infants of any age are to be heard; and if they have any idea of an oath, to be alſo ſworn: it being found by experience, that infants of very tender years often give the cleareſt and trueſt teſtimony. Blackſt. Com. book iv.

The civilians make another kind of rape, called *ſubornatio, rape of ſubornation,* or *ſeduction;* which is, when a perſon ſeduces or entices a maid to uncleanneſs, or even marriage, and that by gentle means; provided there be a conſiderable diſparity in age or condition between the parties. In this caſe, the father and mother intend their action reciprocally for the *crimen raptus,* or *ſubornationis.*

The French laws make no difference between the rape of violence and that of ſolicitation, or ſubornation; they make both capital. This kind of rape our laws call *Raviſhment;* which ſee.

Rape *of the Foreſt,* is a treſpaſs committed in the foreſt by violence.

This is mentioned in the laws of Henry I. as one of the crimes cognizable alone by the king.

Rape is alſo a name given to the wood or ſtalks of the cluſters of grapes, when dried, and freed from the fruit.

The rape is uſed in making vinegar, ſerving to heat and ſour the wine: but it is firſt put into a place to ſour itſelf, before it be caſt into the vinegar veſſel; to which end, preſently after the vintage, it is carefully put up in barrels, leſt it take air, otherwiſe it would heat itſelf and be ſpoiled. There is no other way of keeping rape hitherto diſcovered, but to fill the veſſel, in which it is contained, with wine or vinegar.

Rape, *Rapa,* is alſo uſed for a part or diviſion of a county; ſignifying as much as a *hundred.*

Though ſometimes rape is taken for a diviſion containing ſeveral hundreds. Thus Suſſex is divided into ſix rapes, *viz.* thoſe of Chicheſter, Arundel, Bramber, Lewes, Pevenſey, and Haſtings: every one of which, beſides its hundreds, has a caſtle, a river, and foreſt belonging to it.

The like parts in other counties are called *tithings, lathes,* or *wapentakes.*

Rape, in *Botany.* See Napus.

Rape, *Broom.* (See Orobanche.) It frequently grows

to the roots of geniſta or broom, whence it is called *rapum geniſtæ*, or broom rape: it is alſo found among corn. The herb preſerved, or its ſyrup, is ſaid to be of excellent uſe in ſplenetic or hypochondriac diſorders, and an ointment prepared of it with ſwine's fat, is good for hard and ſcirrhous tumours.

RAPE, *Wild*. See MUSTARD.

RAPE, in *Gardening*, the common name of a plant of the cabbage kind. The variety called the French turnip, or *Braſſica napus*, has been long cultivated upon the continent, and preferred to the common turnip as a culinary vegetable. And it has been lately noticed in the "Tranſactions of the Horticultural Society," that it has been brought to the principal London markets for more than twelve years paſt by one perſon only, and ſold chiefly to foreigners, though, when once fully known, it will be found a very uſeful and acceptable root in moſt families, as being more delicate in its flavour than the common turnip. It is uſed in much the ſame manner. It enriches ſoups, and there is not any neceſſity for cutting away the outer ſkin or rind, but only to ſcrape it, as it is a great deal thinner than that of the turnip. When ſtewed with gravy it forms an excellent diſh, and being white and ſhaped like the carrot, when laid alternately with thoſe on a diſh, they become very ornamental. The French dreſs them ſomewhat in this manner.

The roots are to be waſhed quite clean by means of a bruſh; then ſcraped, cutting a thin ſlice away from the top and bottom parts, ſo as to make them all of equal lengths: after which boil them in water, with a little ſalt, until they are tender; then put them into a ſtew-pan, with a gill of veal gravy, two ſpoonsful of lemon pickle, one of muſhroom ketchup, a little mace, and ſalt, letting them juſt ſimmer, but by no means boil, for a quarter of an hour; afterwards thicken the gravy with flour and butter, ſerving the whole up quite hot. Some add a few ſpoonfuls of cream mixed with yolk of egg to this, juſt before diſhing up; and others dreſs them in a ſimilar manner to the above, ſliced rather thinly, with Madeira, or other wines, after they have been fried to a browniſh colour. See BRASSICA.

RAPE, in *Agriculture*, the name of a plant much cultivated for its ſeed, and alſo as a green food for cattle and ſheep. The methods of culture and management that are neceſſary in raiſing crops of this ſort, have been already deſcribed and explained. (See COLE.) It may, however, be here neceſſary to detail a few of the experiments that were made under the direction of the Dublin Society, by Mr. Whyn Baker, about the years 1769 and 1770, as they tend to throw additional light on the nature of the plant, as well as its cultivation, though the ſoil was not the moſt ſuitable for it. It was a ſhallow ſoil, of a ſtrong adheſive nature when wet, and when perfectly dry, in lumps, almoſt impregnable; but between wet and dry, reducible. It lies upon a bed of lime-ſtone quarry, and has a natural declivity to the north-weſt; naturally very poor, and, he believes, never received any manure until he dreſſed it. Three acres of this land were, in 1768, under potatoes, in the ordinary method of the country, in ſeven-feet beds, and four-feet trenches. In 1769 they were under drilled turnips.

The froſt, ſnow, hail, and rain which they had this year in the months of March and April, rendered it impoſſible to get the grouud in any tolerable condition for the rape-ſeed before the 28th day of April. On that day twenty broad ſets were ſown, with twelve ounces of rape-ſeed to each ſet or ridge. He intended to have ſown it earlier, but the event will ſhew, that, as it was, he ſowed it too early, at leaſt upon this ground.

It was ſlow in coming up, and made but a poor figure until July. After which it ſhot forward; but inſtead of affording a plentiful mowing crop for the purpoſe of fodder ing cattle, it ſoon began to run up very faſt, broke out into branches, with few and ſmall leaves, like rape in bloſſom from the autumn ſowing, but with ſtrong branches and few leaves; and, in a ſhort time after, began to grow hard, pipey, and the ſeed to form.

It September he began to mow it for cattle, and they ate it with great eagerneſs, but every day it became worſe, by growing harder; inſomuch, that before it was exhauſted there was very great waſte, as to the object of fodder, but it wonderfully raiſed the dung-hill, which, in his mind, is of the firſt moment to the farmer: for if he has manure in plenty, and diſpoſes of it judiciouſly, there is hardly any thing he need to fear, except climate.

It was pretty far in October before all his rape was cut, (and the ſeed coming forward very faſt,) although it was brought home in great profuſion. It was ſo ſtrong, that the mowing of it could not be accompliſhed with a common ſcythe; it would have broken an hundred; but he had by him a ſhort ſtrong ſcythe, with a thick back, intended to mow buſhes and other rubbiſh; with this inſtrument he got it mowed, but not ſo cloſe to the ground as he wiſhed, it being next to impoſſible to mow ſuch ſtrong plants as theſe were cloſe to the ground; and he became the leſs ſolicitous about it, as from the ſtrength of the rape ſtumps and roots, and the weeds which were upon the ground, owing to the rape ſhooting up in tall ſtems, he gave up his intention of ſowing the ground with wheat, as was originally intended. Hence he concludes, that the rape was ſown much too early.

On the 16th of July he tranſplanted ſome of this rape in rows upon ridges four feet wide; theſe plants flouriſhed much better than the former, and were at leaſt four times the ſize of any of thoſe left in the ground where they were ſown. Nevertheleſs, theſe alſo ran to ſeed; but the cold nights coming on prevented their forming their ſeed like the former. They were vaſtly more ſappy, and much better food for cattle.

On the 24th of July, he drilled rape-ſeed upon the ſame ground.

N° 1. Six ridges four feet wide, and thirty-two perches long in ſingle rows.

N° 2. Six ridges the ſame length and breadth, in double rows, ten inches aſunder.

It is obſerved, that the double and ſingle rows were drilled alternately on the ſame ground, on the 18th day of July.

N° 3. Six ridges four feet wide, and thirty-two perches long, drilled in ſingle rows.

N° 4. Six ridges the ſame length and breadth, in double rows, ten inches aſunder.

He remarks, that theſe were ſown in alternate rows, on the ſame ground, on the 24th of July. And that the ſeveral rows were thinned the latter end of Auguſt, and twice horſe-hoed during the ſummer. On the third of April 1771, he had a row of each of theſe cut and weighed, and the produce was as follows:

Rows.	Weight. ton.	cwt.	qr.	lb.		Prod. p. Plant. acre. ton.	cwt.	qr.	lb.
N° 1. Single row produced	1	2	1	11	Sown July 18th	29	6	1	16
2. Double row ditto	1	4	3	13		32	12	2	23
3. Single row ditto	1	5	2	22	Sown July 24th	33	14	1	26
4. Double row ditto	1	6	3	25		34	18	0	6

On the whole, it is ſtated, that the laſt ſowing in July afforded conſiderably greater produce than the firſt, for the plaineſt reaſon, that the earlier we ſow this ſeed, the ſooner it runs; and conſequently affords the leſs produce for the purpoſe of foddering cattle in the yards for making dung, and ſeems to account very ſtrongly for the ſtate of the firſt experiment.

And the double rows produced uniformly more than the ſingle rows; and indicate that the double are to be preferred in drilling rape for foddering cattle.

The following trials are on ſowing rape-ſeed broad-caſt. On the 24th of July two acres were ſown broad-caſt, with ten pounds of ſeed to each acre, in the ſame field where the other experiments were carried on; but the ſoil not ſo ſtiff by a good deal, has abundantly fewer looſe ſtones in it, is very ſhallow, and poor, to an incapability of producing any thing to profit, without great aſſiſtance of manure.

In July he manured it with the dung of his yard, conſiſting of that of horned cattle, horſes, and ſwine. The dreſſing was indeed very high; about two ſmart one-horſe cart-loads to a perch. He having ever found that one acre, highly improved, is much more valuable than five imperfectly handled, was the reaſon why he gave this poor piece ſo liberal a dreſſing.

The rape came up but ſlowly for a time, as he finds to be the nature of the plant, but at length it ſhot forward, and flouriſhed away: but in winter it met with a fate which he was not aware of, nor did he expect. The wood-pigeons lay upon it prodigiouſly, and did it great damage. Some plants he obſerved in the froſt to appear as if they had been ſinged: whether that was owing to the wounds given by the birds, and thereby giving the froſt the greater force, or whether it was owing entirely to the ſeverity of the froſt, is not in his power to determine. However, very early in the ſpring this rape ſhot forward, and as the days lengthened the viſits of the pigeons were leſs frequent, until they totally left it.

From this rape breaking out into bloſſom ſooner than he expected, he is inclined to believe that the 24th of July is too early to ſow it for the purpoſe of foddering cattle in the yard.

However, early in April he began to mow this rape for the horned cattle, ſuch as cows, plough bullocks, young cattle, calves, and ſwine. They all ate it with the greateſt eagerneſs, and were foddered with it every evening, until the 19th of May incluſive, and wheat ſtraw in a morning, ſave four calves of the preceding year; and they were foddered twice a day with rape, and had ſtraw before them alſo, and throve upon it vaſtly better than the other cattle; for no other reaſon, he believes, than becauſe they were allowed more than the others: in ſhort, they were in ſuch order, that he dares believe the butchers would have been glad to have had them for killing.

He obſerves, that he need not tell the farmer how neceſſary it is to be frugal of provender in an harſh dry ſpring, as the laſt was, when he was like to be hard run with forty head of cattle, many of which he ſhould actually have been obliged to ſell at ſo improper a ſeaſon, had he not been poſſeſſed of theſe two acres of rape. He adds, that there is yet another circumſtance which renders this a truly valuable fodder. The milk of the cows increaſed prodigiouſly; and the milk and butter were as good, ſweet, and well-flavoured, he thinks, in every particular, as ever he taſted in June. Even the cream for the tea appeared to be perfectly free from any foreign flavour. The cows got hay every day, in the ſame manner as he has in former years mentioned them to have, when feeding upon cabbages.

The ſimplicity of the culture for rape, for the purpoſe of feeding cattle, he cannot but think a particular recommendation to the farmer, and the cheapneſs of the ſeed in purchaſe, or the eaſe with which he may raiſe it, are objects which cannot fail, he thinks, of being perſuaſive to him. And all perſons, who have annexed to their farms any bog, or other waſte ground, the improvement of which can be executed by burning, might ſurely raiſe ſuch quantities of rape for the purpoſe of mowing paſture, as would enable them to keep almoſt any number of cattle; by which they would not only be bringing in the waſte land, but making that the foundation of improvement to their ſound land, by the immenſe quantities of dung they might raiſe by this means from the waſte land. Here the advantage to the cultivator would be double.

On the firſt day of May he had four perches of this rape meaſured out for weighing. It was mowed, immediately drawn home, and weighed. The four perches afforded ſeven hundred and two quarters: multiplying this by forty, ſhews the acreable produce to be fifteen tons. The quantity indeed but ſmall. However, the ſeaſon in which it is to be had renders it more than ordinarily valuable, and, he thinks, bids fair to make it an object of huſbandry, as a paſture for cattle.

This year, 1770, Mr. Baker ploughed up ſix acres of wheat ſtubble, as ſoon as the wheat came off, harrowed it down the 12th, 13th, 14th, and 15th of September, then ſowed rape-ſeed over the whole field, and gave it a light buſh harrowing. The rape came up very thin, and made ſo poor an appearance in the ſpring, that he ploughed up the field, and ſowed ſpring corn. This is a ſtrong indication that but little is to be expected from ſowing rape upon wheat ſtubble; becauſe after the wheat comes off it ſeems to be too late in the year to ſow rape. But ſomething may be charged, as he obſerves, to the natural moiſture of the ſoil. See COLE.

The following is the recapitulation of his experiments on rape, as paſture for cattle.

Exp.			Produce. Ton.	cwt.	qr.	lb.
I.	April ſowing.	Ran, not anſwering the purpoſe.				
II.	Ditto tranſplanted.	Ran, but not ſo ſoon as the other.				
III.	July 18, ſowing.	Single rows produced *per* acre	29	6	1	16
		Double rows ditto	32	12	2	23
	July 24.	Single rows ditto	34	14	1	26
		Double ditto	35	18	0	9
IV.	Ditto	Broad-caſt ditto	15	0	0	0
V.	September ſowing on wheat ſtubble	ditto	10	0	0	0

Rape is a great deal cultivated in ſome diſtricts in the county of Eſſex for the ſeed. The ſyſtem is very profitable, but this ſort of crop is found to draw or exhauſt the land a good deal. It is thought by ſome to prepare well for wheat, eſpecially when fed off upon the land. In ſome places they, however, conſider it more beneficial to till, after this crop has been ſeeded for ſpring corn, than to put in wheat, which, however, is ſtill the moſt common practice. Clover would certainly be better than either method.

In other places they conceive that feeding rape is much on the decline, from the general experience, that it leaves the beſt prepared land in an unfavourable ſtate for oats and clover,

clover, and is conſequently prejudicial to the next ſucceeding winter crop. Other diſtricts think very differently on this point. In ſeeding the crop, the produce is here conſidered to be in general from twenty-nine to thirty-four buſhels the acre. In the greateſt crops and beſt ſeaſons, in particular parts it is ſuppoſed to riſe even ſo high as five and ſix quarters the acre.

In Berkſhire this ſort of crop is not ſo much cultivated as it ſhould be, as it will ſucceed well on ſoil where turnips will not, and with equally beneficial effects to the future crops, when fed off on the ground. When employed it is uſually ſown and managed ſo as to come into a high ſtate of perfection in the early ſpring months, when ſheep feed is moſtly ſcarce. It is grown by ſome to ſupply the deficiency, and found remarkably uſeful, one acre of it affording more feed than two of turnips.

This ſort of crop is ſtill leſs grown in Oxfordſhire, though occaſionally had recourſe to, eſpecially on the rich red land about Banbury. Some ſow it in mixture with the tankard turnip ſeed, for the purpoſe of weaning lambs upon: they begin with the rape, and it teaches them to eat the turnips: it is found to be a very good food for this ſort of ſtock.

In the county of Suſſex, the South Down ſheep farmers hold it in great eſtimation, ſowing it either alone or in mixture with tares as a food for their ſheep; very rarely for the purpoſe of feeding. The ewes and lambs are wattled upon it in the ſpring, and it is very generally allowed to be moſt efficacious, and highly nutritious to the young lambs. Some, at the lambing ſeaſon, hardly allow their ewes any other food but this, as the rape is found to produce a larger ſupply of milk than turnips; which, it is ſuppoſed, has the effect of extending the udder, without affording any conſiderable flow of milk. This crop is conjectured, however, in ſome caſes, to have the effect of cauſing the ſlipping of the lambs, where the ewes are fed upon it. But ſuch an effect is very improbable to ariſe in this way; other cauſes may have been overlooked. In ſome caſes on Down land ray-graſs is ſown with the rape for ſheep feed, one gallon of rape-ſeed and two of ray-graſs to the acre. The rape is firſt fed off; and after that the ray-graſs riſes and affords a bite for the ſpring ſeaſon. The rape crop is uſually put in about June, or the following month, one gallon to the acre. When folded off, a rood and a half is a ſufficient daily conſumption for a flock of ſix hundred ſheep, or rather more.

As it has been found in the improving of peat boggy moraſſy lands, that what is principally wanted is a crop which can be ſown and reaped in the ſummer months; and which may require neither labour nor attendance during the moiſt ſeaſons of autumn, winter, and ſpring; the writer of the "Treatiſe on Landed Property" has ſuggeſted that fortunately, ſuch a crop is natural to, and has long been inured to the climate of this iſland, as well as one of the moſt profitable in the agriculture of it; and that this is rape: which is not only ſown, but reaped, in the very height of ſummer; and which is known to delight in a ſoil of this nature. It has, however, only lately been found capable of being raiſed with advantage on crude moſſy ground, as a firſt crop after draining, from ſome recent trials made in the north, after the above operation, levelling, paring and burning, and turning the aſhes in. The reſult of which was, though the crop was too late in being put in, and the land laid in an improper manner, ſuch as to prove clearly that rape-ſeed may be raiſed with profit as a firſt crop on drained moory ſoils. And it is thought highly probable that many extenſive tracts of land, which now lie entirely waſte, and as nuſances in their neighbourhoods, may through this means be improved with immenſe profit to their proprietors. The experiment may be tried at a ſmall expence. The coſt of the labour and ſeed required for a ſufficient trial are inconſiderable. The proof, it is ſuppoſed, is not whether rape will thrive as herbage, but whether it will mature its ſeed, on the given ſoil, in the given ſituation.

After being recompenſed for the previous expences, in one or more rape crops, as there is here no danger of the exhauſtion of the ſoil,—of impoveriſhing, perhaps, ten feet depth of vegetable mould, it remains to lay the foundation of more permanent profits, which is to be done by ſowing graſs ſeeds either with or over the rape crop, or by light cautious ſtocking after removing the ſtalks, as may be neceſſary, until there is a firmneſs of ſurface and a fitneſs for mixed cultivation, which may be much haſtened by the uſe of heavy calcareous and earthy ſubſtances at any time during the proceſs of improvement.

Rape *Cake*, the refuſe or cake remaining after the oil has been expreſſed from rape-ſeed. It is ſaid to be uſeful as a manure. See Manure.

This ſubſtance is found by chemical trials to contain a large quantity of mucilage, ſome albuminous matter, and a ſmall quantity of oil. It ſhould be kept as dry as poſſible before it is applied to the ſoil, and be employed in that way while it is in a freſh ſtate. It is ſucceſsfully applied in ſeveral ways and intentions, and affords an excellent dreſſing for turnips. See the next article.

Rape *Duſt*, the ſmall reduced parts of the dried refuſe of rape-feed, or the rape cake, after the oil has been obtained from it. This ſubſtance has been found uſeful as a top-dreſſing for crops of different kinds.

The rape cake, when reduced into powder or duſt by means of a machine, has been extenſively uſed in Norfolk; and when for turnip crops, it has been the cuſtom to ſow it ſome weeks before the ſeed of that root is put into the ground. In the practice of Mr. Coke of that diſtrict, it has, however, been found, that by having it brought into a fine powder it may be drilled from the ſame machine, at the ſame time with the turnip ſeed; and that, by thus delivering the manure and the ſeed from the ſame pipes and ſhares of the drill machine, a ton of duſt does ſix acres in the place of three. See Turnip.

In Lancaſhire ſome farmers uſe it with great advantage as a manure for potatoes, putting it in with the ſets in the proportion of about thirty-two buſhels to the ſtatute acre; but if the ground were well prepared, and the duſt carefully depoſited for the reception of the ſets, it is ſuppoſed, a much ſmaller quantity would be ſufficient. It produces much luxuriance in the crops, and a very fine produce.

Rape *Oil*, the oil obtained by means of expreſſion from the ſeeds of this plant, in mills conſtructed for the purpoſe. The refuſe oily ſubſtance of this kind may be employed as manure in mixture with rich earthy matters, with great advantage, wherever it can be procured in any quantity at a reaſonable price.

RAPEL, in *Geography*, a river of Chili, which runs into the Pacific ocean, S. lat. 34° 8′.—Alſo, a town of Chili, on the forementioned river; 70 miles S. of Valparayſo.

RAPERLAH, a town of Hindooſtan, in the Carnatic; 13 miles N.E. of Ongole.

RAPHA, in *Anatomy*. See Raphe.

RAPHAEL, one of the ſeven archangels, who are ſaid to be continually before the throne of God, and ready to perform his commands. We have no ſuch name in the Old

or

or New Teſtament; but his hiſtory occurs in the book of Tobit, c. xii.

If the ſtory of Tobit be true, it is not improbable that the angels, both good and bad, whoſe names do not appear to have been known before the Babyloniſh captivity, are figurative perſonages; and Raphael might only denote the ſalutary protecting agency of divine providence, ſo diſpoſing events as to produce a happy iſſue.

Raphael Sanzio, da Urbino, in *Biography*, during whoſe life, and by the exertion of whoſe talents, in conjunction with thoſe of Lionardo da Vinci, Titian, Michael Angelo, and ſome few others, the art of painting reached its acme in modern times, was born in the city of Urbino, on the morning of Good Friday, in the year 1483. He was deſcended from a reſpectable family, and many of his anceſtors had been painters; as was his father Giovanni Sanzio, whoſe talents, however, did not elevate him to the firſt rank. He cultivated with care the inclination which his ſon Raphael exhibited, at an early age, for painting; and was ſoon repaid by the aſſiſtance he acquired from him, in ſeveral of the pictures he was employed to paint in his native city of Urbino. But finding that the taſte of Raphael merited more ſkilful guidance than he was able to give it, he placed him under the tuition of Corradini, better known by the name of Carnevale, for a ſhort time, till he could be received as a pupil by Pietro Perugino, at Perugia.

This maſter was then in very high eſteem, though his ſtyle was dry and meagre, in compariſon with that of Maſaccio, and others of the Florentine ſchool. It is not ſurpriſing that Raphael, endowed as he was by nature, and trained as he had been in art, ſhould ſoon become the rival, rather than the pupil, of ſuch an artiſt. Accordingly we find, that his aptitude for the practice of art enabled him quickly to acquire his maſter's manner, and that in ſo perfect a degree, that connoiſſeurs were puzzled in their judgments upon the works which proceeded from Perugino's ſtudio; and ordinary obſervers completely deceived. Vaſari ſpeaks of an Aſſumption of the Virgin, crowned by her Son, and the twelve apoſtles below, round her tomb, contemplating the celeſtial glories; with three ſmall pictures in the ſame frame below it, of the Annunciation, the Adoration of the Magi, and Simon embracing the Saviour, painted at this period by Raphael, as being wrought with extreme beauty, and preciſely like the work of Perugino.

We have to lament that we are left ignorant of the time when Raphael went as a pupil to Pietro, how long he remained with him, or when he left him, or rather was left by him; as that maſter returned to Florence, to finiſh ſome pictures he had begun there ſome time before. He muſt certainly have been very young, from the number of pictures which he ſubſequently executed, previous to his going to Rome in his 25th year, and probably not more than 16 or 17, when he acquired his liberty by the departure of Perugino.

From Perugia he went to Citta di Caſtello, where he painted a St. Nicola crowned by the Virgin and St. Auguſtin, for the church of St. Auguſtine; and for that of St. Dominico, a picture of the Cruciſixion of Chriſt, accompanied by angels, the Virgin, St. John, &c.; which would certainly have been conſidered as Perugino's, if Raphael had not ſet his name to them. But he was conſidered to have much ſurpaſſed him in another work, repreſenting the marriage of the Virgin and St. Franciſco, for the church of St. Franciſco, in the ſame city. He acquired by theſe productions a great and deſerved extent of fame, and thus early entered with ſucceſs that courſe, which conducted him to the higheſt pinnacle of renown as an artiſt.

Attached to his perſon by friendſhip, and attracted by his ſkill as a deſigner, Pinturiccio, then employed by pope Pius II. to adorn the library of the Duomo at Sienna, ſought the aſſiſtance of Raphael, and engaged him to compoſe deſigns for his work. This he undertook, but proceeded only to the preparation of ſome of the cartoons, when his ambition and his curioſity were ſtimulated, and his work interrupted, by the renown ſpread through the country of the cartoons painted by thoſe great rivals, Lionardo da Vinci and M. Angelo, for the council-hall at Florence. He immediately determined, in conjunction with almoſt all his brother artiſts of the day, upon going to ſee and form his judgment upon them for himſelf; and conſequently left his engagement with Pinturiccio, and proceeded to Florence.

In this city he found ſo many attractive beauties, both of nature and art, that he reſolved to fix his reſidence there for ſome time. His agreeable perſon and manners, combined with the extraordinary talents he had manifeſted, inſured him friends; and he became intimate with ſeveral artiſts of celebrity, among whom were Ghirtandaio, St. Gallo, and Taddeo Taddi; the latter of them, a learned man, and friend of cardinal Bembo, took the youthful painter to his houſe and table, and thus afforded him the beſt introduction to the world, while he purſued his more immediate ſtudies. This kindneſs the gentle heart of Raphael accepted with grateful emotion; and as he painted ſeveral pictures during his reſidence in that city, he preſented two of them to Taddi. One of theſe pictures, a Madonna with the Child, and St. John bringing a little bird to him, the heirs of Taddi ſold to the archduke Ferdinand Charles of Auſtria at a great price: the other is loſt ſight of. He alſo preſented a picture to his friend Lorenzo Naſi, which afterwards found a place in the Medicean gallery, and a duplicate in that of the monaſtery of Valombroſa.

From Florence Raphael was recalled to Urbino, by the death of both his father and mother; and there, when he had arranged his private affairs, he was engaged by Giudobaldo de Monteſeltro, and ſeveral others, to paint religious ſubjects for the altars of their chapels: and among thoſe he painted at this time, were the two little St. Georges, now in the gallery of the Louvre. Theſe commiſſions he executed with great taſte and delicacy; and Vaſari, who enumerates them, more particularly ſpeaks of one of Chriſt praying in the garden, painted for Franceſco Maria, duke of Urbino, as being finiſhed with all the neatneſs of a miniature. What is become of moſt of theſe pictures, it is not eaſy to aſcertain; but it is a curious fact, that not one of them remains at this time to adorn the native city of this great artiſt.

Thence he returned to Perugia, and painted ſeveral pictures. For the church of the Frati de Servi, one of the Virgin, with St. John Baptiſt, and St. Nicholas. For that of St. Stevens, in the chapel of our Lady, he painted in freſco a picture of Chriſt in glory, with God the Father, ſurrounded by angels and ſix ſaints, three on each ſide. Upon this picture he wrote his name in large letters of gold, and very conſpicuouſly, as if he himſelf was pleaſed with the performance of it. He alſo painted here a picture for the nuns of St. Antonio da Padua, of our Lady with the Infant upon her lap clothed, and near her St. Peter, St. Paul, Sta. Cecilia, and Sta. Catherina. The airs and attire of the two female heads were regarded as the moſt taſteful work of the time, wrought with the greateſt degree of beauty and grace. Above the picture, in a ſemicircle, was repreſented

repreſented the Almighty Father; and at the foot of it, in three compartments, were the ſcenes of our Lord's ſufferings, *viz.* his agony in the garden, carrying his croſs, and dead upon the lap of the Virgin. It is not known what is become of the centre picture, or the uppermoſt compartment; the lower ones formed a part of the Orleans collection. The execution of theſe works was performed in a ſtyle much improved upon that of Perugino; with more breadth, more ſoftneſs, and more freedom and variety of action; proving that he had not ill ſpent the time he had devoted at Florence to the ſtudy of the works of other painters. Hence we may date the commencement of what is termed his ſecond manner, from his firſt viſit to that city.

Soon after he had produced theſe works at Perugia, that zeal for cultivation, which always accompanies true genius, led him to determine upon again viſiting Florence, at that time the emporium of ſcience and of art. Though the native ſtrength and purity of his mind were ſuch as to conduct him, under favourable circumſtances, to his future prominent ſtation; yet he does not appear to have been ſo extraordinary and original an inventor in the art itſelf as M. Angelo, or his great predeceſſor and rival, Lionardo da Vinci. He knew how to take a hint of what was offered to his view, and to cultivate and improve it to his purpoſe; but it yet remains a problem, whether Raphael, alone, and without the leading aid of thoſe great and original artiſts, would have ever ſeen the ſublime of painting. His power may rather be ſaid to have conſiſted in ability to employ the materials furniſhed by their invention, *viz.* the ſtyle of Michael Angelo, in form; and of Lionardo da Vinci, in chiaro-ſcuro and colour; in beautiful conceptions, illuſtrative of the character and paſſions of man; and in an admirable ſelection of ſubject, and mode of conveying it.

He himſelf appears to have been conſcious of this; for we find him in the midſt of honourable employment, leaving the proſecution of it, to ſtudy and improve himſelf by a conſtant obſervation of the works of other renowned artiſts, and again repairing to Florence, where alone he could find the true ſource of ſound cultivation, and in which he made ſo good uſe of his time, as to fit him in great meaſure for the glorious field of exertion which awaited him.

On his return to the renowned abode of theſe great artiſts, from whoſe works he ſought improvement, he had a letter of recommendation and introduction from the ducheſs of Urbino to Pietro Soderini Gonfaloniere of the city; and was thus introduced to the beſt circle of improvement and information.

It would have been highly gratifying to have been enabled to trace the ſteps of a man ſo diſtinguiſhed in the art, from the earlieſt commencement of his ſtudies; but the neglect of dates, by his hiſtorians, counteracts every wiſh to follow them more cloſely; and the record of facts leaves us only the means of conjecture. That he began to paint original pictures very ſoon after he was placed with Perugino is evident, and he muſt then have been very young, for it is on record, that the pictures by Pinturiccio, for which he made the cartoons at Sienna, were completed in 1503, at which time he was 20. If we allow, as we reaſonably may, two years for their execution, it will place his firſt viſit to Florence in 1501, at the age of 18; and it certainly cannot have been far from that period. In every part of his life, modeſty, ingenuity, and the ardour of a mind entirely devoted to his art, characterized his conduct. His induſtry and ingenuity ſeem to have kept equal pace; and the rapidity and certainty with which he muſt have painted, to produce ſo many pictures in ſo ſhort a ſpace of time as he lived, are not the leaſt extraordinary part of his hiſtory.

On this, his ſecond abode at Florence, he ſtudied deeply the works of Maſaccio, and the cartoons of Angelo and Da Vinci; and attached himſelf in friendſhip to Baccio della Porta, better known by the name of Fra. Bartolomeo; than whom no one was better qualified to direct him rightly in whatever was grand and dignified, and from whoſe judicious information in the art of caſting draperies and of colouring, Raphael evidently improved exceedingly; while he had the pleaſure, in return, of communicating to his friend the principles of perſpective. Yet notwithſtanding theſe helps, he did not entirely free himſelf from the formal and dry manner of his maſter, though he painted aſſiduouſly both in portrait and hiſtory. In the former he produced the portraits of Angelo Doni and his lady Maddalena Strozzi; and in the latter he painted for Dominico Caneggiani, a Madonna, with the Infant playing with St. John brought by Elizabeth, who regards St. Joſeph as he ſtands near, leaning both his hands upon a ſtick, and inclining his head towards her. This picture appears to have been re-touched, or poſſibly completed only in 1516, as the name of Raphael, with that date, in letters of gold, is written upon the drapery of the Virgin. He alſo made a cartoon during his reſidence in Florence for a picture which he had previouſly engaged to paint for the Baglioni family at Perugia, and left the city to go and paint it in the church of St. Franceſco in that place. The ſubject of it was our Saviour carried to the ſepulchre, accompanied by the Virgin, St. John, &c.; and it was exceedingly admired for the beauty and expreſſion of the figures, and the ſkill and perfection of the draperies. This picture was removed from Perugia by pope Paul V., and a copy, by Ceſare d'Arpino, placed in its ſtead: it afterwards found a ſtation in the Borgheſe palace at Rome.

When Raphael had completed this work, he returned to renew his ſtudies at Florence, and was employed by the family of Dei, to paint a picture for their altar in Santo Spirito, which he began, and conducted through the preparatory parts; and in the mean time painted another for the city of Sienna, of the Madonna in an open country, with the Child ſtanding by her, and St. John kneeling before him, but was interrupted, in its execution, by a ſummons from pope Julius II. to Rome, and left it in the hands of his friend Ghirlandaio, to finiſh a piece of blue drapery which it wanted. This picture was afterwards ſold to Francis, king of France, and is at preſent in the French collection, known by the name of the Belle Jardinière. The unfiniſhed ſketch of the picture begun for the Dei family, was bought, after the death of Raphael, from his heirs, by Baldaſſare Turini, and placed by him, in its original ſtate, at the altar of his country church; it afterwards came into poſſeſſion of the houſe of Buonvicini di Peſcia, and was ſold, by that family, to the grand duke Ferdinand, who, on removing it, placed a copy by Carlo Sacconi in its ſtead. This was done at night, and with the utmoſt ſecrecy, for fear of a diſturbance among the populace, by whom it was highly prized.

Raphael was indebted for the high patronage of the pope, which placed him in the proper ſphere for the exerciſe of talents ſuch as he poſſeſſed, to the friendſhip of his relation Bramante d'Urbino the architect; and never was recommendation better ſupported by ability. Upon his arrival in Rome, in 1508, he was received with great courteſy by Julius, and the Camera della Segnatura, in the Vatican, aſſigned to him. He immediately began the preparation for his firſt picture, which was the School of Theology, better known by the name of the Diſpute of the Sacrament, and in obſerving which, it is worthy

worthy of remark how his mind enlarged, in regard to ſtyle in the art, as he became accuſtomed to conſider largely of his work; and according to the field of employment which he found before him. The difference in ſtyle between one part of the picture, and that of the other, evidently points out where he began it; *viz.* on the right of the upper part, where the remains of the ſchool of Perugino appears, and is ſpread through the centre, where the glory which ſurrounds our Saviour is repreſented in the Gothic manner, by rays of gold. As he proceeded, his ſtyle enlarged, and the lower part of the picture exhibits an immenſe improvement, and is almoſt equal to any of his ſubſequent productions.

In the ſame room are the pictures of the School of Athens, the Parnaſſus, painted in 1512, (where, ſurrounding Apollo and the Muſes, he has introduced portraits of the great poets, both of antiquity and of his own time,) and the Juriſprudence, comprizing two ſubjects, one of the emperor Juſtinian delivering the digeſt of his code of laws to Tribonius, and another of pope Gregory IV. giving the decretal to a member of the conſiſtory. Over each of theſe ſubjects, reſpectively, are painted circular ones of ſingle figures, repreſenting Theology, Philoſophy, Poetry, and Juſtice.

When pope Julius ſaw the ſuperior taſte and talent with which Raphael produced the former of theſe works, he immediately ordered the whole of the ſtanze, or chambers, which it was intended to decorate, to be entruſted to him; and all that had previouſly been done by Perugino, Pietro del Borgo, Il Soddoma, and Bramante di Milano, to be removed. But of this order Raphael made only a partial uſe; preſerving entire the work of his firſt maſter, and, partially, the ornamental labours of Il Soddoma.

While he was engaged upon theſe great works, he was not altogether indifferent to the more agreeable exerciſe of the pencil, and he painted for the church of the Auguſtines, the pictures of the prophet Iſaiah, and the Sibyls who are ſuppoſed to have predicted the coming of Chriſt. He alſo painted the portrait of his great patron, Julius, now in the Louvre, and ſeveral ſmaller eaſel pictures of Madonnas, and other religious ſubjects. By theſe labours he acquired the renown they ſo well merited, and his manners appear to have been in perfect accordance with the beauties of his mind. His perſon alſo was handſome, and he was beloved, eſteemed, and admired. Yet he continued to ſtudy, and to improve his talents, employing perſons to collect ſpecimens and make drawings from Grecian remains. Full of taſte and feeling, he ſpared no pains to perfect his powers by a thorough knowledge of all that had been done in art, both ancient and modern. In conſequence, however, the fact, related by Vaſari, may be doubted, of his being admitted, while Michael Angelo was abſent, to ſee the work of that great artiſt in the chapel of Sixtus IV.; the taſte in which he wrought became aggrandized, and ſimilar to that introduced by M. Angelo. About this time he painted the Galatea for Agoſtini Ghigi, and the Madonna di Foligno, at the deſire of Sigiſmondo Conti, ſecretary of pope Julius II., for the great altar of the church at Araceli, and which is now at the Louvre.

In another chamber of the Vatican he painted four other large pictures, the ſubjects of which are, the miracle of Bolſenna, when the officiating prieſt, who doubted of the real preſence in the Euchariſt, is offering up the hoſt, and perceiving, with aſtoniſhment, that it diſtils drops of blood; the releaſe of St. Peter from priſon; the Heliodorus; and Attila arreſted, in his journey to Rome, by a viſion of St. Peter and St. Paul; theſe were completed in 1512, 13, and 14.

In theſe pictures his great improvement in colouring and ſtyle is moſt evident, and he continued to carry it ſtill further into practice in another room, for which alſo he had compoſed four other ſubjects, known as the Incendio del Borgo; the coronation of Charlemagne by Leo III.; the ſame pope defending his conduct to the ſame emperor; and the deſcent of the Saracens at the port of Oſtia.

Whilſt Raphael was engaged on the Heliodorus, his firſt great patron, Julius II., died; but fortunately for the arts, if not for the tiara, he was ſucceeded by another, Leo X., who was even more attached to them, and more fond of the renown ariſing from the cultivation of whatever adorns ſociety. By him, therefore, Raphael was ardently encouraged to proceed with his labours, and he continued to make deſigns for other apartments, particularly for the great hall of Conſtantine, as it is now called; but he did not live to execute them. The Incendio del Borgo was the laſt upon which he himſelf wrought; the reſt were completed by Julio Romano. He was alſo employed by Leo to make the cartoons now at Hampton Court, as exemplars for works in tapeſtry, to be executed in Flanders, and which were completed at the expence of 70,000 crowns. Fortunately for us the originals were never returned to Rome, and were purchaſed afterwards by Charles I.

Upon the death of Bramante, in 1514, the ſuperintendance of the architectural concerns of the Vatican was entruſted to Raphael, who had already exhibited his knowledge and taſte in that art, by the introduction he had made of it in his pictures. He invented and began a palace for himſelf, and made ſeveral deſigns for others.

Notwithſtanding the immenſe application neceſſary for the invention and completion of theſe important labours, together with the deſigns he compoſed for the ornamental parts, and the ſcriptural ſubjects on the ceilings and the covings of the loggia and ſtanze of the Vatican, he found time to execute in freſco the deſigns which adorn the palace of Agoſtino Ghigi; the capital portrait of his great friend Leo X., with the cardinals de Medici and Roſſi, now in the Louvre; the St. Michael, and the viſion of Ezekiel, both in the ſame grand depôt; a Madonna, Child, and St. Anne, for Florence; and a large picture of Chriſt bearing his Croſs, for the monaſtery of St. Maria della Spaſimo, at Palermo. Of this picture it is reported, that being ſent on ſhipboard to go to Sicily, the veſſel was beaten from its courſe by a tempeſt, and the mariners loſt; when it drifted to Genoa, and of courſe its preſervation was attributed to the divine influence of this great work. The Genoeſe choſe alſo to ſuppoſe that the hand of God had thus pointed out their city as the proper place for its reſidence; and would not relinquiſh it for a length of time, till the papal influence interfered, when it was conſigned to its original deſtination. He alſo painted the picture of St. John, which adorned the Orleans collection; and laſt of all, the Transfiguration; which indeed he had not quite finiſhed when the unrelenting hand of death ſet a period to his labours, and deprived the world of further benefit from his talents, when he had only attained an age at which moſt other men are but beginning to be uſeful.

The immediate cauſe of his death is allowed to have been brought on by too great an indulgence in gallantry, and, Vaſari adds, by miſmanagement of his phyſicians, who bled him when they ought to have adminiſtered reſtoratives. On his death bed he made his will, leaving his favourite pupils, Julio Romano and Il Fattore, his heirs, and ordering his

burial to take place in the Pantheon (the church of Santa Maria Rotunda), where a monument ſtill remains to his honour. He died on the ſame day of the year on which he was born, Good Friday, in 1520, at the age of 37, deeply lamented by all who knew his value. His body lay for a while in ſtate, in one of the rooms wherein he had diſplayed the powers of his mind, and he was honoured by a public funeral; his laſt produce, the Transfiguration, being carried before him in the proceſſion: and, that Rome might not be deprived of ſo noble a memorial of this extraordinary man, it was placed by the cardinal de Medici in the church of St. Pietro à Montorio, inſtead of being ſent to France, as was originally intended.

Mr. Fuſeli, in his edition of Pilkington, has given ſo diſcriminating and juſt an idea of the peculiar excellencies of Raphael, that we ſhall conclude our hiſtory of him by quoting it. "The general opinion has placed Raphael at the head of his art, not becauſe he poſſeſſed a decided ſuperiority over every other painter in every branch, but becauſe no other artiſt ever arrived at uniting with his own peculiar excellence all the other parts of the art in an equal degree with him.

"The drama, or in other words the repreſentation of character in conflict with paſſion, was his ſphere; to repreſent this, his invention in the choice of the moment, his compoſition in the arrangement of his actors, and his expreſſion in the delineation of their emotions, were, and are, and perhaps will be unrivalled. And to this he added a ſtyle of deſign dictated by the ſubject itſelf, a colour ſuited to the ſubject, all the grace which propriety permitted, or ſentiment ſuggeſted, and as much chiaro-ſcuro as was compatible with his ſupreme deſire of perſpicuity and evidence. It is therefore only when he forſook the drama, to make excurſions into the pure epic or ſublime, that his forms become inadequate, and were inferior to thoſe of M. Angelo: it is only in ſubjects where colour from a vehicle becomes the ruling principle, that he is excelled by Titian; he yields to Correggio only in that grace and that chiaro-ſcuro which is leſs the miniſter of propriety and ſentiment, than its charming abuſe, or voluptuous exceſs; and which ſacrifices to the eye what was claimed in vain by the mind.

"Michael Angelo appears to have had no infancy: if he had, we are not acquainted with it: his earlieſt works equal in principle and elements of ſtyle the vigorous offſprings of his virility:- Raphael we ſee in his cradle, we hear him ſtammer: but propriety rocked the cradle, and character formed his lips. Even the trammels of Pietro Perugino, dry and ſervile in his ſtyle of deſign, formal and gothic in his compoſition, he traced what was eſſential, and ſeparated it from what was accidental, in figure and ſubject. The works of Lionardo, and the cartoon of Piſa, invigorated his eye, but it was the antique that completed the ſyſtem which he had begun to eſtabliſh on nature. From the antique he learned diſcrimination and propriety of form. He found that in the conſtruction of the body, the articulation of the bones was the true cauſe of eaſe and grace in the action of the limbs, and that the knowledge of this was the true cauſe of the ſuperiority of the antients. He diſcovered that certain features were fitted for certain expreſſions, and peculiar to certain characters: that ſuch a head, ſuch hands, and ſuch feet, are the ſtamen or the growth of ſuch a body, and on phyſiognomy eſtabliſhed uniformity of parts. When he deſigned, his attention was immediately directed to the primary intention and motive of his figure, next to its general meaſure, then to the bones and their articulation, from them to the principal muſcles or thoſe eminently wanted, to their attendant nerves, and at laſt to the more or leſs eſſential minutiæ; but the character part of the ſubject is infallibly the characteriſtic part of his deſign, whether it be a rapid ſketch, or a more finiſhed drawing. The ſtrokes of his pen or pencil themſelves are characteriſtic: they follow the direction and texture of the part; fleſh in their rounding, tendons in ſtraight, bones in angular lines.

"Such was the felicity aud propriety of Raphael, when employed in the dramatic evolutions of character! both ſuffered when he attempted to abſtract the forms of ſublimity and beauty; the painter of humanity, not often wielded with ſucceſs ſuper-human weapons. His gods never roſe above prophetic or patriarchal forms; if the finger of Michael Angelo impreſſed the divine countenance oftener with ſternneſs than awe, the gods of Raphael are ſometimes too affable or mild, like him who ſpeaks to Jacob, in a ceiling of the Vatican; or too violent, like him who ſeparates light from darkneſs, in the loggia of the ſame place. But though, to ſpeak with things, he was chiefly made to walk with dignity on earth, he ſoared above it in the conception of Chriſt on Tabor, and ſtill more in the frown of the angelic countenance that withers the ſtrength of Heliodorus.

"Of ideal female beauty, though he himſelf, in his letter to count Caſtiglione, tells us, that from its ſcarcity in life, he made attempts to reach it by an idea formed in his own mind, he certainly wanted that ſtandard which guided him in character: his goddeſſes and mythologic females are no more than aggravations of the generic forms of Michael Angelo. When the drama inſpired Raphael, his women became definitions of grace and pathos at once. Such is the exquiſite line and turn of the half-averted kneeling female with two children, among the ſpectators of the puniſhment inflicted on Heliodorus; her attitude, the turn of her neck, ſupplies all face, and intimates more than he ever expreſſed by features."

RAPHAEL, in *Geography*, a fertile and healthy diſtrict, being the weſternmoſt in the Spaniſh part of St. Domingo. Its northern boundary is found in part of the French pariſh Gonſalves. The air round St. Raphael in very ſalubrious, but the town, which is in a hollow, is very hot; 10 leagues S. of Cape François.

RAPHAEL, *St.*, *Cape*, lies at the S. end of St. Domingo, and is the S.E. limit of Samana bay.

RAPHANEA, in *Ancient Geography*, a city of Syria, between which and Arca, or Arac, a city of Judea belonging to the kingdom of Agrippa, the Sabbatical river flowed. Joſeph. de Bell. l. vii. c. 24. Raphanea is, perhaps, the Arpal of ſcripture. 2 Kings, xviii. 34. xix. 13. Iſ. x. 9. xxxvi. 19. xxxvii. 13. Jerem. xlix. 23.

RAPHANIA, in *Medicine*, an appellation given by Linnæus, and afterwards by Dr. Cullen and others, to a ſevere and fatal diſeaſe, which has been deſcribed as epidemic in Sweden at particular ſeaſons, and imputed to the uſe of the *raphanus* raphaniſtrum of Linnæus as food.

It is not neceſſary to deſcribe the ſymptoms of this diſeaſe in this place; ſince it is, in fact, the ſame malady which has been epidemic in various other countries of Europe, during ſeaſons of ſcarcity; and has been attributed to various other ſpecies of unwholeſome grain, but more eſpecially to diſeaſed rye, affected with the *ergot*, to the *lolium temulentum*, to charlock, &c. We have already entered at great length into the hiſtory of the ſymptoms and imputed cauſes of this formidable malady, which has been more commonly denominated *ergot*, from one of its ſuppoſed ſources. (See ERGOT.) We have endeavoured alſo to ſhew, that it conſtituted one of the varieties of epidemic diſeaſe, deſcribed by the ancients, under the appellation of IGNIS *Sacer* (which ſee); and that, inſtead of being properly imputed to the admixture

admixture of any of theſe ſubſtances with the corn uſed for food, the diſeaſe is to be aſcribed with more probability to the inſufficient nouriſhment afforded by damaged corn, or the actual dearth of it, which uſually occur together; eſpecially as theſe diſeaſes have commonly been epidemic in years of ſcarcity, which is the only circumſtance that can be obſerved in common to all the epidemics deſcribed by authors. In addition to the works on ergot and ignis ſacer, formerly referred to, conſult, for an account of raphania, Pulteney's View of the Writings of Linnæus; Rothman's Paper, in the Amœnitates Academ. of Sweden; Tiſſot. Epiſtolæ Med. Pract.

RAPHANIS, in *Botany*, the name by which the Attics, among the Greeks, called the radiſh; for the word *raphanos*, or *raphanus*, with them, does not expreſs the radiſh, but the cabbage. The Greek of all other places concurred in calling the radiſh *raphanos*, and the cabbage *crambe*; and it is owing to this that we have many authors who confound together theſe two plants, though ſo very unlike one another in appearance and uſe. It is generally to be underſtood, that wherever Theophraſtus mentions the word *raphanos*, he means by it the cabbage; and the ſame being obſerved, in regard to all the other Attic writers, the whole danger of confuſion and error will ceaſe.

RAPHANISTRUM, a name given by botaniſts to the wild radiſh, and deſigned to expreſs its affinity to the cultivated one. See RAPHANUS.

RAPHANUS, an ancient name for the Radiſh, a ſpecies of this genus, derived from ῥα, *eaſily*, or *quickly*, and φαινομαι, *to appear*, or *come forth*, in alluſion to the quickneſs of its vegetation.—Linn. Gen. 343. Schreb. 445. Willd. Sp. Pl. v. 3. 560. Mart. Mill. Dict. v. 4. Ait. Hort. Kew. v. 4. 129. Sm. Fl. Brit. 723. Prodr. Fl. Græc. Sibth. v. 2. 32. Juſſ. 238. Tourn. t. 114. Lamarck Illuſtr. t. 566. Gærtn. t. 143. (Raphaniſtrum; Tourn. t. 115. Gærtn. t. 143.)—Claſs and order, *Tetradynamia Siliquoſa*. Nat. Ord. *Siliquoſæ*, Linn. *Cruciferæ*, Juſſ.

Gen. Ch. *Cal.* Perianth inferior, erect, of four oblong, parallel, converging, deciduous leaves, gibbous at the baſe. *Cor.* cruciform, of four inverſely heart-ſhaped, ſpreading petals, whoſe claws are rather longer than the calyx. Nectariferous glands four; one at each ſide, between the ſhorter ſtamen and the piſtil; and one at each of the oppoſite ſides between the longer ſtamens and the calyx. *Stam.* Filaments ſix, awl-ſhaped, erect; two oppoſite ones the length of the calyx; the reſt as long as the claws of the corolla; anthers ſimple. *Piſt.* Germen oblong, tumid, tapering, the length of the ſtamens; ſtyle ſcarcely any; ſtigma capitate, undivided. *Peric.* Pod oblong, pointed, ſwelling here and there, imperfectly jointed, without valves. *Seeds* roundiſh, ſmooth.

Obſ. *Raphanus* of Tourneſort and Gærtner has a ſpongy fruit, of two cells, not burſting. *Raphaniſtrum* of the ſame authors has a jointed fruit, ſeparating at the joints.

Eſſ. Ch. Calyx cloſed. Nectariferous glands four. Pod ſwelling out into knobs, imperfectly jointed, without valves.

1. R. *ſativus*. Common Garden Radiſh. Linn. Sp. Pl. 935. Willd. n. 1. Ait. n. 1. Ger. Em. 237. (R. primus; Matth. Valgr. v. 1. 399.)—Leaves lyrate. Pod roundiſh, tumid, of two cells.—The native country of this well-known plant, ſo commonly cultivated in gardens, is not aſcertained. Linnæus mentions China; but his authority does not appear. Its chief value with us conſiſts in the root, eſteemed for its grateful pungency, mixed with a watery coolneſs. The ſhape of this part varies, from its natural ſpindle-like figure, to a globular one, and the colour of the ſkin from purple to white. We doubt much whether the *R. niger* of Bauhin, commonly called the Black Spaniſh Radiſh, which Linnæus marks β, can belong to this ſpecies. Its firmneſs, and black rugged coat, ſeem to indicate more than a mere variety. We have not examined the herbage. The *leaves* of *R. ſativus* are lyrate, notched, and rough, eſpecially the lower ones; the upper part of the herb is ſmoother, and ſomewhat glaucous. *Stem* branched. *Flowers* purple, corymboſe; ſoon racemoſe. *Pods* erect, tumid, juicy, pale, glaucous, ſmooth, ſlightly ſtriated, various in length and thickneſs, tipped with an awl-ſhaped beak. Linnæus cultivated at Upſal a Chineſe variety, or poſſibly ſpecies, whoſe *leaves* are broader and ſmoother, and its whole habit more lax. The oil of the *ſeeds* is ſaid to be uſed in China.

2. R. *caudatus*. Long-tailed Radiſh. Linn. Mant. 95. Linn. fil. Plant. Rar. faſc. 1. 19. t. 10. Willd. n. 2.—Leaves lyrate. Pod compreſſed, of one cell, wavy, longer than the whole plant.—Native of Java, where, according to the younger Linnæus, it is cultivated, and the pickled pods known by the name of Mougri. In Sweden, as well as in England, it may be treated as a hardy annual, like the foregoing; but the preſent ſpecies does not occur in Hort. Kew., though Mr. Lambert met with it laſt year in a country garden in Wiltſhire. The appearance of the plant, weighed down to the ground by its immoderately long ſerpentine *pods*, is altogether extraordinary. The lobes and indentations of the *leaves* are ſharper than in the Common Radiſh, but the *flowers* and other parts, except the *pods*, ſcarcely betray any difference.

3. R. *Raphaniſtrum*. Wild Radiſh, or Jointed Charlock. Linn. Sp. Pl. 935. Willd. n. 3. Ait. n. 2. Fl. Brit. n. 1, α, β. Eng. Bot. t. 856. Curt. Lond. faſc. 4. t. 46. Mart. Ruſt. t. 71. Fl. Dan. t. 678. (R. ſylveſtris; Ger. Em. 240.)—Leaves ſimply lyrate. Pod round, jointed, even, of one cell.—A troubleſome weed in the cornfields of Europe, flowering in June and July. The *root* is annual, ſmall, and tapering. *Stem* branched, round, glaucous, rough with prominent briſtles, leafy. *Leaves* rough, lyrate; the upper ones oblong, ſimply toothed. *Flowers* numerous, lemon-coloured, changing to white in decay, with purple veins; ſometimes the petals are white from the firſt. *Pods* cylindrical, or rather tapering, beaked, knobbed or imperfectly jointed, ſmooth, becoming ſtriated as they ripen. In a young ſtate they are divided into two cells, but the partition is obliterated, and confounded in one ſpungy maſs, as they ripen. Linnæus was of opinion that the ſeeds of this plant cauſed a convulſive diſeaſe, thence termed by him *Raphania*, of which he has given a hiſtory in Amœn. Acad. v. 6. 430, with a figure, and elaborate ſynonymy of the plant. We have never met with any circumſtance to corroborate this hypotheſis.

4. R. *maritimus*. Sea Radiſh. Sm. Engl. Bot. t. 1643. Ait. n. 3. (R. Raphaniſtrum γ; Fl. Brit. 723. R. maritimus, flore luteo, ſiliquis articulatis, ſecundum longitudinem eminentèr ſtriatis; Raii Syn. 296. Raphaniſtrum ſiliquâ articulatâ ſtriatâ maximâ; Moriſ. v. 2. 266. Raii Hiſt. v. 1. 806.)—Radical leaves interruptedly lyrate. Pod round, jointed, ſmooth, deeply furrowed, of one cell.—Found on the ſea-ſhore in various parts of Britain, flowering in May. The late Rev. Dr. Walker, and Mr. J. Mackay, obſerved it on the weſtern coaſts of Scotland; and the former cultivated this plant, till his death, as an eſculent root, preferable to horſe radiſh; he alſo found that cattle were very fond of the leaves. Mr. Turner and Mr. W. Borrer gathered the ſame on rocks, near Beachy Head, Suſſex. The *root* is large and ſucculent, laſting two or three

three years. *Stems* three or four feet high, round, roughest at the base. *Leaves* all rough, and rather sharply toothed; the radical ones interruptedly lyrate, which we have never observed in the last described species. *Flowers* of a deeper yellow, and less veiny. *Pods* strongly jointed, and very deeply furrowed longitudinally, destitute of hairs or other roughness. There can be no doubt of this being a distinct species from the former, though generally confounded therewith.

5. R. *sibiricus*. Siberian Radish. Linn. Sp. Pl. 935. Murray Comment. Gott. for 1775. 48. t. 11. (R. n. 28; Gmel. Sib. v. 3. 266.)—Leaves pinnatifid, somewhat toothed. Pod round, beaded, downy, of one cell.—Native of Siberia. The seeds were sent by Professor Pallas to the Goettingen garden, where the plant flowered in June. *Root* annual, long, and slender. *Stems* from three to six inches high; or more, as the seeds ripen, ascending, leafy, hairy, simple or branched. *Leaves* sometimes elegantly and neatly pinnatifid, almost pectinate, either in a simple or interrupted manner, roughish at the edge only, sometimes more dilated, with distant and broader lobes. *Flowers* large, yellow, sweet-scented in an evening, their *petals* strongly emarginate. *Pods* inflexed, copiously and neatly beaded in appearance, rather than distinctly jointed, downy, each with a sharp taper beak.

6. R. *tenellus*. Slender Purple Radish. Pallas Trav. v. 3. append. 741. t. L. f. 3. Willd. n. 5. Ehrh. Sel. n. 38. (Chorispermum tenellum; Brown in Ait. H. Kew. v. 4. 129.)—Leaves smooth, oblong, toothed; the lowermost pinnatifid. Pod awl-shaped, jointed, smooth, of two cells.—Native of deserts near the Caspian sea. A hardy annual in our gardens, flowering in June and July. *Root* long, simple, tapering, and slender. *Herb* smooth, scarcely branched, leafy. *Leaves* elliptic-oblong, toothed or pinnatifid, tapering down into longish footstalks. *Flowers* small, purple. Beak of the *pod* very long and slender. The ingenious Mr. Brown separates this from *Raphanus* chiefly, as it seems, because the cotyledons are flat, not folded.

7. R. *arcuatus*. Curve-podded Radish. Willd. n. 6.—"Leaves oblong-lanceolate, toothed. Pod awl-shaped, curved, two-celled, smooth."—Native country unknown. Willdenow cultivated the plant, which he describes as annual, with an erect branched *stem*, hardly a span high. *Leaves* stalked, oblong-lanceolate, very smooth, with broad shallow teeth. *Flowers* small, violet. *Pods* round, of two cells, jointed, curved, smooth, striated, with an awl-shaped beak. The figure of *Hesperis arenaria*, Desfont. Atlant. v. 2. t. 162, answers exactly to this plant, except the pods. *Willdenow*.

8. R. *lanceolatus*. Lanceolate Radish. Willd. n. 7.—"Leaves oblong-lanceolate, somewhat toothed at the apex. Pod tumid, smooth, two-celled, with a squarish beak."—Native of the West Indies. *Stem* a foot and half high, erect, zigzag, with short branches, smooth like every other part of the plant. *Leaves* stalked, oblong-lanceolate; the uppermost lanceolate, narrow, entire; the lower ones bluntly toothed at the extremity. *Flowers* of a middling size, yellow, in a terminal cluster, six inches long. *Pods* half an inch long, with a long, obtuse, obscurely quadrangular beak. *Willdenow*.

9. R. *pilosus*. Hairy-stalked Radish. Willd. n. 8.—"Leaves lanceolate-linear, pinnatifid at the base. Stem rough with bristly hairs. Pod round, smooth, jointed, of one cell."—Native of Guinea. *Stem* two feet, or perhaps more, in height, branched, divaricated. *Leaves* three inches long, narrow, smooth, pointed; pinnatifid at the base; toothed in the middle; entire at the extremity. *Clusters* axillary from every leaf, of few flowers. *Pods* an inch and half long, round, jointed, of one cell, with a short beak, all of them turned one way. *Willdenow*.

R. *erucoides*, Linn. Suppl. 299, is rightly referred by Mr. Brown, in Ait. H. Kew. v. 4. 126, to *Sinapis Allionii*, Jacq. Hort. Vind. v. 2. t. 168. Willd. Sp. Pl. v. 3. 557. (See SINAPIS.) Willdenow cites it, doubtingly, under *Brassica Cheiranthus* of Villars, a very different plant; for which he also by mistake quotes Barrel. Ic. t. 1016, a synonym properly belonging to *Sisymbrium Barrelieri*.

Linnæus once referred *Bunias Cakile* to this genus of *Raphanus*.

RAPHANUS, in *Gardening*, contains plants of the herbaceous, annual, esculent kind, of which the species cultivated is, the common garden radish (R. sativus).

There are several varieties; some of which have the appearance of distinct species, from their shape, size, and colour of the roots; as the *long-rooted*, which is that commonly cultivated in kitchen-gardens for its roots. Of this there are several subordinate variations: as the small-topped, and the long-topped striped radish. The small-topped is most commonly preferred by the gardeners near London, as they require much less room than those with large tops; for as forward radishes are what produce the greatest profit to the gardener, and these are commonly sown upon borders near hedges, walls, or pales, the large-topped sorts would be apt to grow mostly at top, and not swell so much in the root as the other, especially if the plants should be left pretty close.

The *small round-rooted*, which is not very common here, but in many parts of Italy it is the only one cultivated; the roots of this are very white, round, small, and very sweet. It is now frequently brought to the London markets in the spring, generally in bunches, and is sometimes mistaken there for young turnips: when eaten young, it is crisp, mild, and pleasant.

The large *turnip-rooted*, or *white Spanish*, which has a moderately large, spheroidal white root, and is esteemed chiefly for eating in autumn and the early part of winter. Both these sorts are commonly called indiscriminately turnip radishes.

The *black turnip-rooted Spanish*, which has a root like the preceding, white within, but with a black skin; and is greatly esteemed by many for autumn and winter eating.

There are likewise some other subvarieties of the radish noticed by gardeners, as the common *salmon radish*, and the short-topped early *salmon radish*. Also the small red *turnip-rooted radish*. Gardeners, too, often call the long-topped sort the *sallad radish*.

Method of Culture.—These are raised from seed by different sowings from the end of October till April, or the following month. They should have a light fine mould, and the more early sowings be made on borders, under warm walls, or other similar places, and in frames covered by glasses. The common spindle-rooted, short-topped sorts are mostly made use of in these early sowings, the seed being sown broadcast over the beds after they have been prepared by digging over and raking the surface even, being covered in with a slight raking. Some sow carrots with the early crops of radishes.

It is usual to protect the early sown crops in the borders, during frosty nights and bad weather, by mats or dry wheat straw, which should be carefully removed every mild day. By this means they are brought more forward, as well as form better roots. When mats are used, and supported by pegs or hoops, they are readily applied and removed.

A ſecond more general ſowing ſhould be made in January or February. When the crops have got their rough leaf, they ſhould be thinned out, where they are too thick, to the diſtance of two inches, as there will be conſtantly more thinning by the daily drawing of the young radiſhes.

When the weather is dry in March, or the following month, the crops ſhould be occaſionally well watered, which not only forwards the growth of the crops, but increaſes the ſize of the roots, and renders them more mild and criſp in eating.

And the ſowings ſhould be continued at the diſtance of a fortnight, till the latter end of March, when they ſhould be performed every ten days, until the end of April or beginning of the following month. In ſowing theſe later crops, it is the practice of ſome gardeners to ſow coſs-lettuces and ſpinach with them, in order to have the two crops coming forward at the ſame time, but the practice is not to be much recommended, where there is ſufficient room.

But in ſowing the main general crops in the open quarters, the market-gardeners generally put them in on the ſame ground where they plant out their main crops of cauliflowers and cabbages, mixing ſpinach with the radiſh-ſeed as above, ſowing the ſeeds firſt, and raking them in, then planting the cauliflowers or cabbages; the radiſhes and ſpinach come in for uſe before the other plants begin to ſpread much, and as ſoon as thoſe ſmall crops are all cleared off for uſe, hoe the ground all over to kill weeds and looſen the ſoil, drawing earth about the ſtems of the cauliflowers and cabbages.

The turnip radiſh ſhould not be ſown till the beginning of March, the plants being allowed a greater diſtance than for the common ſpindle-rooted ſort. The ſeeds of this ſort are apt to degenerate, unleſs they are ſet at a diſtance from that kind.

The white and black Spaniſh radiſhes are uſually ſown about the middle of July, or a little earlier, and are fit for the table by the end of Auguſt, or the beginning of September, continuing good till froſt ſpoils them. Theſe ſhould be thinned to a greater diſtance than the common ſort, as their roots grow as large as turnips, and ſhould not be left nearer than ſix inches.

To have theſe roots in winter, they ſhould be drawn before hard froſt comes on, and laid in dry ſand, as practiſed for carrots, carefully guarding them from wet and froſt; as in this way they may be kept till the ſpring.

In regard to the culture of the general crops, they require very little, except occaſional thinning where they are too thick, when the plants are come into the rough leaf, either by hoeing or drawing them out by hand: though for large quantities, ſmall hoeing is the moſt expeditious mode of thinning, as well as moſt beneficial to the crop by looſening the ground; in either method thinning the plants to about two or three inches diſtance, clearing out the weakeſt, and leaving the ſtrongeſt to form the crop.

In order to ſave the ſeed, about the beginning of May ſome ground ſhould be prepared by digging and levelling; then drawing ſome of the ſtraighteſt and beſt-coloured radiſhes, plant them in rows three feet diſtant, and two feet aſunder in the rows; obſerving, if the ſeaſon be dry, to water them until they have taken root: after which they will only require to have the weeds hoed down between them, until they are advanced ſo high as to overſpread the ground.

When the ſeed begins to ripen, it ſhould be carefully guarded againſt the birds. When it is ripe, the pods will turn brown: then it muſt be cut, and ſpread in the ſun to dry; after which it muſt be thraſhed, and laid up for uſe where no mice can come at it.

Method of Culture on Hot-beds.—This method is ſometimes practiſed in order to have the roots early, as in January or the following month. They ſhould have eighteen inches depth of dung to bring them up, and ſix or ſeven inches depth of light rich mould. The ſeed ſhould be ſown moderately thick, covering it in half an inch thick, and putting on the lights: the plants uſually come up in a week or leſs; and when they appear, the lights ſhould be lifted or taken off occaſionally, according to the weather; and in a fortnight thin the plants to the diſtance of an inch and half or two inches, when in ſix weeks they will be fit to draw. Where there are no frames to ſpare, the beds may be covered with mats over hoops, and the ſides ſecured by boards and ſtraw-bands. And, when in want of dung, if the beds be covered with frames, and the lights put on at night and in bad weather, the plants may be raiſed for uſe a fortnight ſooner than in the open borders.

RAPHE, in *Anatomy*, a Greek term, ſignifying ſuture, applied to ſome parts of the body; thus we have the raphe corporis calloſi in the brain (ſee BRAIN); raphe perinei, ſcroti, and penis. See GENERATION.

RAPHELENGIUS, ſometimes called RAULENGHIEN, FRANCIS, in *Biography*, a learned orientaliſt, was born in 1539 at Lanoy, near Lille, in Flanders. He had the early part of his education at Ghent, but on the death of his father, it was intended to bring him up to trade, and for that purpoſe he was ſent to Nuremberg. Here he had acceſs to books, reſumed his ſtudies, and took an opportunity of going to Paris, where he made great progreſs in the Greek and Hebrew languages. The civil wars obliged him to quit France, and he came to England, where, for ſome time, he taught Greek in the univerſity of Cambridge. After this he returned to the Low Countries, and became a corrector of the preſs to the celebrated printer Plantin, whoſe daughter he married in the year 1565. He made himſelf very ſerviceable in the printing office, eſpecially with reſpect to the famous Antwerp Polyglot Bible, printed in 1571 by order of Philip II. of Spain. When Plantin removed to Leyden, he left his buſineſs at Antwerp under the care of Raphelengius, and upon his return the latter went to Leyden. The curators of the univerſity of that place conferred upon him the profeſſorſhip of Hebrew, to which was added that of Arabic. He died in 1597. His literary works were "Variæ Lectiones et Emendationes in Chaldaicam Bibliorum Paraphraſin;" "Grammatica Hebræa;" "Dictionarium Chaldaicum;" and "Lexicon Arabicum." He had a ſon of the ſame name, a man of talents and learning, who publiſhed "Notes upon Seneca's Tragedies," and "Eulogies, in Verſe, of fifty Perſons, with their Portraits."

RAPHIA, in *Botany*, from ῥαφὶς, *a point* or *needle*, ſo that it ought to have been *Rhaphia*, a genus of Palms, with a very pointed fruit, eſtabliſhed by Paliſot Beauvois, in his *Flore d'Oware et de Benin*, faſc. 8.

RAPHIA, in *Ancient Geography*, a famous city in the Mediterranean, between Gaza and Rhinocorura. This was perhaps Gath of the Rephiam. Raphia is famous for the victory of Philopator, king of Egypt, over Antiochus the Great, king of Syria. (3 Maccab. i. 11.) Joſephus ſays (Antiq. l. xiii. c. 21.) that Raphia was taken by Alexander Jannæus, and after being ruined in the wars, was repaired by Gabinius. There are extant ſome ancient medals ſtruck at Raphia, and ſome biſhops of this city are found in the liſts of the eaſtern councils.

RAPHIDIA, in *Entomology*, a genus of inſects of the order Neuroptera, of which there are two ſpecies. The generic character is as follows; Mouth with a curved toothed

toothed horny mandible; the thorax is long and cylindrical; it has three ſtemmata; the wings are deflected; the antennæ filiform, as long as the thorax, the anterior part is elongated and cylindrical: it has four feelers, which are ſhort and filiform; the tail of the female is terminated by a large recurved briſtle.

* Ophiosus. The wings of this ſpecies are immaculate. It inhabits divers parts of Europe in woods, and preys on other inſects.

* Notata. Wings with a brown marginal ſpot. It inhabits England, and has been thought to be only a variety of the former. The body is black; the head is alſo black with a teſtaceous ſpot; the legs are teſtaceous; the appendage of the female is as long as the body.

RAPHOE, in *Geography*, a biſhopric of Ireland, in the eccleſiaſtical province of Armagh, which compriſes the greater part of the county of Donegal, being 44 miles in length from north to ſouth, and 32 in breadth, comprehending 515,250 Iriſh acres. It contains 31 pariſhes, in which are 32 churches. The dean, archdeacon, and four prebendaries, compoſe the chapter. The patronage of 6 pariſhes, which form the corps of the deanery, is in the crown; of 15 others, in the biſhop; of 7, in the univerſity of Dublin; and of 3, in lay hands. It is not preciſely known at what time this ſee was founded, but it muſt have been as early as the ninth century, ſince biſhops of Raphoe are mentioned at that time. Beaufort.

Raphoe, a ſmall poſt-town of Ireland, the pariſh church of which ſerves as a cathedral, where is the biſhop's palace. It is 107 miles N. by W. from Dublin.

Raphoe, a townſhip in Lancaſter county, Pennſylvania, containing 2814 inhabitants.

RAPHON, in *Ancient Geography*, a city beyond Jordan, on a brook, not far from Carnaim.

RAPICIO, Grovita, in *Biography*, an Italian man of letters, was born about the year 1480, at Chiari, in the territory of Breſcia. Devoting himſelf to the inſtruction of youth in literature, he firſt opened a ſchool at Bergamo, where he wrote a Latin treatiſe on the education of youth, which was afterwards printed at Venice. He next taught at Vicenza, and various other cities in Italy, and was for many years employed at Venice in inſtructing, in polite literature, the youths deſtined for public life, and among others, the care and inſtruction of the ſons of cardinal Bembo were devolved upon him. Cardinal Pole, in one of his letters, ſpeaks of Rapicio in high terms of commendation. He died at Venice in 1553. He was author of various harangues, poems, and epiſtles, but his chief work was entitled "De numero Oratorio," in five books, printed at Venice in 1544. "In this," ſays his biographer, "he minutely inveſtigates the principles of writing the Latin language with ſweetneſs and harmony, and he replies to Melanchthon's aſſertion, that rules of this kind are rendered uſeleſs by our ignorance of the ancient pronunciation. Moreri."

RAPID Ann, in *Geography*, a ſmall river of Virginia, which runs into the Rappahanock, about 10 miles above Frederickſburg.

Rapid *Plat*, *Iſle au*, a ſmall iſland of Upper Canada, in the river St. Lawrence, in front of the townſhip of Matilda, containing about 200 acres.

Rapid *River*, a river which runs into Hudſon's Bay.

RAPIDES, a county of the territory of Orleans, containing three pariſhes, *viz.* Rapides, including 2200 inhabitants, Catahula 1164, and Avoyelles 1209.

RAPIER, properly denotes a long, ordinary, old-faſhioned cutting ſword, ſuch as thoſe worn by the common ſoldiers.

The word is formed from the French *rapiere*, of the Greek ῥαπίζειν, *cædere*, *to ſmite*, or *ſtrike*.

In this ſenſe do the French ſtill uſe the term; ſo that among them, to *take the rapier*, is to enter in the army.

Rapier, in a modern ſenſe among us, uſually denotes a ſmall ſword, as contradiſtinguiſhed from a back-ſword, or cutting-ſword.

RAPILLO, in *Mineralogy*, the name given by the Italians to the ſand or powders (improperly called aſhes) thrown from the craters of volcanoes in immenſe quantities, towards the concluſion of an eruption. See Volcano, and Volcanic *Products*.

RAPIN, Renè, in *Biography*, a Jeſuit, was born at Tours in 1621. He entered the ſociety in 1639, and was a teacher of the belles lettres in it during nine years. He became eminent by ſeveral publications in the Latin and French, and obtained a high rank among the literary characters of his time. It is, however, as a Latin poet that he is chiefly known: his didactic poem on *Gardens*, entitled "Hortorum, lib. iv." firſt printed in 1665, has paſſed through many editions, and has been regarded as one of the moſt elegant and claſſical pieces of modern Latin verſe. By others it has been thought a work of art and ſtudy, rather than an effuſion of poetical feeling and fancy, and treats on gardening more as a branch of rural economy than as one of the fine arts. His other Latin poems are ſacred eclogues, heroic, elegiac, and lyric poems. Father Rapin died at Paris in 1687. He was no leſs eſteemed for his virtues and amiable qualities, than admired for his talents; and he poſſeſſed all that poliſh and fitneſs for the ſociety of the great world, which have diſtinguiſhed this order from other religious communities. His works were collected and publiſhed, in 3 vols. 12mo. 1681. There is a fine edition of his "Hortorum," publiſhed by Brotier at Paris, in 1780. Rapin was great as a critic, in which line he is known by his "Reflexions ſur l'Eloquence, ſur la Poeſie, ſur l'Hiſtoire, et ſur la Philoſophie;" and alſo by his "Comparaiſons de Virgile et d'Homere," printed in 2 vols. 4to. Bayle. Moreri.

Rapin de Thoyras, Paul, well known as the hiſtorian of England, was born at Caſtres, in Languedoc, in 1661. He was deſcended from a noble family of Savoy, which came into France in the reign of Francis I. for the ſake of profeſſing the reformed religion. The ſubject of this article, after having received his education, went to his father, who was an advocate in the chamber of the edict at Nantes, for the purpoſe of ſtudying the law. He was in due time admitted an advocate, but the chamber being ſuppreſſed in the ſame year, he went with his father to Toulouſe. On the revocation of the edict of Nantes, in 1685, he withdrew to England, after which he went to Holland, and entered into a company of French cadets at Utrecht. In 1689 he followed the prince of Orange into England, and obtained an enſigncy in lord Kingſton's regiment, which went to Ireland. He was engaged in ſeveral battles, particularly at the ſieges of Carrickfergus and Limerick, and at the battle of the Boyne, and ſo much diſtinguiſhed himſelf, that he obtained a captain's commiſſion. In 1693 he was nominated governor to the ſon of the earl of Portland, reſigned his commiſſion to a younger brother, and received from the crown, for his paſt ſervices, 100*l.* a-year. He travelled to different countries in company with his pupil, and reſided with him ſome time at the Hague. By the death of king William he was deprived of his penſion, and his engagement as private tutor being over, he retired, in 1707, to Weſel, in the duchy

of Cleves, where he devoted himself to the compoſition of the hiſtory of England. Here he died in 1725. He had, previouſly to his deceaſe, publiſhed in the year 1717, "Diſſertation ſur les Whigs et Torys," which was tranſlated into Engliſh. His great work, "L'Hiſtoire de Angleterre," was printed at the Hague in 9 vols. 4to. in the years 1725—6. It commences with the remoteſt periods, and is brought down to the proclamation of William and Mary. It has been twice tranſlated into our own language, and was, till the appearance of Hume, the moſt popular hiſtory of England, and Tindal's, or rather Birch's, and other continuations, have been adapted to it. It is written in a prolix and unanimated ſtyle, but deſerves the praiſe of much ſolid information. "His work," ſays an excellent writer, "is of great authority, on account of his perpetual references to original documents, and the ample quotations which he frequently makes from important ſtate papers, confer upon it additional value. He has ſo copiouſly detailed the matters which were agitated in the turbulent, but prudent parliament of Charles I., as to give a clear view of the riſe of thoſe parties which to this day divide the people of England. On the dark and horrible tranſactions of the reign of Charles II. he perhaps throws as much light as it is now poſſible to obtain. In reference to that important period, he has ſtated hiſtorical difficulties with candour, and in diſcuſſing the merits and demerits of parties, he has weighed evidence with laudable ſcrupuloſity." (See Shepherd's Syſtematic Education.) Rapin, during the collection of his materials, undertook the uſeful labour of making an "Abridgment of Rymer's Foedera," which was publiſhed in Le Clerc's "Bibliotheque Choiſie;" and tranſlated into the Engliſh by Mr. Stephen Whatley, and publiſhed in 1733, under the title of "Acta Regia," and in folio.

RAPINE, Rapina, in *Law*. To take a thing in private; againſt the owner's will, is properly *theft;* but to take it openly or by violence, is *rapine*, or *robbery*.

RAPINIA, in *Botany*, was ſo called by Loureiro, Fl. Cochinch. 127, after father Renè Rapin, a French Jeſuit, author of an elegant Latin poem on gardens, who died in 1687, aged 66. If this writer contributed nothing to improve the ſcience of botany, he has, doubtleſs, helped to promote a love of plants, and may therefore claim a botanic wreath. A Jeſuit of his day is doubly entitled to reſpect, for having, like the good Loureiro, turned his mind to an elegant and improving purſuit, from thoſe two corruptors of the human heart and underſtanding, political intrigue, and ſcholaſtic divinity; in which moſt of his brethren ſought their temporal, and oftenſibly their eternal, good. The *Rapinia* of Loureiro however, proved, on the examination of his ſpecimens by the late Mr. Dryander, to be the Spheneoclea of other authors; and this laſt-mentioned name is now generally adopted. See that article.

RAPINO, in *Geography*, a town of Naples, in Abruzzo Citra; nine miles S. of Civita di Chieti.

RAPISTRUM, in *Botany*, originally the wild turnip, ſo called from its affinity to *Rapa*, the cultivated one. Tournefort, however, uſes the word generically, for ſome ſpecies referred by other botaniſts to *Myagrum*. In this he is followed, as far as concerns *M. paniculatum*, by Gærtner, and by the writer of the preſent article, in the Prodr. Fl. Græc.—Tourn. t. 99. Gærtn. v. 1. 285. t. 141. Sm. Prodr. Fl. Græc. Sibth. v. 2. 1. Brown in Ait. Hort. Kew. v. 4. 74.—Claſs and order, *Tetradynamia Siliculoſa*. Nat. Ord. *Siliquoſæ*, Linn. *Cruciferæ*, Juſſ.

Gen. Ch. *Cal.* Perianth inferior, of four oblong, ſpreading, deciduous leaves, gibbous at the baſe. *Cor.* cruciform, of four obovate, entire, ſpreading petals, whoſe claws are ſhorter than the calyx. *Stam.* Filaments ſix, about the length of the calyx, the four oppoſite ones rather the longeſt; anthers ſimple. *Piſt.* Germen oblong; ſtyle awl-ſhaped, the length of the calyx; ſtigma obtuſe. *Peric.* Pouch lenticular, pointed, corrugated, of two cells, and two cohering, not ſpontaneouſly ſeparating, coriaceous valves; partition membranous. *Seeds* roundiſh, ſolitary in each cell; cotyledons flat.

Eſſ. Ch. Calyx ſpreading. Pouch of two cells, and two convex valves, not burſting.

1. R. *paniculatum*. Panicled Rapiſtrum. Ait. n. 2. (R. arvenſe, folio auriculato acuto; Tourn. Inſt. 211. Myagrum paniculatum; Linn. Sp. Pl. 894. Willd. Sp. Pl. v. 3. 409. Fl. Dan. t. 204. Myagro ſimilis, ſiliquâ rotundâ; Bauh. Prodr. 52.)—Native of cultivated fields in various parts of Europe, from Sweden to Greece, but not, as yet, obſerved in Britain. *Root* annual, tapering. *Stem* about two feet high, erect, round, roughiſh, leafy, branched. *Leaves* oblong, acute, undivided, rough, ſomewhat toothed, claſping the ſtem with their arrow-ſhaped baſe. *Flowers* ſmall, yellow, in numerous cluſters, which become greatly elongated when in fruit. *Pouch* ſcarcely bigger than muſtard-ſeed, a little abrupt, finely reticulated. One of the *ſeeds* is often, but not always, abortive. Mr. Brown refers to this genus the *Bunias ægyptiaca* of Linnæus, which agrees with our *R. paniculatum* in having flat, not ſpiral, cotyledons, but has otherwiſe the characters of *Bunias*.

Rapistrum is alſo a ſpecies of the *ſea-cabbage*, or *crambe*.

RAPOLLA, in *Geography*, a town of Naples, in Baſilicata, the ſee of a biſhop, united to Melfi; ſix miles W. of Venoſa. N. lat. 40° 58′. E. long. 15° 44′.

RAPORE, a town of Naples, in Principato Ultra; 9 miles E. of Conza.

RAPOSO, a town of South America, in the country of Popayan.—Alſo, a river of Popayan, which runs into the Pacific ocean, N. lat. 3° 48′.—Alſo, a ſmall iſland in the Pacific ocean, near the coaſt of Popayan. N. lat. 4°.

RAPPAHANOCK, a large navigable river of Virginia, which riſes in the Blue Ridge, and runs about 130 miles from N.W. to S.E., and enters into Cheſapeak bay, between Windmill and Stingray points. It waters, in its courſe, the towns of Falmouth, Frederickſburg, Port-Royal, Leeds, Tappahannock, and Urbonne.

RAPPE, in *Commerce*, a money of account in Switzerland, 10 of which are equal to a good batze; and 6 are equal to a plappert, ſhilling, or eſcalin. This is the caſe at Baſil, but at Lucern the plappert is only 3 rappen, and the Zurich eſcalin = $3\frac{3}{4}$ rappen.

Rappe, in *Ichthyology*, a name given by ſome to the *capito fluviatilis rapax* of Geſner, more frequently known by the name of the *corvus piſcis*.

RAPPERSCHWEIT, in *Geography*, a town of Switzerland, and capital of a diſtrict to which it gives name; ſituated on the N. ſide of the lake of Zurich, over which there is a bridge, 1852 paces in length, built in 1358 by the counts of Habſburg. The town was founded in 1091, and formerly had its own counts. In 1358 it was ſold to the ſons of Albert, archduke of Auſtria. In 1464 it put itſelf under the cantons of Uri, Schweitz, Unterwalden, and Glarus, with a reſerve of its liberties; but the cantons gradually made themſelves maſters of it. At the peace of Arau in 1712, its liberties were reſtored, though the country remains ſubject to the ſovereignty of Zurich and Berne; 15 miles S.E. of Zurich.

RAPPIN, a town of Anterior Pomerania; 7 miles N. of Bergen.

RAPPO Rappo, a bay on the coaſt of Mowee, one of the Sandwich iſlands.

RAPPOLTSKIRCHEN, a town of Auſtria; five miles S. of Tuln.

RAPPORT, Fr. in *Muſic*, is ſometimes uſed for proportion, and ſometimes for relation, words which will be explained in their places.

RAPPS, in *Geography*, a town of Auſtria, on the river Taya; four miles S.W. of Droſendorf.

RAPSO, a town of Iſtria; 52 miles S.E. of Capo d'Iſtria.

RAPTEC, a river of Hindooſtan, which runs into the Dewah, five miles S.W. of Sellempour.

RAPTU Hæredis, in *Law*, an ancient writ which lies for taking away an heir, holding in ſocage; of which there are two ſorts; one when the heir is married, the other when not. See Ravishment.

RAPTURE, Raptura, an extaſy, or tranſport of mind. See Extasy, Enthusiasm, Rhapsody, &c.

RAPUNCULUS, in *Botany*, the Rampion, owes its name to a reſemblance in the root to a Rape, or oblong Turnip. This root, *Campanula Rapunculus* of Linnæus, is biennial, ſcarcely larger than a radiſh, which it reſembles alſo in ſhape, but the colour is white. Its flavour is ſweet and mild, notwithſtanding ſome degree of milkineſs in the juices, in which it accords with other, uſually bitter and acrid, ſpecies of its genus. The Rampion is now much leſs cultivated than formerly, and almoſt a ſtranger at our tables.

RAPUNTIUM, a name uſed by Tournefort and Moriſon for ſome plants referred to *Lobelia* by Linnæus. (See Lobelia.) Gærtner, having adopted Plumier's *Lobelia*, the Linnæan *Scævola*, reſtores *Rapuntium;* but ſuch a meaſure could now lead to inconvenience only.

RAPUTIA, ſo called by Aublet, becauſe the plant grows in the foreſts of *Orapu* in Guiana. Juſſieu and Lamarck have retained this curious name. Schreber has changed it for Sciuris; ſee that article hereafter.

RARAKIT, in *Geography*, a town of the iſland of Ceram, at the foot of a mountain covered with trees, which ſerves as a harbour for pirates.

RARE, in *Phyſics*, denotes a body that is very porous, whoſe parts are at a great diſtance from one another, and which contains but little matter under a great deal of bulk.

In this ſenſe *rare* ſtands oppoſed to *denſe*.

The corpuſcular philoſophers, *viz.* the Epicureans, Gaſſendiſts, Newtonians, &c. aſſert that bodies are rarer ſome than others, in virtue of a greater quantity of vacuity included between their pores. The Carteſians hold, that a greater rarity only conſiſts in a greater quantity of materia ſubtilis included in the pores. Laſtly, the Peripatetics contend, that rarity is a new quality ſuperinduced upon a body without any dependence, either on vacuity, or ſubtile matter.

RARECOURT, in *Geography*, a town of France, in the department of the Meuſe; 10 miles S.W. of Verdun.

RAREE, a town of Hindooſtan, in Concan; 20 miles N.N.W. of Goa.—Alſo, a town of Hindooſtan, in Bahar; 11 miles N.N.W. of Durbungah.

RAREFACTION, Rarefactio, in *Phyſics*, the act by which a body is rendered *rare;* that is, is brought to poſſeſs more room, or appear under a larger bulk, without acceſſion of any new matter.

Rarefaction is oppoſed to *condenſation*.

Our more accurate writers reſtrain rarefaction to that expanſion of a maſs into a larger bulk, which is effected by means of heat. All expanſion from other cauſes they call *dilatation*.

The Carteſians deny any ſuch thing as abſolute rarefaction: extenſion, with them, conſtituting the eſſence of matter, they are obliged to hold all extenſion equally full.

Hence, they make rarefaction to be no other than an acceſſion of freſh, ſubtile, and inſenſible matter, which, entering the parts of the body, ſenſibly diſtends them. See this diſproved under Vacuum.

It is by rarefaction that gunpowder has its effect; and to the ſame principle alſo we owe our æolipiles, thermometers, &c.

The degree to which the air is rareſiable exceeds all imagination: Merſennus, long ago, by means of an intenſe heat, found that air might be rarefied ſo as to poſſeſs more than ſeventy times its former ſpace.

Mr. Boyle afterwards found, that air, by its own elaſticity, and without the help of any heat, would dilate itſelf ſo as to take up nine times its former ſpace; then 31 times; then 60; then 150: at length, by many degrees, he found it would reach to 8000 times, then 10,000, and finally to 13,679.

Such is the rarefaction of common air, from its own principle of elaſticicity, and without any previous condenſation; but if it be compreſſed, the ſame author found its greateſt ſpace when moſt rarefied, is to its leaſt when moſt condenſed, as 55,000 to 1.

Such an immenſe rarefaction, ſir Iſaac Newton ſhews, is inconceiveable on any other principle than that of a repelling force inherent in the air, by which its particles mutually fly from one another.

This repelling force, he obſerves, is much more conſiderable in air than in other bodies, as being generated from the moſt fixt bodies, and that with much difficulty, and ſcarcely without fermentation; thoſe particles being always found to fly from each other with the moſt force, which, when in contact, cohere the moſt firmly. See Air.

The members of the French Royal Academy have beſtowed much attention on the different rarefactions, or rather the different rarities of the air at different heights. M. Mariotte eſtabliſhed this as a principle, from experiments, that the different rarefactions, or condenſations, of the air, follow the proportion of the weights with which it is preſſed.

Hence, ſuppoſing the mercury in the level of the ſea ſuſpended to twenty-eight inches, which is the weight of the whole atmoſphere; and that ſixty feet height of air are equivalent to a line, or one-twelfth of an inch of mercury; ſo that the barometer, at the height of ſixty feet from the ſea, would fall a line; it is eaſy finding what height of air would be equal to a ſecond, or any other line of mercury: for as twenty-eight inches of mercury one-twelfth are to twenty-eight inches, ſo is the height of ſixty feet of air to a fourth term, which is the height of air correſponding to a ſecond line of mercury.

And after the ſame manner may the height of air correſponding to each line be found; which will make a geometrical progreſſion, the ſum of which will be the whole *height of the* Atmosphere (which ſee); and, of conſequence, a certain part of that ſum will be the height of a mountain, at whoſe top the barometer ſhall have ſunk a certain quantity.

Meſſrs. Caſſini and Maraldi, upon meaſuring the heights of ſeveral mountains, found, that this progreſſion of M. Mariotte was defective; that it always gave the height of the mountains, and conſequently the rarefactions, leſs than they really were; and from ſome farther experiments,

M. Amon-

M. Amontons found, that the principle will only hold in the mean rarefactions, not in the extremes. See Barometer.

RAREN, or Raron, in *Geography*, a town of the Valais, and capital of a tithing; 21 miles E. of Sion.

RARGIARA, a town of Hindooſtan, in Bahar; 32 miles S.W. of Bahar.

RARITON, a river of America, in New Jerſey, formed by two conſiderable ſtreams, called the north and ſouth branches; the one riſes in Morris county and the other in the county of Hunterdon. This river paſſes by Brunſwick and Amboy, and, uniting with the waters of the Arthur Kull ſound, helps to form the fine harbour of Amboy. At Rariton hills, through which this river paſſes, is a ſmall caſcade, with a fall of water from fifteen to twenty feet, romantically ſituated between two rocks. Copper ore has been found upon the upper part of this river.

Rariton, a town of New Jerſey, ſituated between the mouth of the N. branch of the above river and Boundbrook; 12 miles N.W. of Brunſwick.

RARO, a town of Hungary; 8 miles E.S.E. of Altenburg.

RARONGHAKON, a large lake of Thibet. N. lat. 31° 4′. E. long 85° 52′.

RARUM, *Non-Spiſſum*, in the *Ancient Muſic*. See Apycnon.

RAS, in *Geography*, a town of Syria, anciently called "Conna," ſituated near the ſource of the Orontes; 24 miles N. of Balbec.

Ras *Abad*, or *Baba*, a cape on the coaſt of Arabia, in the Red ſea; 10 miles S.S.W. of Jiddah.

Ras-*Acon-natter*. See Caxines.

Ras *Adder*. See *Cape* Bon.

Ras *Ahahaz*, a cape on the coaſt of Arabia, in the Red ſea. N. lat. 18° 19′. E. long. 37° 48′.

Ras *Ain*, or *Ain Verdeh*, a town of Aſiatic Turkey, in the province of Diarbekir; 80 miles S. of Diarbekir. N. lat. 36° 34′. E. long. 39° 48′.

Ras *el Amouſhe*, a cape of Africa, on the coaſt of Algiers; 42 miles E. of cape Tennes. N. lat. 36° 41′. E. long. 2° 48′.

Ras *Aſſah*, a cape on the coaſt of Abyſſinia, in the Red ſea. N. lat. 13° 8′. E. long. 43° 10′.

Ras *el Camir* or *Kanſir*, or cape of the wild boar, a town of Syria, in the pachalic of Aleppo, near a cape on the ſea-coaſt; 16 miles W. of Alexandretta.

Ras *el Doar*, a cape on the coaſt of Nubia, in the Red ſea. N. lat. 21° 21′. E. long. 36° 9′.

Ras *el Anf* or *Enf*, *i. e.* cape of the Roſe, a cape on the coaſt of Egypt, in the Red ſea; without tree or herb; in the front of the point are the remains of a large temple. N. lat. 23° 57′.

Ras *Fartach*. See Fartach.

Ras *Fillam*, a cape on the E. coaſt of Arabia; 18 miles S.E. of cape Mozendum. N. lat. 29° 59′.

Ras *Ibrahim*, a cape of Arabia, in the Red ſea; 6 miles S. Ghunfude.

Ras *Iggidid*, or *Ras el Jidid*, a cape of Nubia, in the Red ſea; near which is a harbour, reſembling a cauldron, and round as the arch of a circle; the entrance is formed by two points, N. and S. of each other, with 18 fathoms of water, and in the harbour 13. This port is ſubject to no inconvenience, except from the eaſt. N. lat. 22° 15′. E. long. 36°.

Ras *al Mahbees*, a cape of Africa, on the coaſt of Tripoli. N. lat. 32° 18′. E. long. 11° 49′.

Ras *Mohammed*, a cape on the coaſt of Arabia, in the Red ſea. N. lat. 27° 54′.

Ras *al Mar*, a town of Perſia, in the province of Segeſtan; 200 miles S.W. of Zareng.

Ras *al Naſhef*, a cape of Egypt, in the Red ſea. N. lat. 23° 16′.

Ras *Rouzé*, a cape on the E. coaſt of Arabia. N. lat. 21° 55′.

Ras *Viré*, a cape on the coaſt of Arabia, forming the S. point of the gulf of Curia Muria. N. lat. 17° 25′.

Ras *Zafrane*, a cape on the coaſt of Egypt, in the Red ſea; 32 miles S.S.E. of Suez. N. lat. 29° 14′.

RASA, a ſmall iſland in the Indian ſea, near the coaſt of Africa. S. lat. 17° 8′.

RASAIN, a town of Perſia, in the province of Fars or Farſiſtan; 110 miles N.W. of Schiras or Shirauz.

RASAL, or Rasal-sem, *Cape*, a cape of Africa, on the coaſt of Tripoli. N. lat. 32° 36′. E. long. 21° 10′.

RASALEMA, a river of Africa, which waters the city of Fez.

RASALGATA, Cape, or *Ras Rouſe*, a cape on the E. coaſt of Arabia. N. lat. 22° 25′. E. long. 58° 15′.

RASANT, or Razant *flank*, in *Fortification*. See Flank.

The defence of the baſtion is raſant.

Rasant *Fire*. See Fire.

RASCA, in *Geography*, a river of Servia, which joins the Ibar; 16 miles N.E. of Jenibaſar.

RASCETA, a word uſed by the Arabian phyſicians to expreſs the wriſt or ankle.

RASCH, in *Geography*, a town of Bavaria, in the territory of Nuremberg; two miles S.S.E. of Altorf.

RASCHNA, or Rizana, a town of Servia; eight miles S. of Parakin.

RASCHOWITZ, a town of Bohemia, in the circle of Leitmeritz; four miles E. of Auſche.

RASCIA, a port of Servia, watered by the Raſca.

RASCINES, a town of Spain, in the province of Biſcay; 21 miles S.E. of Santander.

RASE, Rasarium, in our *Old Writers*, ſeems to have been a meaſure of corn now diſuſed; toll ſhall be taken by the raſe, and not by the heap or cantel.

Rase, in the *Manege*. *To raſe*, or glance upon the ground, called in French *razer le tapis*, is to gallop near the ground, as our Engliſh horſes do.

RASEB, Al, in *Geography*, a fortified paſs in the mountains of Grand Bucharia; 60 miles N. of Vaſhgherd.

RASEBORG, a ſea-port town of Sweden, in the gulf of Finland; 30 miles S.E. of Abo.

RASEC, a town of Perſia, in the province of Segeſtan; 60 miles S.W. of Zareng.

RASGRAD, or Rasgrat. See Hrasgrad.

RASH, in *Clock-Work*. See Ratch.

Rash, in *Medicine*, an eruption or efflorescence upon the ſkin, thrown out in fevers, or ſurfeits.

RASHAUA, in *Geography*. See Rassagu.

RASHED, a town of Nubia, in Sennaar; 15 miles N. of Gieſſim.

RASICULMO, Cape, a cape on the N. coaſt of Sicily. N. lat. 38° 18′. E. long. 12° 49′.

RASIERE, or Raziere, in *Commerce*, a meaſure of corn in Dunkirk and Flanders. At Dunkirk, they have the ſea raſiere, and the land raſiere; 8 of the former being = 9 of the latter; 54 ſea raſieres or 60¾ land raſieres anſwer to 31 Engliſh quarters. Each ſea raſiere contains 9884 inches, and each land raſiere contains 8786 inches; 17.40 of the former, and 19.57 of the latter, are equal (each) to 10 Engliſh

Engliſh quarters. At Dixmude 29.51 raſieres are equal to 10 Engliſh quarters, and each raſiere contains 5821 inches. At Gravelines 21.29 raſieres are equal to 10 Engliſh quarters, and each contains 8080 inches. At Nieuport 16.93 raſieres are equal to 10 Engliſh quarters, and each raſiere contains 10157 cubic inches. At Oſtend 16.02 raſieres are equal to 10 Engliſh quarters, and each of them contains 10733 inches. At St. Omer 21.77 raſieres = 10 Engliſh quarters, and each contains 7900 cubic inches. At Liſle or Lille, the raſiere is divided into 8 parts; of theſe there are two ſorts, one, uſed for wheat or rye, the other, called raſiere de Mars, for oats or beans; 38 of the former, and 40 of the latter, are reckoned for one laſt. The raſiere of wheat weighs about 128lbs., and 41 of theſe are equal to 19 ſetiers, Paris meaſure, or about 10½ Engliſh quarters; 39.64 raſieres of Liſle are equal to 10 Engliſh quarters, and each contains 4339 cubic inches.

RASILIS Æruco, in the *Materia Medica of the Ancients*, one of their kinds of verdigris. It was prepared in the following manner; they ſet ſome ſharp vinegar over the fire in a ſtrong earthen veſſel, and covered it with a braſs pot inverted, well cleaned, and without any vent-hole. And after ſome time the veſſels were to be ſeparated; and the verdigris, which was found concreted on the inſide of the braſs pot, was ſcraped off, and put up for uſe.

RASILITA, in *Geography*, a town of Italy, in Friuli; 26 miles S.S.E. of Friuli.

RASIN, a town of Hindooſtan, in Dowlatabad; 18 miles W.S.W. of Carmullah.

RASINTA, a town of Italy, in Friuli; 14 miles N. of Udina.

RASKOW, a town of Poland, in the palatinate of Braclaw; 54 miles S. of Braclaw.

RASMAN, an iſland in the Red ſea. N. lat. 13° 58′.

RASMEND, a mountain of Perſia, in the province of Irak; 60 miles N.E. of Nehavend.

RASNO, an iſland in the Adriatic. N. lat. 44° 6′. E. long. 15° 25′.

RASO, or Ell of Turin, in *Commerce*, is equal to 2⅔ Genoeſe palmi, or 23¾ Engliſh inches; the foot 143.2 French lines, or 3 1/17 Engliſh inches; hence 180 Piedmonteſe raſi are equal to 119 Engliſh yards, and 33 Piedmonteſe feet = 35 Engliſh feet. At Cagliari, 166.7 raſi = 100 Engliſh yards, and each of them equal to 21.6 Engliſh inches. At Chamberry 158.5 raſi = 100 Engliſh yards, and each = 22.7 Engliſh inches. At Nice, 166.7 raſi = 100 Engliſh yards, and each = 21.6 Engliſh inches; 154.5 raſi of Turin = 100 Engliſh yards, and each = 23.3 Engliſh inches.

RASP, a coarſe ſort of file.

RASPACH, in *Geography*, a town of Auſtria; eight miles E. of Zwetl.

RASPATORIUM, (from *rado*, to ſcrape,) a ſurgical inſtrument with which the perioſteum was, by the old practitioners, ſcraped from the bones, and the bones themſelves ſometimes raſped.

RASPBERRY Bush, in *Botany*. See Rubus.

For the dietetic and medicinal uſe of raſpberries, ſee Summer *Fruits*.

RASPECON, in *Ichthyology*, a name given by ſome to the uranoſcope, or ſtar-gazer.

RASPENBURG, in *Geography*, a town of Germany, in the principality of Weimar, near which are ſome medicinal ſprings; 12 miles N. of Weimar. N. lat. 51° 13′. E. long. 11° 35′.

RASPHUYS, or *Raſp-houſe*, a celebrated work-houſe, or houſe of correction, at Amſterdam. See Work-*houſe*.

RASPUGLY, in *Geography*, a town of Bengal; four miles S. of Calcutta.

RASSADES, a cluſter of ſmall iſlands, in the river St. Lawrence. N. lat. 48° 15′. W. long. 68° 48′.

RASSAGU, one of the Kurile or Kuriliſkoy iſlands, lying 40 verſts from Mutova, and in extent about 30 verſts meaſured either way. It has lofty mountains and ſteep rocky ſhores, with very few ſandy bogs. On the mountains, here and there, is a good foreſt of birch, alders, and the nut-bearing pine; the vales and flats abound in herbs. On the land is no other animal beſides the fox, but the cliffs of the rock afford neſting-places for all kinds of ſea-birds; and the beavers and ſeals lie ſcattered on ſeveral parts of the ſtrand. Here are no ſtreams that yield fiſh. The Kurils on this iſland are not numerous, and ſome of them are baptized. N. lat. 48° 20′. E. long. 154° 14′.

RASSE Coronde, in *Natural Hiſtory*, a name given by the Ceyloneſe to a peculiarly fine kind of cinnamon, which is the bark of a tree, growing no where but in that iſland. The name they give it ſignifies *ſharp* or *biting cinnamon*. This choice kind was formerly exported annually, in conſiderable quantity, by the Dutch Eaſt India company, who prohibited the mixing any other kind of cinnamon with it, under a very ſevere penalty. Phil. Tranſ. N° 409.

RASSOOLPOUR, in *Geography*, a town of Hindooſtan, in the circar of Nagore; 22 miles N.W. of Didwana.—Alſo, a town of Hindooſtan, in the circar of Gohud, on the Jumnah; 40 miles E. of Gohud.

RASSOVAT, or Axiopoli, a town of European Turkey, in Bulgaria; 24 miles N. of Driſtra. N. lat. 44° 25′. E. long. 27° 37′.

RASTADT, a town of the duchy of Baden, ſituated on a large plain on the river Merg; the town is new, and regularly built, and the principal ſtreet is broad and handſome; 16 miles S.W. of Durlach. N. lat. 48° 52′. E. long. 8° 15′.—Alſo, a town of Bavaria, in the biſhopric of Bamberg; five miles N.W. of Bamberg.—Alſo, a town of the duchy of Wurzburg; three miles S. of Melrichſtadt.

RASTAGARA, a town of Egypt; 90 miles E. of Cairo.

RASTEDE, a town of Germany, in the country of Oldenburg; 11 miles N. of Oldenburg.

RASTENBURG, a town of Pruſſia, in the province of Natangen, founded in 1329, and after having been deſtroyed by the Lithuanians in 1348, was rebuilt, together with its caſtle, and put into a better ſtate of defence; it is encloſed by a wall, and, in 1669, ſurrounded by a rampart. The burghers, moſt of whom are Lutherans, are about 200. The inhabitants derive their ſubſiſtence from a little commerce, brewing, agriculture, and mechanic trades; 46 miles S.E. of Königſberg. N. lat. 53° 58′. E. long. 21° 27′.

RASTICO Harbour, *Grand*, a bay in the gulf of St. Lawrence, on the N. coaſt of the iſland of St. John. N. lat. 46° 25′. W. long. 62° 50′.

RASTORFF, a town of Auſtria; ſeven miles E. of Ehrnſprunn.

RASTOWICA, a river of Poland, which runs into the Dnieper, on the borders of Ruſſia.

RASURA, a word uſed by the pharmaceutic writers to expreſs the ſhavings of woods, or other hard ſubſtances, to make them readily yield their virtues by decoction. Phyſicians alſo uſe it to expreſs the corroſion of acrid humours.

RASURE *in a Deed*, in *Law*. See Deed.

RASZNA, in *Geography*, a town of Servia; 24 miles N. of Niſſa.

RAT, in *Zoology*. See Mus.

It has been obſerved that this country was formerly infeſted with two kinds of rats, the *houſe*-rat and the *water*-rat; but that it is believed that the latter, within this laſt half century, has deſtroyed the former. This is probably, however, only imaginary, ſince it is well known that the houſe-rats are frequently brought, in great abundance, into the different ſea-ports of the kingdom, in corn, and other veſſels. It ſeems not improbable, but that theſe different varieties of rats may intercopulate, and by that means the latter become houſe-rats, as there is conſiderable diverſity in the colours of the houſe-rats, ſome approaching to nearly black, which is the natural colour of the water-rat, while the genuine houſe-rat is always of a darkiſh or dapple brown. In their habits they have ſome circumſtances in which they agree, as in that of making burrows in the ground; but the water-rat is capable of living much in the water, and of feeding on fiſh and other aquatic animals, while the houſe-rat moſtly lives upon grain, and other produce of that kind. The water-rats are alſo ſaid, by Dr. Darwin, to eat the foliage as well as the ſeeds and fruits of vegetables, as he has ſeen a young rat of this kind devour a large leaf of the water-plantain (aliſma plantago). They likewiſe, as well as the houſe-rats, are deſtructive of young animals, ſuch as ducklings, goſlings, chickens, and rabbits. But the great miſchief which the water-rats produce, is in feeding on, and deſtroying, the roots of a great variety of vegetables, in their innumerable burrows. The above writer remembers to have ſeen ſome new-planted apple-trees taken out of the ground with nearly the whole of their ſmaller roots eaten, and the larger ones peeled by them. With the houſe kind, they are, likewiſe, extremely deſtructive of the food of poultry, and ſwine, and of courſe are highly detrimental near waters. It is remarked by the above able writer, that as theſe animals, like the dog, are of a laſcivious nature, and, as ſome materials have a ſtrong ſcent, reſembling, perhaps, that of their venereal orgaſm, they are liable to be attracted by ſuch ſmells, as dogs are, on the ſame account, he ſuppoſes, inclined to roll themſelves in putrid carrion; and male cats to eat marum valerian, and cat-mint. It is of this principle that rat-catchers avail themſelves, and by indulging the propenſity, deceive them to their deſtruction, by blending with their favourite foods different ſtrong-ſcented ſubſtances, ſuch as the eſſential oil of rhodium, or muſk, with the poiſonous powders of ſtrychnos nux vomica, or of delphinium ſtaviſagria, or perhaps of arſenic.

The firſt ſtep taken by rat-catchers, in order to clear a houſe, &c. of thoſe vermin, is to allure them all together, to one proper place, before they attempt to deſtroy them; for there is ſuch an inſtinctive caution in theſe animals, accompanied with a ſurpriſing ſagacity in diſcovering any cauſe of danger, that if any of them be hurt, or purſued, in an unuſual manner, the reſt take the alarm, and become ſo ſhy and wary, that they elude all the devices and ſtratagems of their purſuers for ſome time after. The place where the rats are to be aſſembled, ſhould be ſome cloſet, or ſmall room, into which all the openings, but one or two, may be ſecured; and this place ſhould be, as near as may be, in the middle of the houſe, or buildings. It is the practice, therefore, to attempt to bring them all together in ſome ſuch place before any attempt be made to take them; and even then to avoid any violence, hurt, or fright to them, before the whole be in the power of the operator. In reſpect to the means uſed to allure them to one place, they are various; one of thoſe moſt eaſily and efficaciouſly practiſed is the trailing ſome piece of their moſt favourite food, which ſhould be of the kind that has the ſtrongeſt ſcent, ſuch as toaſted cheeſe, or broiled red-herring, from the holes or entrances to their acceſſes in every part of the houſe, or contiguous buildings, whence it is intended to allure them. At the extremities, and in different parts of the courſe of this trailed tract, ſmall quantities of meal, or any other kind of their food, ſhould be laid, to bring the greater number into the tracks, and to encourage them to purſue it to the centre place, where they are intended to be taken; at that place, where time admits of it, a more plentiful repaſt is laid for them, and the trailing repeated for two or three nights. But beſides this trailing, and way-baiting, ſome of the moſt expert of the rat-catchers have a ſhorter, and, perhaps, more effectual method of bringing them together, which is, the calling them, by making ſuch a kind of whiſtling noiſe as reſembles their own call, and by this means, with the aſſiſtance of the way-baits, they call them out of their holes, and lead them to the repaſt prepared for them at the place deſigned for taking them. But this is much more difficult to be practiſed than the art of trailing; for the learning the exact notes, or cries, of any kind of beaſts or birds, ſo as to deceive them, is a peculiar talent, not eaſily attained to in other caſes.

And in practiſing either of theſe methods great caution muſt be uſed by the operator to ſuppreſs, and prevent, the ſcent of his feet and body from being perceived; which is done by overpowering that ſcent by others of a ſtronger nature. In order to this the feet are to be covered with cloths rubbed over with aſſafœtida, or other ſtrong ſmelling ſubſtances; and even oil of rhodium is ſometimes uſed for this purpoſe, but ſparingly, on account of its dearneſs, though it has a very alluring, as well as diſguiſing effect. If this caution of avoiding the ſcent of the operator's feet, near the track, and in the place where the rats are propoſed to be collected, be not properly obſerved, it will very much obſtruct the ſucceſs of the attempt to take them; for they are very ſhy of coming where the ſcent of human feet lies very freſh, and intimates, to their ſagacious inſtinct, the preſence of human creatures, whom they naturally dread. To the above-mentioned means of alluring by trailing, way-baiting, and calling, is added another of very material efficacy, which is the uſe of oil of rhodium, which, like the marum ſyriacum in the caſe of cats, has a very extraordinary faſcinating power on theſe animals. The oil is extremely dear, and therefore very ſparingly uſed. It is exhaled in a ſmall quantity in the place, and at the entrance of it, where the rats are intended to be taken, particularly at the time when they are to be laſt brought together in order to their deſtruction; and it is uſed alſo, by ſmearing it on the ſurface of ſome of the implements uſed in taking them, by the method before deſcribed, and the effect it has in taking off their caution and dread, by the delight they appear to have in it, is very extraordinary.

It is uſual, likewiſe, for the operator to diſguiſe his figure as well as ſcent, which is done by putting on a ſort of gown or cloak, of one colour, that hides the natural form, and makes him appear like a poſt, or ſuch inanimate thing; which habit muſt likewiſe be ſcented as above, to overpower the ſmell of his perſon; and beſides this he is to avoid all motion, till he has ſecured his point of having all the rats in his power. When the rats are thus enticed and collected, where time is afforded, and the whole in any houſe or out-buildings are intended to be cleared away, they are ſuffered to regale on what they moſt like, which is ready prepared for them; and then to go away quietly for two or three nights; by which means thoſe which are not allured the firſt night are brought afterwards, either by their fellows, or

the effects of the trailing, &c. and will not fail to come duly again, if they are not disturbed or molested. But many of the rat-catchers make shorter work, and content themselves with what can be brought together in one night or two; but this is never effectual, unless where the building is small and entire, and the rats but few in number.

With respect to the means of taking them when they are brought together, they are various. Some entice them into a very large bag, the mouth of which is sufficiently capacious to cover nearly the whole floor of the place where they are collected; which is done by smearing some vessel, placed in the middle of the bag, with oil of rhodium, and laying in the bag baits of proper food. This bag, which before laid flat on the ground, with the mouth spread open, is to be suddenly closed when the rats are all in it. Others drive or frighten them, by slight noises or motions, into a bag of a long form, the mouth of which, after all the rats are come in, is drawn up to the opening of the place by which they entered, all other ways of retreat being secured. Others, again, intoxicate or poison them, by mixing with the repast prepared for them the cocculus indicus, or the nux vomica. A receipt for this purpose has appeared, which directs four ounces of cocculus indicus, with twelve ounces of oatmeal, and two ounces of treacle or honey, to be made up into a moist paste with strong beer; but if the nux vomica be used, a much less proportion will serve than is here given of the cocculus. Any similar composition of these drugs, with that kind of food the rats are most fond of, and which has a strong flavour, to hide that of the drugs, will equally well answer the end. If, indeed, the cocculus indicus be well powdered, and infused in strong beer for some time, at least, half the quantity here directed will serve as well as the quantity before mentioned. When the rats appear to be thoroughly intoxicated with the cocculus, or sick with the nux vomica, they may be taken with the hand, and put into a bag or cage, the door of the place being first drawn to, lest those which have strength and sense remaining should escape. By these methods, when well conducted, a very considerable part of the rats in a farm, or other house, and the contiguous buildings, may be taken and destroyed. But various other methods have been practised.

In the Transactions of the Bath Agricultural Society, the following compositions are advised for destroying these mischievous creatures, and which are stated to have been attended with great success. First, to a quart of oatmeal, add six drops of oil of rhodium, one grain of musk, and two or three of the nuts of nux vomica finely powdered; make them into pellets, and put them into the rat-holes. This, it is said, was at first greedily eaten, and did great execution; but the wise animals, after a time, ceased to eat it. Secondly; this consisted of three parts of oatmeal and one of stave's-acre, mixed well into a paste with honey. Pieces of this paste were laid in their holes, and again did great execution. Thirdly; this is a method of destroying them by laying a large box down on its front side, with the lid supported open by a string over a pulley; and by trailing toasted cheese and a red-herring from their holes to this box, and placing oatmeal and other food in it, which they are for a few nights to be permitted to eat unmolested; and finally to watch them by moon-light, the inside of the box being painted white; and, when many of them are seen, to let down the lid; by which contrivance sixty of them are stated to have been taken at one time.

But though the usual ways of destroying rats are by traps and poison, Mr. Forsyth advises never to use arsenic, or corrosive sublimate, for that purpose, except under particular circumstances, as they are deadly poisons: nux vomica will, he thinks, generally answer the end as well, without the danger. He suggests it as a very good plan, to prevent accidents, to enclose the traps in cases, having holes in the ends of them large enough to admit rats, but small enough to exclude dogs, cats, &c. And that, as a bait for rat-traps, the following composition may be made use of with advantage. Take a pound of good flour, three ounces of treacle, and six drops of the oil of carraways: put them all in a dish; and rub them well together till they are properly mixed: then add a pound of crumb of bread. The traps baited with this mixture should be set as near their haunts as possible; but, for two or three days, so as not to fall or strike on the rats going in, but letting them have free liberty to go in and out at pleasure, as this makes them fearless. Some of the bait should also, he thinks, be laid at the rat-holes, and a little of it scattered quite up to the traps, and so on to the bridge of each trap, where a handful may be placed. It may also, he thinks, be proper to scent the traps with the following mixture, for the purpose of enticing the rats into them. Take twenty drops of the oil of rhodium, six or seven grains of musk, and half an ounce of oil of aniseed; put them in a small phial, and shake it well before using; then dip a piece of twisted paper or rag in the mixture, and rub each end of the trap with it, if a box trap, and put two or three drops on the bridge, leaving the paper or rag in the trap. Of whatever kind the trap is, it should be scented; but once in a twelvemonth will be sufficient. Then throw some chaff mixed with a little wheat about the bottom of the trap, in order to deceive the rats; for they are very sagacious, and will not enter a suspicious place. This will be necessary to be done only at the first time of setting the traps; for, after some rats have been caught and have watered and dunged in them, rats will enter boldly when they find others have been there before them: do not, therefore, wash or clean out the trap, as some people do before they set it again, but let the dung and urine remain in it. Keep the places where the traps are set as private as possible; and when they are set for catching, mix no bread with the bait, as the rats will, in that case be apt, to carry it away.

And it is useful, this writer remarks, when the holes are found quiet, and that no rats use them, to stop them up with the following composition. Take a pint of common tar, half an ounce of pearl-ashes, an ounce of oil of vitriol, and a good handful of common salt, mix them all well together in an old pan or pot. Take some pieces of paper, and lay some of the above mixture very thick on them; then stop the holes well up with them, and build up the mouth of the holes with brick or stone, and mortar; if this be properly done, rats will, he asserts, no more approach these while either smell or taste remains in the composition.

But with a view to destroy rats in places where traps cannot be set, it is recommended to take a quart of the above bait, then to rasp into it three nuts of nux vomica, and add a quarter of a pound of crumb of bread, if there was none before; mix them all well together, and lay it into the mouth of their holes, and in different places where they frequent; but first give them of the bait without nux vomica, for three or four succeeding nights; and when they find it agrees with them, they will eat that mixed with the nut with greediness.

However, as it is frequently found that rats are very troublesome in sewers and drains, in such cases arsenic may be used with success in the following manner. Take some dead rats, and having put some white arsenic, finely powdered, into an old pepper-box, shake a quantity of it

on the fore-parts of the dead rats, and put them down the holes, or avenues, by the ſides of the ſewers at which they come in; this puts a ſtop to the live ones coming any further: for when they perceive the arſenic, they will retire immediately; whereas, if they were put down without the arſenic, the live ones would eat them.

It is by means of arſenic, notwithſtanding the above obſervations, that the moſt certain method of deſtroying theſe troubleſome vermin, (provided they can be made to eat it,) takes place; which we have found to anſwer beſt, when it is prepared by being finely levigated, and mixed up with very ſtrong old cheeſe and oatmeal.

In a note in the Agricultural Survey of Lancaſhire, it is ſtated, that it is greatly to be lamented that Mr. Heathcote's method of deſtroying rats and mice is not generally known and practiſed; if it were, there would be a total extirpation of thoſe obnoxious and deſtructive animals; for in one night he totally deſtroys them (where he is employed), be they ever ſo numerous, as can be well atteſted by hundreds in the neighbourhood of Ormſkirk, who have employed him. And it is added, that the compoſition he makes uſe of he puts in their holes and burrows, and from the ſmall quantity he uſes, it is aſtoniſhing it ſhould have ſuch an effect: it will keep good two years. It is alſo ſtated, that a farmer recommends, for the deſtruction of rats, one ounce of pounded quick-lime to four ounces of tallow cake, to be beaten together and made into balls, and placed in their runs, which has cleared many buildings. But it has been proved by experience, is is ſaid, that an ounce of aerated barytes finely powdered, mixed with the tallow, in place of lime, is more effectual. And it has been remarked by the author of Phytologia, with the view of deſtroying the water-rats, that they poſſeſs ſome kind of ingenuity ſimilar to the beaver in the conſtruction of their houſes near the brinks of rivers and pools; which have two apertures, one above ground amongſt the graſs, and the other beneath the ſurface of the water; and unleſs they can hide their upper opening amid weeds, or graſs, they forſake the ſituation. Thus, if a rim, three or four feet in breadth, round a fiſh-pond be kept ſo low as to riſe only two, three, or four inches above the level of the water; and if this be kept clean from high graſs or weeds, the rats will deſert the pond.

But after all, it is probable that this highly deſtructive animal, and great peſt to the farmer, might be moſt readily exterminated by pariſhes uniting for the purpoſe, and raiſing certain ſums of money to be applied in this way, under the direction of a proper perſon who is fully acquainted with the buſineſs.

In many grain and other diſtricts in the kingdom theſe animals prevail very much, eſpecially the grey kind, particularly in all thoſe where there are no regular raiſed ſtaddles or ſtands for the grain ſtacks to reſt upon, which is the caſe in a great number. The miſchief, injury, and deſtruction of grain which is produced in this way, is ſcarcely to be calculated; and they are beſides very miſchievous, troubleſome, and inconvenient in ſeveral others; ſo that they ſhould be every where extirpated as much as poſſible. And in corn tracts, ſtands or ſtaddles ſhould every where be provided in order to prevent miſchief being done by them. See VERMIN, and STAND, *Corn*.

RAT, *Beaver*. See MUS *Coypus*.

RAT, *Black*. See MUS *Rattus*.

RAT, *Blind*. See MUS *Typhlus*.

RAT, *Field*. See MUS *Silvaticus*.

RAT *Mole*. See MUS.

RAT, *Mountain*. See MARMOT *Talpinus*, &c.

RAT, *Muſk*. See MUS *Zibethicus*.

RAT, *Norway* or *brown*, *mus Norwegicus*, (*Mus decumanus*) is a rat whoſe head, back, and ſides are of a light brown colour, mixed with tawny and aſh-colour; the breaſt and belly are of a dirty white; the feet naked, and of a dirty fleſh-colour; the fore-feet are furniſhed with four toes, and a claw inſtead of the fifth: the length from the noſe to the tail is nine inches, and the tail is of the ſame length. This animal is more ſtrongly made than the common black rat, or *mus rattus*.

This ſpecies of rat, which is the ſame animal that is called in the Eaſt Indies a *bondicote*, now inhabits moſt parts of Europe; whither it is ſuppoſed to have been brought within the laſt century, in ſome of the India ſhips. It came into Great Britain about 70 or 80 years ago, but has not been known in the neighbourhood of Paris above half that time. They ſwarm in Peterſburg, and are known in Pruſſia; but have not yet reached the oppoſite ſide of the Baltic, as Linnæus takes no notice of this ſpecies. Theſe were probably the *mures Caſpii* of Ælian, which made periodical viſits in great multitudes to the countries bordering on the Caſpian ſea, ſwimming boldly over the rivers, holding by one another's tail. (Ælian. Hiſt. An. 17. cap. 17.) They burrow, like the water rat, on the ſides of ponds and ditches; ſwim and dive well; live on grain and fruits, but will deſtroy poultry and game; increaſe faſt, producing from fourteen to eighteen young at a time; are very bold and fierce; will turn, when cloſely purſued, and faſten on the ſtick or hand that offers to ſtrike them: they have deſtroyed the common black rat in moſt places: they inhabit the fields part of the year, but migrate in great numbers into houſes, and do much miſchief. The bite of theſe rats is not only ſevere but dangerous; the wound being immediately attended with a great ſwelling, and healing very ſlowly. Pennant. See MUS *Decumanus*.

RAT, *Norway*, is alſo a name given by ſome writers to the lemming, or ſable mouſe. See MUS *Lemmus*, and *Sable* MOUSE.

RAT, *Water*. See MUS *Amphibius*.

RAT, in the *Sea Language*, is uſed to expreſs a part of the ſea, where there are rapid and dangerous currents, or counter-currents.

RAT-*Gooſe*, in *Ornithology*, the name of a ſmall ſpecies of wild gooſe, common in ſome of the northern counties of England.

RAT-*Tails*, in the *Manege*. See ARRETS.

RAT-*Tailed*. A horſe is thus called that has no hair upon his tail.

RAT-*Tailed Worms*, in *Natural Hiſtory*, a ſpecies of fly-worms with long tails, reſembling thoſe of rats, whence they have their name. They are of ſeveral ſizes, and found alſo in different places, but all change into two-winged flies, having very much the reſemblance of bees, and commonly called *bee-flies*. See DRONE-*Fly*.

RAT, *Cape*, in *Geography*, a cape of Africa, in the Red ſea. N. lat. 14° 55′.

RAT *Iſland*, a ſmall iſland in Milford Haven.—Alſo, an iſland in the Red ſea. N. lat. 14° 55′.—Alſo, a ſmall iſland in the Eaſt Indian ſea, near the W. coaſt of Sumatra. S. lat. 3° 57′. E. long. 101° 55′.—Alſo, a ſmall iſland in the Mergui Archipelago, S.W. of Olive iſland.

RATA *pro* RATA. See PRO *rata*.

Onerando pro Rata portionis. See ONERANDO.

RATAFIA, a fine ſpirituous liquor, prepared from the kernels, &c. of ſeveral kinds of fruits, particularly of cherries and apricots.

Ratafia of cherries is prepared by bruiſing the cherries, and putting them into a veſſel in which brandy has been long kept;

kept; then adding to them the kernels of cherries, with ſtrawberries, ſugar, cinnamon, white pepper, nutmegs, cloves; and to twenty pounds of cherries, ten quarts of brandy. The veſſel is left open ten or twelve days, and then ſtopped cloſe for two months before it be tapped.

Ratafia of apricots is prepared two ways; *viz.* either by boiling the apricots in white wine, adding to the liquor an equal quantity of brandy, with ſugar, cinnamon, mace, and the kernels of apricots; infuſing the whole for eight or ten days; then ſtraining the liquor, and putting it up for uſe: or elſe by infuſing the apricots, cut in pieces, in brandy, for a day or two; paſſing it through a ſtraining-bag, and then putting in the uſual ingredients.

RATAN, in *Geography*, a ſmall iſland on the W. ſide of the gulf of Bothnia. N. lat. 63° 58′. E. long 20° 39′.

RATCH, or RASH, in *Clock Work*, a ſort of wheel having twelve fangs, which ſerve to lift up the detents every hour, to make the clock ſtrike.

RATCHETS, in a *Watch*, are the ſmall teeth at the bottom of the fuſee, or barrel, which ſtop it in winding up.

RATCHIN LOPA, in *Geography*, a large lake of Thibet. N. lat. 30° 43′. E. long. 82° 27′.

RATCLIFF, a town of America, in Maryland; 22 miles S. of Saliſbury.

RATE, a ſtandard or proportion, by which either the quantity or value of a thing is adjuſted.

The rates of bread, &c. in London, are fixed by authority. See *Aſſiſe of* BREAD.

The rate of intereſt, as now eſtabliſhed by law in England, is five *per cent.* The rate of intereſt in Italy, is three *per cent.*; in Sweden, ſix; in France, five; in Spain, ten; in Barbadoes, ten; in Ireland, twelve; in Turkey, twenty. Low rates of intereſt advance the prices of land.

The rates or fares of hackney-coachmen, chairmen, and watermen, are fixed by act of parliament. See *Hackney* COACHES, &c.

The rates of exchange, factorſhip, &c. are different. See EXCHANGE, FACTORAGE, &c.

RATE *of a Ship of War*, is its order, degree, or diſtinction, as to magnitude, burden, force, &c.

The Britiſh fleet is accordingly diſtributed into ſix rates, excluſive of the inferior veſſels that uſually attend on naval armaments; as ſloops of war, armed ſhips, bomb-ketches, fire-ſhips, and cutters or ſchooners, commanded by lieutenants.

Ships of the *firſt* rate mount a hundred cannon, and ſome more, having forty-two-pounders on the lower deck, twenty-four-pounders on the middle deck, twelve-pounders on the upper deck, and ſix-pounders on the quarter-deck and forecaſtle. They are manned with eight hundred and fifty men, including their officers, ſeamen, marines, and ſervants.

In general, the ſhips of every rate, beſides the captain, have the maſter, the boatſwain, the gunner, the chaplain, the purſer, the ſurgeon, and the carpenter; all of whom, except the chaplain, have their mates or aſſiſtants, in which are comprehended the ſail-maker, the maſter at arms, the armourer, the captain's clerk, the gunſmith, &c. The number of other officers is always in proportion to the rate of the ſhip. Thus, a firſt rate has ſix lieutenants, ſix maſter's mates, twenty-four midſhipmen, and five ſurgeon's mates, who are conſidered as gentlemen; beſides the following petty officers: quarter-maſters, and their mates, fourteen; boatſwain's mates, and yeomen, eight; gunner's mates and aſſiſtants, ſix; quarter-gunners, twenty-five; carpenter's mates, two, beſides fourteen aſſiſtants; with one ſteward, and ſteward's mate to the purſer.

Ships of the *ſecond* rate carry ninety-eight and ninety guns upon three decks; of which thoſe on the lower battery are thirty-two-pounders; thoſe on the middle, eighteen-pounders; on the upper deck, twelve-pounders; and thoſe on the quarter-deck, ſix-pounders, which uſually amount to four or ſix. Their complement of men is ſeven hundred and fifty, in which there are ſix lieutenants, four maſter's mates, twenty-four midſhipmen, and four ſurgeon's mates, fourteen quarter-maſters and their mates, eight boatſwain's mates and yeomen, ſix gunner's mates and yeomen, with twenty-two quarter-gunners, two carpenter's mates, with ten aſſiſtants, and one ſteward and ſteward's mate.

Ships of the *third* rate carry from ſixty-four to eighty cannon, which are thirty-two, eighteen, and nine-pounders. The eighty-gun ſhips, however, begin to loſe their repute, and give way to thoſe of ſeventy-four, ſeventy, &c. which have only two whole batteries; whereas the former have three, with twenty-eight guns planted on each; the cannon of their upper deck being the ſame as thoſe on the quarter-deck and forecaſtle of the latter, which are nine-pounders. The complement in a ſeventy-four is ſix hundred and fifty; and in a ſixty-four, five hundred men: having in peace, four lieutenants, but in war, five, and when an admiral is aboard, ſix. They have three maſter's mates, ſixteen midſhipmen, three ſurgeon's mates, ten quarter-maſters and their mates, ſix boatſwain's mates and yeomen, four gunner's mates and yeomen, with eighteen quarter-gunners, one carpenter's mate with eight aſſiſtants, and one ſteward and ſteward's mate under the purſer.

Ships of the *fourth* rate mount from ſixty to fifty guns, upon two decks and the quarter-deck. The lower tier is compoſed of twenty-four-pounders; the upper tier, of twelve-pounders; and the cannon on the quarter-deck and forecaſtle are ſix-pounders. The complement of a fifty-gun ſhip is three hundred and fifty men, in which there are three lieutenants, two maſter's mates, ten midſhipmen, two ſurgeon's mates, eight quarter-maſters and their mates, four boatſwain's mates and yeomen, one gunner's mate and one yeoman, with twelve quarter-gunners, one carpenter's mate and ſix aſſiſtants, and a ſteward and ſteward's mate.

All veſſels of war under the fourth rate, are uſually comprehended under the general name of frigates, and never appear in the line of battle. They are divided into the *fifth* and *ſixth* rates, the former mounting from forty to thirty-two guns, and the latter from twenty-eight to twenty. The largeſt of the fifth rate have two decks of cannon, the lower battery being of eighteen-pounders, and that of the upper deck of nine-pounders; but thoſe of thirty-ſix and thirty-two guns have only one complete deck of guns, mounting twelve-pounders, beſides the quarter-deck and forecaſtle, which carry ſix-pounders. The complement of a ſhip of forty-four guns is two hundred and eighty men; that of a frigate of thirty-ſix guns, two hundred and forty men. The firſt has three, and the ſecond two lieutenants; and both have two maſter's mates, ſix midſhipmen, two ſurgeon's mates, ſix quarter-maſters and their mates, two boatſwain's mates and one yeoman, one gunner's mate and one yeoman, with ten or eleven quarter-gunners, and one purſer's ſteward.

Frigates of the ſixth rate carry nine-pounders; thoſe of twenty-eight guns having three-pounders on their quarter-deck, with two hundred men for their complement; and thoſe of twenty-four, one hundred and ſixty men: the former has two lieutenants; the latter, one; and both have two maſter's mates, four midſhipmen, one ſurgeon's mate, four quarter-maſters and their mates, one boatſwain's mate and one yeoman, one gunner's mate and one yeoman, with ſix or ſeven quarter-gunners, and one purſer's ſteward.

The

The ſloops of war carry from eighteen to eight cannon: the largeſt of which have ſix-pounders; and the ſmalleſt, *viz.* thoſe of eight or ten guns, four-pounders. Their officers are generally the ſame as in the ſixth rates, with little variation; and their complements of men are from one hundred and twenty to ſixty, in proportion to their force or magnitude.

Bomb-veſſels are on the ſame eſtabliſhment as ſloops; but fire-ſhips and hoſpital-ſhips are on that of fifth rates. If the dimenſions of all ſhips of the ſame rate were equal, it would be eaſy to collect them into one point of view in a table; but as there is no invariable rule for the general dimenſions, we ſhall ſelect thoſe of ſome of a late conſtruction in each rate.

		Guns.	Length of the keel.		Length of the lower deck.		Extreme breadth.		Depth in the hold.		Burthen in tons.
Rates.			Ft.	In.	Ft.	In.	Ft.	In.	Ft.	In.	
1ſt	Victory	100	151	3	186	0	51	10	21	6	2162
2d	Barfleur	90	144	0¾	177	6	50	0	21	0	1934
3d	Arrogant	74	138	0	168	3	47	4	19	9	1644
	Europa	64	139	0	159	0	44	4	19	4	1366
4th	Saliſbury	50	120	8	146	0	40	4	17	4	1044
5th	Phœnix	44	116	11	140	9	37	1⅜	16	0	856
	Venus	36	106	3	128	4½	35	9	12	4	722
6th	Carysfort	28	97	3½	118	4	33	8	10	6	586
	Dolphin	24	93	4	113	0	32	1	11	0	511
Sloop	Nautilus	16	80	7⅝	98	0	27	2	12	8	316

Ships of one hundred guns, and above, and downwards to ſixty-four, are termed ſhips of the line.

Ships of the line, fifties, frigates, and royal yatchs, are commanded by poſt-captains; ſloops of war, bombs, fire-ſhips, armed ſhips, ſtore-ſhips, and armed *en flute*, under fifty guns, by commanders; ſchooners, cutters, &c. by lieutenants; ſlop-ſhips occaſionally by maſters; and ſmall craft by midſhipmen, who have paſſed for lieutenants.

Ships of the ſecond rate, and thoſe of the third, which have three decks, carry their ſails remarkably well, and labour very little at ſea. They are excellent in a general action, or in cannonading a fortreſs. Thoſe of the third rate, which have two tiers, are fit for the line of battle, to lead the convoys and ſquadrons of ſhips of war in action; and, in general, to ſuit the different exigencies of the naval ſervice. The fourth rates may be employed on the ſame occaſions as the third rates; and may be alſo deſtined for ſervice among the foreign colonies, or on expeditions of great diſtance; ſince theſe veſſels are uſually excellent for keeping and ſuſtaining the ſea. Veſſels of the fifth rate are too weak to ſuffer the ſhock of a line of battle; but they may be deſtined to lead the convoys of merchant ſhips, to protect the commerce in the colonies, to cruiſe in different ſtations, to accompany ſquadrons, or be ſent expreſs with neceſſary intelligence and orders. The ſame may be obſerved of the ſixth rates.

The frigates which mount from twenty-eight to thirty-eight guns upon one deck, with the quarter-deck, are extremely proper for cruiſing againſt privateers, or for ſhort expeditions, being light, long, and uſually excellent ſailers. Falconer.

RATES, *Books of.* See BOOK and CUSTOMS.

RATE, *Poor.* See POOR.

RATE-*Tythe.* When ſheep, or other cattle, are kept in a pariſh for leſs time than a year, the owner muſt pay tythe for them *pro rata*, according to the cuſtom of the place.

RATE, in *Geography*, a town of Hindooſtan, in Myſore; 25 miles E. of Rattinghery.

RATEEN, or RATTEN, in *Commerce*, a thick woollen ſtuff, quilled, woven on a loom with four treddles, like ſerges, and other ſtuffs that have the whale or quilling.

There are ſome rateens dreſſed and prepared like cloths; others left ſimply in the hair; and others where the hair, or knap, is frized.

Rateens are chiefly manufactured in France, Holland, and Italy; and moſtly uſed in linings.

The frize is a ſort of coarſe rateen; and the drugget is a rateen half linen, half woollen.

RATEL, in *Zoology*, a name given by the Hottentots to an animal inhabiting the Cape of Good Hope, which lives on honey, and is a great enemy to bees: hence called the VIVERRA *Mellivora:* which ſee. It has a blunt black noſe; no external ears, but a ſmall rim round the orifice; a rough tongue, ſhort legs, very long claws, which are ſtraight like thoſe of a badger, and guttered beneath: the colour of the forehead, crown, and whole upper part of the body, is a cinereous grey; the cheeks, and ſpace round the ears, throat, breaſt, belly, and limbs, black; from each ear to the tail extends along the ſides a duſky line, leaving beneath another of grey. Its length from the noſe to the tail is forty inches, and the tail twelve.

This animal preys in the evening, and aſcends to the higheſt parts of the deſert to look about; and will then put one foot before its eyes, to prevent the dazzling of the ſun. The reaſon of its going to an eminence is for the ſake of ſeeing or hearing the honey-guide cuckoo, or cuculus indicator, which lives on bees, and, as it were, conducts it to their haunts. Pennant.

RATENSTADT, in *Geography*, a town of Hungary; 16 miles S.E. of Baes.

RATESPONTE *de Mulher*, a town of Portugal, in the province of Entre Duero e Minho; 15 miles N.E. of Villa de Conde.

RATH, a word uſed in the compoſition of names of places in Ireland, as Rathdrum, &c. It ſignifies an intrenchment, or fort.

RATH, *ripe*, in *Agriculture*, a term applied to ſome early ripe corn crops, and which have a degree of redneſs in the ſtraw; ſuch as ſome varieties of barley, &c.

RATHANGAN, in *Geography*, a poſt-town of the county of Kildare, Ireland, ſituated on the Athy branch of the Grand Canal; 28½ miles W. from Dublin, and 5 miles N.N.W. from Kildare.

RATHCONRATH, a ſmall town of the county of Weſtmeath, Ireland, which gives name to a barony. It is 44 miles N. by W. from Dublin, on the road to Laneſborough, and 6 miles W. from Mullingar.

RATHCOOLE, a ſmall poſt-town of the county of Dublin, Ireland, where fairs are holden for cattle and pedlars' wares. It is on the great ſouthern road, 7¾ miles S.W. from Dublin.

RATHCORMUCK, a poſt-town of the county of Cork, Ireland, which returned two members to the Iriſh parliament, before the union. It has gone much to decay, in conſequence of the proſperity of Fermoy, which is little more than three miles diſtant. It is near the river Bride, 111 miles S.W. from Dublin, and 13½ N.E. from Cork.

RATHDOWNY, a poſt-town of the Queen's county, Ireland; 59 miles S.W. from Dublin.

RATHDRUM, a poſt-town of the county of Wicklow, Ireland, ſituated on the river Ovoca. It has a monthly fair

fair for flannels, of which there is a conſiderable manufacture. The adjoining country is very intereſting, and the Wicklow copper-mines are not far diſtant. Rathdrum is 29 miles S. from Dublin.

RATHENAU, or RATEMAO, a town of the middle mark of Brandenburg, on the Havel; 38 miles W. of Berlin. N. lat. 52° 38′. E. long. 12° 30′.

RATHER, or NEITHER, a river of England, which runs into the Lune, four miles N. of Kirkby Lonſdale, in the county of Weſtmoreland.

RATHERIUS, in *Biography*, a very learned prelate in the tenth century, commenced his eccleſiaſtical career by embracing a monaſtic life at the abbey of Lobbes, or Laubes, in Flanders. Here he diſtinguiſhed himſelf by his abilities and acquirements. In the year 928, after Hilduin had been driven out of the ſee of Liege, he accompanied him into Italy; and in 931 he was, by the expreſs order of the pope, put in poſſeſſion of the ſee of Verona. As, however, this was in direct hoſtility to the king of the country, he was expoſed to much perſecution, and at length baniſhed from Italy. After ſpending five years in exile, he returned with the hope of regaining his biſhopric: but he was unſucceſsful, and was ordered to withdraw. He obeyed, and retired into Provence: from this place he went to the abbey of Lobbes, where the recollection of the honour, which he had formerly reflected on that eſtabliſhment, ſecured him a welcome reception. Shortly after this, he was ſent for by the emperor Otho, who placed him near the perſon of his brother Bruno. This prince, having been made archbiſhop of Cologne in the year 953, preſented Ratherius to the biſhopric of Liege; from which, however, he was driven in about two years. As the emperor Otho was at this time in Italy, our prelate made an effort to recover his former ſee of Verona. Accordingly he laid his caſe before a ſynod aſſembled at Pavia, which paſſed a decree that he ſhould be re-eſtabliſhed in that biſhopric. His peace was ſoon interrupted by controverſies with the clergy, who could not endure his reproofs of their irregularities and corruptions; till at length they became ſo irkſome to him, that he determined to take his final leave of Italy. He accordingly went to France, where he purchaſed ſome eſtates, and obtained the abbies of St. Amand, Aumont, and of Aunay. He died at Namur, about the year 973. His works are numerous, ſome of which are inſerted in father d'Achery's "Spicilegium." They are ſaid to afford evident proofs of great ſagacity and judgment, while they breathe throughout an ardent love of virtue. They alſo ſhew, that he was moſt zealous and intrepid in expoſing the irregularities and vices of the times, and particularly the corrupt morals of eccleſiaſtics. Moreri. Moſheim.

RATHFRILAND, in *Geography*, a poſt-town of the county of Down, Ireland. It is ſituated on a riſing ground, and has four great ſtraight roads leading up to it, and centering in the town. It is on the road to Downpatrick, and much frequented. The neighbourhood abounds with granite of a cloſe texture, and fit for building. On the ſummit of the hill are the ruins of a caſtle, formerly one of the reſidences of the Magenniſes, lords Iveach. Rathfriland is 57½ miles N. from Dublin, and 7½ miles N.E. from Newry.

RATHKEALE, a poſt-town of Ireland, in the county of Limerick. It is ſituated on the river Deel, and was formerly a corporation town, and of much more conſequence than at preſent. It has ſeveral fairs, one of which for horſes is much frequented, as are alſo its races. In the reign of queen Elizabeth, it ſuſtained an attack of the Engliſh army. The ruins of a priory, founded by a perſon of the name of Harvey, are ſtill remaining. Rathkeale is 108 miles S.W. from Dublin, and 14 miles W.S.W. from Limerick.

RATHLACKEN, a poſt-town of the county of Mayo, Ireland, on the ſea-coaſt, nor far from Rathlacken or Relakin head, and weſt of the entrance to Killala bay. It is 132 miles W.N.W. from Dublin, and 5 miles N. from Killala.

RATHLIN, RAGHLIN, or *Raghery*, an iſland ſituated between the north coaſt of Antrim, in Ireland, and Scotland, and conſidered as belonging to the former. It is about five miles in length, and three quarters of a mile in breadth, being bent in an angle towards the middle. This angle lies oppoſite to Ballycaſtle, and forms a tolerable bay, called Church bay; but in a weſterly wind, though the anchorage is good, few veſſels can ride it out, from the ſwell along the coaſt. The number of plantation acres is about 2000, which ſupport a population of about 130 or 140 families, amounting to about 1100 perſons. The cultivated land is kindly enough, and produces excellent barley. But kelp is the great ſource of wealth to this iſland, 100 tons of which have been exported from it in one year. The horſes, as well as the ſheep, are ſmall, but ſerviceable; and the black cattle are not large, though they do well when brought to the main land, and better ſoil. The inhabitants are a ſimple, laborious, and honeſt race of people, much attached to their own iſland, and regarding Ireland as a foreign country. The monuments of antiquity are ſmall tumuli, in one of which, when opened, a ſtone coffin was found, beſide which an earthen veſſel ſtood. Within the tumuli lay a conſiderable number of human bones, which might have been the remains of more ignoble men than the perſon whoſe remains the coffin covered. Brazen ſwords and ſpear-heads have alſo been found. The remains of a fortreſs are viſible, where Robert Bruce is ſaid to have defended himſelf for ſome time, when obliged to fly from his country. N. lat. 55° 20′. W. long. 6° 6′.

RATHMANSDORF, a town of Sileſia, in the principality of Neiſs; 4 miles N.N.W. of Weidenau.

RATHOWEN, a poſt-town of the county of Weſtmeath, Ireland, near the borders of Longford; 48 miles W.N.W. from Dublin.

RATHSCHACH, or RADESCHE, a town of the duchy of Carniola, on the Save; 9 miles W.N.W. of Gurckfeld.

RATHSPRÆSENTGERS, in *Commerce*, ſilver coins of Aix-la-Chapelle, being double, ſingle, or half pieces of 22, 16, and 8 marks. By the aſſay, the rathſpræſentger is worſe than the Engliſh ſtandard of 11 oz. 2 dwts., by 4 oz. 2 dwts. Its weight is 4 dwts. 1½ gr.; its content in pure ſilver 56.9 grs.; and its value in ſterling 8*d*. The double of the ſame is worſe by 2 oz. 15 dwts.; its weight 6 dwts. 23¼ grs.; its content in pure ſilver 116.3 grs.; and its value in ſterling 1*s*. 4¼*d*. This coin bears on one ſide an eagle within a circle, marked 16 on his breaſt, (32 on the double piece,) and within another circle the legend, REGUM CURIA PRINCIPALIS PRIMA; and next the edge, URBS AQUENSIS. URBS REGALIS. REGNI SEDES: on the other ſide, or reverſe, an altar, with two ſwords and a crown over it, on the double piece; but on the ſingle, a crown and the date within a circle: the legend on both is LOCUS CÆSAREA CORONATIONIS; Cæſar being a general title for the emperor. Kelly's Un. Cambiſt.

RATI, in *Geography*, a ſmall iſland in the Grecian Archipelago, near the S. coaſt of Nicaria.

RATIBOR, a town of Sileſia, in a principality of its name, on the Oder, which here becomes navigable; 70 miles

miles S.E. of Breſlau. N. lat. 50°. E. long. 18° 5′. The principality is bounded N. by the principality of Oppeln, on the E. by Poland, on the S. by Teſchen, and on the W. by the principality of Jagendorf. Its ſoil is better than that of Oppeln, as it produces a ſufficient ſupply of wheat, rye, and barley, with fruits; and beſides, it has alſo good paſture grounds. Its only river is the Oder, which paſſes through its weſtern part; but it is abundantly watered in all its parts with ſtreams, ponds, and lakes. It contains only three cities, and the inhabitants are univerſally Poliſh. It became a principality in 1288, and about 200 years afterward it was united to Oppeln, from which it has never been ſeparated.

RATIFICATION, Ratificatio, an act, approving of, and confirming, ſomething done by another, in our name.

A treaty of peace is never ſecure till the princes have ratified it.

All procuration imports a promiſe of ratifying and approving what is done by the proxy, or procurator: after treating with a procurator, agent, factor, &c. a ratification is frequently neceſſary on the part of his principal.

Ratification is particularly uſed, in our *Laws*, for the confirmation of a clerk in a benefice, prebend, &c. formerly given him by the biſhop, &c. where the right of patronage is doubted to be in the king.

Ratification is alſo uſed for an act confirming ſomething we ourſelves have done in our own name.

An execution, by a major, of an act paſſed in his minority, is equivalent to a ratification.

RATING. See Raiting.

RATINGEN, or Rattingen, in *Geography*, a town of the duchy of Berg; 4 miles N.E. of Duſſeldorp. N. lat. 51° 15′. E. long. 6° 47′.

RATINO, a town of Naples, in the county of Moliſe; 6 miles S.E. of Moliſe.

RATIO, in *Arithmetic* and *Geometry*, that relation of homogeneous things, which determines the quantity of one from the quantity of another, without the intervention of any third.

The homogeneous things, thus compared, we call *the terms of the ratio;* particularly that referred to the other, we call the *antecedent;* and that to which the other is referred, the *conſequent*.

Thus, when we conſider one quantity by comparing it with another, to ſee what magnitude it has in compariſon of that other; the magnitude this quantity is found to have in compariſon with it, is called the *ratio* of this quantity to that: which ſome think would be better expreſſed by the word *compariſon*.

Euclid defines ratio by *a mutual relation of two magnitudes of the ſame kind in reſpect of quantity*. But this definition is found defective; there being other relations of magnitudes which are conſtant, yet are not included in the number of ratios: ſuch as that of the right ſine, to the ſine of the complement in trigonometry.

Hobbes endeavoured to improve Euclid's definition of ratio, but without ſucceſs: for in defining it, as he does, by *the relation of magnitude to magnitude*, his definition has not only the ſame defect with Euclid's, in not determining the particular kind of relation; but it has this farther, that it does not expreſs the kind of magnitudes which may have a ratio to one another.

Ratio is frequently confounded, though very improperly, with *proportion*. Proportion, in effect, is an identity or ſimilitude of two ratios.

Thus, if the quantity A be triple the quantity B; the relation of A to B, *i. e.* of 3 to 1, is called the ratio of A to B. If two other quantities, C, D, have the ſame ratio to one another that A and B have, *i. e.* be triple one another, this equality of ratio conſtitutes *proportion;* and the four quantities A : B :: C : D, are in proportion, or proportional to one another.

So that ratio exiſts between two terms; proportion requires more.

There is a twofold compariſon of numbers: by the firſt, we find how much they differ, *i. e.* by how many units the antecedent exceeds, or comes ſhort of, the conſequent.

This difference is called the *arithmetical* ratio, or exponent of the arithmetical relation or habitude of the two numbers. Thus, if 5 and 7 be compared, their arithmetical ratio is 2.

By the ſecond compariſon, we find how oft the antecedent contains, or is contained in, the conſequent; *i. e.* as before, what part of the greater is equal to the leſs.

This ratio, being common to all quantity, may be called ratio in the general, or by way of eminence: but is uſually called *geometrical* ratio; becauſe expreſſed, in geometry, by a line, though it cannot be expreſſed by any number.

Modern authors diſtinguiſh ratio, with regard to quantity in the general, into *rational* and *irrational*.

Ratio, *Rational*, is that which is as one rational number to another; *e. gr.* as 3 to 4.

Ratio, *Irrational*, is that which cannot be expreſſed by rational numbers.

Suppoſe, for an illuſtration, two quantities, A and B; and let A be leſs than B. If A be ſubtracted as often as it can be from B, *e. gr.* five times, there will either be left nothing, or ſomething. In the former caſe, A will be to B, as 1 to 5; that is, A is contained in B five times; or $A = \frac{1}{5}$ B. The ratio here, therefore, is *rational*.

In the latter caſe, either there is ſome part, which, being ſubtracted certain times from A, *e. gr.* 3 times, and likewiſe from B, *e. gr.* 7 times, leaves nothing; or there is no ſuch part: if the former, A will be to B as 3 to 7, or $A = \frac{3}{7}$ B; and therefore the ratio, *rational*. If the latter, the ratio of A to B, *i. e.* what part A is of B, cannot be expreſſed by rational numbers; nor any other way than either by lines, or by infinite approaching ſeries.

The *exponent of a geometrical ratio* is the quotient ariſing from the diviſion of the antecedent by the conſequent. Thus, the exponent of the ratio of 3 to 2, is $1\frac{1}{2}$; that of the ratio of 2 to 3, is $\frac{2}{3}$: for when the leſs term is the antecedent, the ratio, or rather the exponent, is a proper fraction. Hence the fraction $\frac{3}{4} = 3 \div 4$. If the conſequent be unity, the antecedent itſelf is the exponent of the ratio: thus, the exponent of 4 to 1, is 4. See Exponent.

If two quantities be compared, without the intervention of a third; either the one is equal to the other, or unequal: hence, the ratio is either of *equality* or *inequality*. If the terms of the ratio be unequal, either the leſs is referred to the greater, or the greater to the leſs: that is, either the leſs to the greater, as a part to the whole, or the greater to the leſs, as the whole to a part. The ratio, therefore, determines how often the leſs is contained in the greater, or how often the greater contains the leſs; *i. e.* to what part of the greater the leſs is equal.

The following diſtinctions of ratios are ſometimes found in early authors.

The ratio which the greater term has to the leſs, *e. gr.* 6 to 3, is called the *ratio of the greater inequality:* the ratio which the leſs term has to the greater, *e. gr.* 3 to 6, is called the *ratio of the leſſer inequality*.

This ratio correſponds to quantity in the general, or is admitted

admitted of by all kinds of quantities, diſcrete or continued, commenſurable or incommenſurable: but diſcrete quantity, or number, does likewiſe admit of another ratio.

If the leſs term of a ratio be an aliquot part of the greater, the ratio of the greater inequality is ſaid to be *multiplex*, multiple; and the ratio of the leſs inequality, *ſubmultiple*.

Particularly, in the firſt caſe, if the exponent be 2, the ratio is called *duple*; if 3, *triple*, &c. In the ſecond caſe, if the exponent be $\frac{1}{2}$, the ratio is called *ſubduple*; if $\frac{1}{3}$, *ſubtriple*, &c.

E. gr. 6 to 2 is in a triple ratio; becauſe 6 contains two thrice. On the contrary, 2 to 6 is a ſubtriple ratio; becauſe 2 is the third part of 6.

If the greater term contains the leſs once, and over and above an aliquot part of the ſame; the ratio of the greater inequality is called *ſuperparticularis*, and the ratio of the leſs *ſub-ſuperparticularis*.

Particularly, in the firſt caſe, if the exponent be $1\frac{1}{2}$, it is called *ſeſquialterate*; if $3\frac{1}{2}$, *ſeſquitertial*, &c. In the other, if the exponent be $\frac{2}{3}$, the ratio is called *ſubſeſquialterate*; if $\frac{3}{4}$, *ſubſeſquitertial*, &c.

E. gr. 3 to 2 is in a ſeſquialterate ratio; 2 to 3 in a ſubſeſquialterate.

If the greater term contains the leſs once, and over and above ſeveral aliquot parts; the ratio of the greater inequality is called *ſuperpartiens*; that of the leſs inequality is *ſubſuperpartiens*.

Particularly, in the former caſe, if the exponent be $1\frac{2}{3}$, the ratio is called *ſuperbipartiens tertias*; if the exponent be $1\frac{3}{4}$, *ſupertripartiens quartas*; if $1\frac{4}{5}$, *ſuperquadripartiens ſeptimas*, &c. In the latter caſe, if the exponent be $\frac{3}{5}$, the ratio is called *ſubſuperbipartiens tertias*; if $\frac{4}{7}$, *ſubſupertripartiens quartas*; if $\frac{7}{11}$, *ſubſuperquadripartiens ſeptimas*.

E. gr. the ratio of 5 to 3 is *ſuperbipartiens tertias*; that of 3 to 5, *ſubſuperbipartiens tertias*.

If the greater term contains the leſs ſeveral times, and, beſides, ſome quota part of the ſame; the ratio of the greater inequality is called *multiplex ſuperparticularis*; and the ratio of the leſs inequality, *ſubmultiplex ſubſuperparticularis*.

Particularly, in the former caſe, if the exponent be $2\frac{1}{2}$, the ratio is called *dupla ſeſquialtera*; if $3\frac{1}{3}$, *tripla ſeſquiquarta*, &c. In the latter caſe, if the exponent be $\frac{2}{5}$, the ratio is called *ſubdupla ſubſeſquialtera*; if $\frac{1}{13}$, *ſubtripla ſubſeſquiquarta*, &c.

E. gr. the ratio of 16 to 5 is *tripla ſeſquiquinta*; that of 4 to 9, *ſubdupla ſubſeſquiquarta*.

Laſtly, if the greater term contains the leſs ſeveral times, and ſeveral aliquot parts of it beſides; the ratio of the greater inequality is called *multiplex ſuperpartiens*; that of the leſs inequality, *ſubmultiplex ſubſuperpartiens*.

Particularly, in the former caſe, if the exponent be $\frac{2}{3}$, the ratio is called *dupla ſuperbipartiens tertias*; if $3\frac{1}{7}$, *tripla ſuperbiquadrapartiens ſeptimas*, &c. In the latter caſe, if the exponent be $\frac{3}{8}$, the ratio is called *ſubdupla ſubſuperbipartiens tertias*; if $\frac{7}{25}$, *ſubtripla ſubſuperquadripartiens ſeptimas*, &c.

E. gr. the ratio of 25 to 7 is *tripla ſuperquadripartiens ſeptimas*; that of 3 to 8, *ſubdupla ſubſuperbipartiens tertias*.

Theſe are the various kinds of *rational* ratios; the names of which, though they occur but rarely among the modern writers (for in lieu of them they uſe the ſmalleſt terms of the ratios, *e. gr.* for *duple* 2 : 1, for *ſeſquialterate* 3 : 2); yet are they abſolutely neceſſary to ſuch as converſe with the ancient authors.

Clavius obſerves, that the exponents denominate the ratios of the greater inequality, both in deed and name; but the ratios of the leſs inequality, only in deed, not in name: but it is eaſy finding the name in theſe, if you divide the denominator of the exponent by the numerator.

E. gr. if the exponent be $\frac{5}{8}$, then $5 : 8 = 1\frac{3}{5}$; whence it appears, the ratio is called *ſubſupertripartiens quintas*. As to the names of irrational ratios, nobody ever attempted them.

Same, or *identic* ratios, are thoſe whoſe antecedents have an equal reſpect to their conſequents, *i. e.* whoſe antecedents divided by their conſequents, give equal exponents. And hence may the identity of irrational ratios be conceived.

Hence, firſt, as oft as the antecedent of one ratio contains its conſequent, or whatever part it contains of its conſequent, ſo oft, or ſuch part of the other conſequent does the antecedent of the other ratio contain: or, as oft as the antecedent of the one is contained in its conſequent, ſo oft is the antecedent of the other contained in its conſequent.

Secondly, if A be to B as C to D; then will A : B :: C : D; or A : B = C : D. The former of which is the uſual manner of repreſenting the identity of ratios, the latter is that of the excellent Wolfius; which has the advantage of the former, in that the middle character, =, which denotes the ſameneſs, is ſcientifical; *i. e.* it expreſſes the relation of the thing repreſented, which the other, ::, does not. See CHARACTER.

Two *equal* ratios, *e. gr.* B : C = D : E, we have already obſerved, conſtitute a proportion: of two *unequal* ratios, *e. gr.* A : B and C : D, we call A : B the *greater*, if A : B > C : D; on the contrary, we call C : D the *leſſer*, if C : D > A : B.

Hence, we expreſs a greater and leſs ratio thus: *e. gr.* 6 to 3 has a greater ratio than 5 to 4; for, 6 : 3 (= 2) > 5 : 4 (= $1\frac{1}{4}$). But 3 to 6 has a leſs ratio than 4 to 5; for $\frac{3}{6} = \frac{1}{2} > \frac{4}{5}$. Compound ratio is that made up of two or more other ratios, which the factum of the antecedents of two or more ratios has to the factum of their conſequents. Thus, 6 to 72 is in a ratio compounded of 2 to 6, and 3 to 12.

Particularly if it be compounded of two, it is called a *duplicate* ratio; if of three, a *triplicate*; if of four, *quadruplicate*; and, in the general, *multiplicate*, if it be compoſed of ſeveral ſimilar ratios. Thus 48 : 3 is a duplicate ratio of 4 : 1 and 12 : 3.

RATIO, *Additive*. See ADDITIVE.

RATIO, *Alternate*. See ALTERNATE.

RATIO, *Ordinate*. See ORDINATE.

RATIO *Modularis* and *Modulus*, were terms introduced into uſe by Cotes, but more modern authors do not uſe them always in the ſame ſenſe: according to Cotes, the modulus in logarithms is that number which connects any ſyſtem of logarithms with the hyperbolic ſyſtem, or that number by which the hyperbolic number of a logarithm muſt be multiplied, or by the reciprocal of which it muſt be divided, in order to tranſform it to another ſyſtem; and this modulus is, therefore, always the reciprocal of the hyperbolic logarithm of the radix of that ſyſtem to which the modulus belongs.

This is what Cotes calls the modulus, to whom we owe the introduction of the term; and the reciprocal of it he calls the *ratio modularis*: but ſome modern authors, as Lagrange, &c. uſe the term modulus to denote the ratio modularis of Cotes.

The modulus of the hyperbolic ſyſtem is 1, this being the reciprocal of the hyperbolic logarithm of 2.71828182, the radix of this ſyſtem; and the modulus of the common

logarithmic ſyſtem is .43429448, which is the reciprocal of 2.3025809, the hyperbolic logarithm of 10, the radix of this ſyſtem.

It is ſhewn under the article LOGARITHMS, that

$$\log. a = \frac{(a-1) - \frac{1}{2}(a-1)^2 + \frac{1}{3}(a-1)^3, \text{ &c.}}{(r-1) - \frac{1}{2}(r-1)^2 + \frac{1}{3}(r-1)^3, \text{ &c.}}$$

where r is the radix, and may be aſſumed at pleaſure, and the reciprocal of this whole denominator is called the modulus. In the hyperbolic ſyſtem the whole denominator is aſſumed 1, which makes $r = 2.71828182$; and in the common ſyſtem r is aſſumed 10, and the whole ſeries becomes $= 2.3025809$, which is the reciprocal of the modulus; and ſince, in the former caſe, we have

$$\text{hyp. log. } a = (a-1) - \tfrac{1}{2}(a-1)^2 + \tfrac{1}{3}(a-1)^3, \text{ &c.}$$

it follows alſo that in any other

$$\text{hyp. log. } r = (r-1) - \tfrac{1}{2}(r-1)^2 + \tfrac{1}{3}(r-1)^3, \text{ &c.}$$

whatever be the value of r; therefore, in every ſyſtem, the modulus is the reciprocal of hyp. log. of the radix. See LOGARITHMS.

RATIO, *Denominator of a.* See DENOMINATOR.

RATIO, *Properties of.*—1. Ratios ſimilar to the ſame third are alſo ſimilar to one another; and thoſe ſimilar to ſimilar, are alſo ſimilar to one another.

2. If A : B :: C : D; then, inverſely, B : A :: D : C.

3. Similar parts P and p have the ſame ratio to the wholes T and t; and if the wholes have the ſame ratio, the parts are ſimilar.

4. If A : B :: C : D; then, alternately, A : C :: B : D. And hence, if B = D, A = C; hence, alſo, if A : B :: C : D; and A : F :: C : G; we ſhall have B : F :: D : G. Hence, again, if A : B :: C : D; and F : A :: G : C; we ſhall have F : B :: G : D.

5. Thoſe things which have the ſame ratio to the ſame, or equal things, are equal; and *vice verſâ*.

6. If you multiply any quantities, as A and B, by the ſame, or equal quantities; their products D and E will be to each other as A and B.

7. If you divide any quantities, as A and B, by the ſame or equal quantities, the quotients F and G will be to each other as A and B.

8. The exponent of a compound ratio is equal to the factum of the exponents of the ſimple ratios.

9. If you divide either the antecedents or the conſequents of ſimilar ratios, A : B, and C : D, by the ſame E; in the former caſe, the quotients F and G will have the ſame ratio to the conſequents B and D; in the latter, the antecedents A and B will have the ſame ratio to the quotients H and K.

10. If there be ſeveral quantities in the ſame continued ratio A, B, C, D, E, &c. the firſt A is to the third C, in a *duplicate* ratio; to the fourth D, in a *triplicate*; to the fifth E, in a *quadruplicate*, &c. ratio of the ratio of the firſt A, to the ſecond B.

11. If there be any ſeries of quantities in the ſame ratio, A, B, C, D, E, F, &c. the ratio of the firſt A to the laſt F is compounded of the intermediate ratios A : B, B : C, C : D, D : E, E : F, &c.

12. Ratios compounded of ratios, of which each is equal to each other, are equal among themſelves. Thus the ratios 90 : 3 :: 960 : 32, compounded of 6 : 3 :: 4 : 2, and 3 : 1 :: 12 : 4; and 5 : 1 :: 20 : 4.

For other properties of ſimilar or equal ratios, ſee PROPORTION.

RATIOS, *Reduction of.*—It is obvious that there is a variety of caſes in which the real ratio of two quantities may be expreſſed in terms too great to be applied to any uſeful purpoſe; of which we have an example in the conſtruction of planetariums, and ſimilar aſtronomical inſtruments. The ratios of the times in which the ſeveral planets perform their ſidereal revolutions, are expreſſed in very large numbers, far exceeding the number of teeth that can be introduced into the machinery of a planetarium; and it, therefore, becomes neceſſary to find ſmaller numbers, which, though they do not expreſs the true ratio, may approximate as near to the truth as the ſtate of the caſe will admit. Another inſtance, in which a reduction of the ratio of large numbers to others expreſſed in lower terms becomes neceſſary, occurs in the calendar; for, according to the common reckoning, the year is ſuppoſed to be 365 days, whereas it is known to be nearly 365 days 6 hours; it, therefore, becomes neceſſary to have ſome means of expreſſing the ratio between the true and the aſſumed length of the years, in order that, by a proper intercalation, we may preſerve an uniformity in the ſeaſons, with reference to the months, as we ſhould otherwiſe find the ſhorteſt day transferred to the middle of June, and the longeſt to the month of December.

This reduction of ratios is beſt performed by means of *continued* FRACTIONS, of which a ſketch is given under that article, as alſo under the article INDETERMINATE *Analyſis*, but which we ſhall probably treat at greater length in a ſupplement to the preſent work, on which account it is not our intention to enter much into the rationale of the theory in this place, but merely to ſtate the rules by which the required reduction is to be performed.

To reduce a ratio expreſſed in large numbers, to others nearly equivalent, but repreſented in ſimpler terms.

Rule 1.—Divide the greater of the two numbers by the leſs; then the diviſor by the remainder, and ſo on, as in finding the greateſt common meaſure of two numbers, and reſerve the ſeveral quotients, which may be denoted by *a*, *b*, *c*, *d*, &c.

2. Write down the ſeveral quotients, thus; *a*, *b*, *c*, *d*, *e*, &c. from which the ſeries of converging fractions or ratios will be derived as follows; *viz.* the firſt fraction will have unity for its numerator, and the firſt quotient, *a*, for its denominator; the ſecond will have the ſecond term, *b*, for its numerator, and for its denominator $ab + 1$; and the numerators of all the ſucceeding fractions will be found, by multiplying the numerator laſt obtained, by the ſucceeding quotient in the above ſeries, and adding to the product the preceding numerator. And the denominators are obtained by preciſely the ſame rule, merely changing the word numerator into denominator.

In this rule we have ſuppoſed the ratio to be leſs than 1, or the numerator leſs than the denominator; if the denominator be leſs than the numerator, it muſt be reverſed, making the numerator what we have called the denominator, and the denominator the numerator.

The laſt fraction of this ſeries will be the ſame as the original fraction propoſed, and the others will be ſo many approximate or converging fractions, each of which will approach nearer to the original fraction than the preceding one, and nearer than any other fraction whoſe terms are not expreſſed by greater numbers. This rule may be exhibited analytically as follows:

Let $\frac{A}{B}$ be the propoſed fraction, and *a*, *b*, *c*, &c. the quotients obtained by the diviſions as above, then the converging

verging fractions will be $\frac{1}{a}$, $\frac{b}{ab+1}$, $\frac{bc+1}{(ab+1)c+a}$, $\frac{(bc+1)d+b}{[(ab+1)c+a].d+ab+1}$, &c. which will be found to agree with the preceding rule; and thefe fractions will be alternately greater and lefs than that propofed, which will be the laft of the feries.

Let us illuftrate this rule by an example. Required a feries of converging fractions towards $\frac{314159}{100000}$, which is the fraction commonly employed for expreffing the ratio of the diameter to the circumference of a circle.

Operation by Diviſion.

100000)314159(3 = *a*
300000

14159)100000(7 = *b*
99113

887)14159(15 = *c*
13305

854)887(1 = *d*
854

33)854(25 = *e*
825

29)33(1 = *f*
29

4)29(7 = *g*
28

1)4(4 = *h*
4

0

Having thus obtained our quotients, the feveral fractions will be eafily formed by the preceding rule; thus,

3 7 15 1 25 1 7 4

$\frac{3}{1}, \frac{22}{7}, \frac{333}{106}, \frac{355}{113}, \frac{9208}{2931}, \frac{9563}{3044}, \frac{76149}{2423}, \frac{314159}{100000}$;

the laft of which is the fame as the original fraction. Thefe fractions are formed according to the preceding rule, which will be underftood from one example; thus, the fifth fraction is formed from the two preceding fractions as follows:

$355 \times 25 + 333 = 9208$ numerator,
$113 \times 25 + 106 = 2931$ denominator,

and all the others are obtained in the fame manner.

Each of thefe fractions reprefents an approximate ratio towards the original one, and each of them nearer than any preceding fraction in the feries, and nearer than any fraction expreffed in lefs numbers, or than any fraction having a lefs denominator than the fucceeding fractions. Thus, $\frac{3}{1}$ is a nearer approximation than any fraction whofe denominator is lefs than 3, and $\frac{355}{113}$ nearer than any fraction whofe denominator is lefs than 2931; &c.

Our original fraction exhibited the ratio ufually employed to denote the ratio of the diameter to the circumference of a circle, and amongft our approximations we find fome of thofe commonly employed by former writers; as 7 to 22, being that given by Archimedes; 106 to 333, which is another ratio formerly ufed; alfo 113 to 355, being that invented by Peter Metius. Each of thefe ratios is alternately too fmall and too great, to expreſs the ratio of the diameter to the circumference of the circle. Thus, 1 to 3 is too fmall a ratio, 7 to 22 too great, 106 to 333 too fmall, and 113 to 355 too great; and fo on.

We may therefore divide the above feries into two diftinct claffes, one of which fhall exhibit the ratios all in excefs, and the other all in defect, which will ftand as follows: *viz.*

Ratios in defect.

$\frac{3}{1}, \frac{333}{106}, \frac{9208}{2931}, \frac{76149}{24239}$.

Ratios in excefs.

$\frac{22}{7}, \frac{355}{113}, \frac{9563}{3044}, \frac{314159}{100000}$.

And between every two confecutive fractions we may now interpolate as many fractions of the fame kind, as is one lefs than the number of units in the quotients from which it was formed. If we write the firft of the above feries, with the correfponding quotients above their terms, we fhall have

15 25 7

$\frac{3}{1}, \frac{333}{106}, \frac{9208}{2931}, \frac{79149}{24239}$.

We may therefore interpolate, between the two firft fractions, fourteen others, which will poffefs the fame property as the principal fractions above, *viz.* of approximating nearer to the true ratio than any other fractions expreffed in lefs terms, but all in defect. Between the fecond and third we may interpolate twenty-four fractions: and between the third and fourth, fix: all of them lefs than the propofed ratio. But if we take the fecond feries and their correfponding quotients, they will ftand thus:

1 1 1 4

$\frac{22}{7}, \frac{355}{113}, \frac{9563}{3044}, \frac{314159}{100000}$,

which fhews, that no fraction can here be interpolated either between the firft and fecond, or between the fecond and third; but there may be three interpolated between the third and fourth, which will, of courfe, be all in excefs. This interpolation is performed as follows: to the numerator and denominator of the lefs fraction add, once, twice, three times, &c. the numerator and denominator of the principal fraction which interpofes between the two, which will form the interpolated fractions required. Thus, becaufe $\frac{76149}{24239}$ is the principal fraction interpofed between $\frac{9563}{3044}$ and $\frac{314159}{100000}$, the intermediate or interpolated fractions will be

$\frac{9563+76149}{3044+24239} = \frac{85712}{27283}$

$\frac{9563+2.76149}{3044+2.24239} = \frac{161861}{51522}$

$\frac{9563+3.76149}{3044+3.24239} = \frac{238010}{75761}$

And in the same manner we may interpolate fourteen fractions between $\frac{3}{1}$ and $\frac{333}{106}$; twenty-four between $\frac{333}{106}$ and $\frac{9208}{2931}$; and six between $\frac{9208}{2931}$ and $\frac{16149}{24339}$.

Having thus explained the nature of the operation, we shall enter less into detail in the following example.

Example 2.—Accordiug to M de la Caille, the solar year is $365^d\ 5^h\ 48^m\ 49^s$, and consequently longer by $5^h\ 48^m\ 49^s$ than the common year of 365 days. If this difference were exactly 6 hours, it would make one day at the end of four common years: but if we wish to know exactly at the end of how many years this difference will produce a certain number of days, we must seek the ratio between 24^h and $5^h\ 48^m\ 49^s$, which we find to be $\frac{86400}{20929}$, so that at the end of 86400 common years, we must intercalate 20929 days, in order to reduce them to tropical years.

Now as the ratio of 86400 to 20929 is expressed in very high terms, let it be required to find ratios in lower terms, as near this as possible.

For this purpose, we must perform upon these numbers the same operations as in the preceding case; thus:

$$
\begin{array}{l}
20929)86400(4 = a \\
\quad 83716 \\
\quad \overline{} \\
\quad 2684)20929(7 = b \\
\qquad 18788 \\
\qquad \overline{} \\
\qquad 2141)2684(1 = c \\
\qquad\quad 2141 \\
\qquad\quad \overline{} \\
\qquad\quad 543)2141(3 = d \\
\qquad\qquad 1629 \\
\qquad\qquad \overline{} \\
\qquad\qquad 512)543(1 = e \\
\qquad\qquad\quad 512 \\
\qquad\qquad\quad \overline{} \\
\qquad\qquad\quad 31)512(16 = f \\
\qquad\qquad\qquad 496 \\
\qquad\qquad\qquad \overline{} \\
\qquad\qquad\qquad 16)31(1 = g \\
\qquad\qquad\qquad\quad 16 \\
\qquad\qquad\qquad\quad \overline{} \\
\qquad\qquad\qquad\quad 15)16(1 = h \\
\qquad\qquad\qquad\qquad 15 \\
\qquad\qquad\qquad\qquad \overline{} \\
\qquad\qquad\qquad\qquad\quad 1)15(15 \\
\qquad\qquad\qquad\qquad\quad\ 15 \\
\qquad\qquad\qquad\qquad\quad\ \overline{}
\end{array}
$$

From which quotients we derive the following converging fractions, *viz.*

$$\frac{4}{1}, \frac{7}{2}, \frac{1}{1}, \frac{3}{3}, \frac{1}{1}, \frac{16}{4}, \frac{1}{1}, \frac{1}{1}, \frac{15}{5}$$

$$\frac{4}{1}, \frac{29}{7}, \frac{33}{8}, \frac{128}{31}, \frac{161}{39}, \frac{2704}{655}, \frac{2865}{694}, \frac{5569}{1349}, \frac{86400}{20929}.$$

Now we see from the above fractions, that the simplest intercalation is that of one day in four common years, which is the foundation of the Julian calendar; but that we should approximate with more exactness, by intercalating only 7 days in the space of 29 common years, or 8 in the space of 33 years, and so on.

It appears farther, that as the fractions $\frac{4}{1}, \frac{29}{7}, \frac{33}{8}$, &c. are alternately less and greater than the fraction $\frac{86400}{20929}$, or $\frac{24^h}{5^h\ 48^m\ 49^s}$, the intercalation of 1 day in 4 years would be too much, of 7 days in 29 years too little, of 8 days in 33 years too much again, and so on; but each of these intercalations will be the most exact, that it is possible to make in the same space of time.

Now if we arrange in two separate series, the fractions that are less, and those that are greater, than the given fractions, we may insert or interpolate between certain of those fractions, as in the preceding examples.

Taking first those fractions that are less than the given one, and their corresponding quotients, we shall have,

$$\frac{4}{1}, \frac{33}{8}, \frac{2865}{694}, \frac{86400}{20929}.$$

$$1 \quad 1 \quad 15$$

Hence it appears, that the only interpolation that can be performed is between the two fractions $\frac{2865}{694}$ and $\frac{86400}{20929}$; which will admit of 14 intermediate fractions; which being supplied, as in the former example, gives the following series of converging fractions, each less than the fraction originally proposed, *viz.*

$$\frac{4}{1}, \frac{33}{8}, \frac{161}{39}, \frac{2865}{694}, \frac{8434}{2043}, \frac{14003}{3392},$$
$$\frac{19572}{4741}, \frac{25141}{6090}, \frac{30710}{7439}, \frac{36279}{8788},$$
$$\frac{41848}{10137}, \frac{52986}{12835}, \frac{58555}{14184}, \frac{64124}{15533},$$
$$\frac{69633}{16882}, \frac{75262}{18231}, \frac{80831}{19580}, \frac{86400}{20929}.$$

And as the last fraction is the same as the given fraction, it is evident that this series cannot be carried farther: hence, if we choose to admit those intercalations only in which the error is too much, the simplest and most exact will be those of 1 day in 4 years, or of 8 days in 33 years, or of 39 in 161 years, and so on.

Let us now consider the decreasing fractions:

$$\frac{7}{29}, \frac{3}{128}, \frac{16}{2704}, \frac{1}{5569}.$$

Here it appears, that we may place 6 fractions before the first, 2 between the first and second, 15 between the second and third; but between the third and fourth no such fraction can be inserted.

These interpolations being made, we shall have the following series of decreasing fractions, *viz.*

$$\frac{5}{1}, \frac{9}{2}, \frac{13}{3}, \frac{17}{4}, \frac{21}{5}, \frac{25}{6},$$
$$\frac{29}{7}, \frac{62}{15}, \frac{95}{23}, \frac{128}{31}, \frac{289}{70}, \frac{450}{109},$$
$$\frac{611}{148}, \frac{772}{187}, \frac{933}{226}, \frac{1094}{265}, \frac{1255}{304},$$

$$\frac{1416}{343}, \frac{1577}{382}, \frac{1738}{421}, \frac{1899}{460}, \frac{2060}{499},$$
$$\frac{2221}{538}, \frac{2382}{577}, \frac{2543}{616}, \frac{2704}{655}, \frac{5569}{1349},$$

which are all leſs than the propoſed fraction, and expreſſed in leſs terms; and each of which is nearer than any other fraction that can be expreſſed in leſs terms.

Hence we conclude, that if we only attend to the intercalations in which the error is too ſmall, the ſimpleſt and moſt exact are thoſe of 1 day in 5 years, of 2 days in 9 years, of 3 days in 13 years, of 4 days in 17 years, and ſo on.

In the Gregorian calendar, only 97 days are intercalated in 400 years; but it is evident, from the preceding table, that it would be much more exact to intercalate 109 days in 450 years.

But it muſt be obſerved, that in the Gregorian reformation, the determination of the year given by Copernicus was made uſe of, which is $365^d\ 5^h\ 49'\ 20''$; and ſubſtituting this inſtead of the fraction $\frac{86400}{20929}$, we ſhall have $\frac{86400}{29060}$, or rather $\frac{540}{131}$; whence we may find, by the preceding method, the quotients 4, 8, 5, 3; and from them the principal fractions

$$\frac{4}{1}, \frac{33}{8}, \frac{169}{41}, \frac{540}{131};$$

which, except the two firſt, are quite different from thoſe before determined. However, we do not find amongſt theſe fractions $\frac{400}{97}$, which is that adopted in the Gregorian calendar; and this fraction cannot even be found among the interpolated fractions, which might be inſerted in the two ſeries, $\frac{4}{1}, \frac{169}{41}$, and $\frac{33}{8}, \frac{540}{131}$: for it is evident that it could only be between the laſt two fractions, between which, becauſe of the number 3, (the correſponding quotient,) there can be but two fractions interpolated, which are $\frac{202}{49}$, and $\frac{371}{90}$: whence it appears, that it would have been more exact, if, in the Gregorian reformation, they had only intercalated 90 days in the ſpace of 371 years.

If we reduce the fraction $\frac{400}{37}$, ſo as to have for its numerator the number 86400, it will become $\frac{86400}{20952}$, which eſtimates the tropical year at $365^d\ 5^h\ 49'\ 12''$.

In this caſe, the Gregorian intercalation would be quite exact; but as obſervations ſhew that the year is ſhorter than this by more than $20''$, it is evident that, at the end of a certain period of time, we muſt introduce a new intercalation.

If we adopt the determination of de la Caille, it follows, as the denominator 97 of the above fraction, *viz.* $\frac{400}{97}$, lies between the denominators of the fifth and ſixth principal fractions already found, that, from what has been ſtated above, the fraction $\frac{161}{39}$ will be nearer the truth than $\frac{400}{97}$. But as aſtronomers are ſtill divided with regard to the exact length of the year, we ſhall refrain from giving a deciſive opinion on this ſubject. For more on the reduction of ratios, ſee Lagrange's Additions to Euler's Elements of Algebra.

Ratios, *Prime and Ultimate*, is a ſpecies of computation, which we owe to the fertile genius of Newton. The ancients, in order to extend the geometry of right lines to curvilinear figures, had recourſe to the method of *exhauſtions*, in which they made uſe of what is called the *reductio ad abſurdum* method, which, though logical, is extremely tedious, and to avoid which, Cavalerius propoſed his method of *indiviſibles*, publiſhed in 1635 under the title of "Geometria Indiviſibilibus," in which he was followed by Dr. Wallis and others of the 17th and 18th centuries. In this method every line was ſuppoſed to conſiſt of a number of other lines indefinitely ſmall; every curve was conſidered as a polygon of an indefinite number of ſides, each ſide being indefinitely ſmall; a ſolid was ſuppoſed to conſiſt of an infinite number of plane ſections, or of indefinitely thin laminæ, and ſo on; ſuppoſitions which in many inſtances led thoſe, who adopted them, into errors and inconſiſtencies, which indeed it was very difficult to avoid.

To obviate both the tedioufneſs of the ancients, and the inaccuracy of the moderns, Newton introduced his method of *prime* and *ultimate* ratios, the foundation of which is contained in the firſt lemma of the firſt book of his "Principia." Many difficulties have been ſtarted, and much controverſy concerning the proof of it; all of which would have been avoided, had either the author or his readers obſerved, that he is in reality laying down the definition of a term, *viz. being ultimately equal*, and not proving a propoſition. Taking, therefore, this firſt lemma for a definition, it may be illuſtrated as follows.

Let there be two quantities, one fixed and the other varying, ſo related to each other, that, 1ſt, the varying quantity continually approaches to the fixed quantity; and, 2dly, that the varying quantity never reaches or paſſes beyond that which is fixed: 3dly, that the varying quantity approaches nearer to the fixed quantity than by any aſſigned difference. Then is ſuch a fixed quantity called the *limit* of the varying quantity; or, in other words, the varying quantity may be ſaid to be *ultimately equal* to the fixed quantity. Theſe three conditions may be expreſſed more diſtinctly thus. 1. The difference between the varying quantity and the fixed quantity muſt continually decreaſe. 2. This difference muſt never become either nothing or negative. 3. This difference muſt become leſs, in reſpect of the fixed quantity, than by any aſſigned ratio; or the difference between the two quantities muſt become a leſs part of the fixed quantity than any fractional part that is aſſigned, however ſmall the fraction expreſſing ſuch part may be. Wherever theſe properties are found, the fixed quantity is called the *limit* of the varying quantity, or the varying quantity is ſaid to be *ultimately equal* to the fixed quantity. The laſt expreſſion, however, muſt not be underſtood in its ſtrict literal ſenſe, there being no *ultimate ſtate*, no particular magnitude, that is the *ultimate magnitude* of ſuch a varying quantity. Under the word quantity in this definition, muſt be included not only numbers, lines, &c., but more eſpecially ratios conſidered as a peculiar ſpecies of quantity; but as the con-

ſideration of ratios which have limits is difficult, we ſhall begin with examples of other quantities.

1ſt. Let there be formed a ſeries, whoſe firſt term is 1; ſecond, $\frac{1}{2}$; third, $\frac{1}{4}$; fourth, $\frac{1}{8}$, and ſo on; every term being half the preceding one, *viz.*

$$1,\ \frac{1}{2},\ \frac{1}{4},\ \frac{1}{8},\ \frac{1}{16},\ \frac{1}{32},\ \&c.$$

and let the ſum of an indefinite number of terms in this ſeries be conſidered as continually increaſed by the acceſſion of a new term; thus, the ſum of the two firſt is $1\frac{1}{2}$, of three terms is $1\frac{3}{4}$, of four terms is $1\frac{7}{8}$, &c. I ſay then, that the varying ſum of the terms of this ſeries continually approximates to the fixed number 2, as its limit. For the difference between 1, 2, 3, &c. terms and the number 2, will be the numbers $1,\ \frac{1}{2},\ \frac{1}{4},\ \frac{1}{8},\ \frac{1}{16}$, &c. ſucceſſively, *in infinitum*. Here it is evident, that the terms in this laſt ſeries, which expreſs the ſucceſſive differences between the increaſing ſum of the former ſeries and the number 2, *firſt*, continually decreaſe; and *ſecondly*, no term in this ſeries of differences can become either nothing or negative; and *thirdly*, we may continue this ſeries of ſucceſſive differences, till we arrive at a term which ſhall be a leſs part of the fixed number 2, than any fractional part of it that can be aſſigned; or ſo that this difference ſhall be leſs, when compared with the number 2, than any ratio aſſigned. The number 2, therefore, having the conditions laid down in the definition, is to be called the limit of the ſum of the terms of the infinite ſeries $1,\ \frac{1}{2},\ \frac{1}{4},\ \frac{1}{8},\ \frac{1}{16}$, &c.

And the ſame is to be underſtood of any other infinite ſeries; *viz.* if a number can be found having the above conditions, that ſeries is ſaid to have a limit; and the finding of this limit, is what is to be underſtood when mathematicians ſpeak of finding the ſum of ſuch an infinite ſeries.

No number leſs than 2, for inſtance $1\frac{7}{8}$, can be taken for the limit; for, in this caſe, it will not anſwer the ſecond condition of the definition. In the above example, the ſum of four terms of the ſeries is equal to $1\frac{7}{8}$, and the ſum of five terms exceeds it; therefore, the difference between this ſum and the number $1\frac{7}{8}$ propoſed as a limit is, in the former caſe zero, and in the latter negative. Neither can any number greater than 2, as for example 3, be taken for the limit, becauſe here the laſt condition will be wanting; for if the ſum of any aſſigned number of terms be leſs than 2, that ſum muſt always want more than unity of the number 3, and conſequently cannot approach nearer to 3, than any aſſigned quantity, as 1.

In like manner the ſum of the ſeries $1,\ \frac{1}{3},\ \frac{1}{9},\ \frac{1}{27}$, &c. continued *in infinitum*, will be $1\frac{1}{2}$; the ſeries of ſucceſſive differences being $\frac{1}{2},\ \frac{1}{6},\ \frac{1}{18},\ \frac{1}{54}$, &c. *in infinitum*.

Now, in order to make the preceding example general, let $a : b$ expreſs the common ratio of any ſeries of numbers in continual proportion, whoſe firſt term is unity, I ſay then, if a be greater than b, ſuch a ſeries will have for its limit the quantity $\frac{a}{a-b}$; or, in other words, the ſum of all the terms of ſuch an infinite ſeries will be $\frac{a}{a-b}$.

For the terms of this ſerics will be $1,\ \frac{b}{a},\ \frac{b^2}{a^2},\ \frac{b^3}{a^3},\ \frac{b^4}{a^4}$, &c.

Whence the ſum of 1 term is - - - 1

of 2 terms - - - $\frac{a+b}{a}$

of 3 terms - - $\frac{a^2+ab+b^2}{a^2}$

of 4 terms - $\frac{a^3+a^2b+ab^2+b^3}{a^3}$

Let each of theſe ſums be ſubtracted from the limit $\frac{a}{a-b}$, and we have the ſucceſſive differences $\left(\frac{b}{a-b}\right)$, $\left(\frac{b}{a-b}\cdot\frac{b}{a}\right)$, $\left(\frac{b}{a-b}\cdot\frac{b^2}{a^2}\right)$, $\left(\frac{b}{a-b}\cdot\frac{b^3}{a^3}\right)$, &c. or if n be any aſſigned number of terms, the difference between the ſum of that number of terms and the limit $\frac{a}{a-b}$, will be $\frac{b}{a-b}\cdot\frac{b^{n-1}}{a^{n-1}}$. Whence we may obſerve, 1ſt, that as the number of terms whoſe ſum is required increaſes, this difference continually decreaſes, becauſe $\frac{b}{a}$, being a fraction leſs than unity, its powers continually decreaſe. 2dly. This difference can never become nothing or negative; the powers of a fraction, though they decreaſe, being always real and affirmative. 3dly. This difference may become leſs in reſpect of $\frac{a}{a-b}$, than by any aſſigned ratio. For $\frac{a}{a-b} : \frac{b}{a-b}\cdot\frac{b^{n-1}}{a^{n-1}}$ as $a^n : b^n$; or as $\frac{a^n}{b^n}$ to 1; or as $\left(\frac{a}{b}\right)^n$ to 1: and ſince $\frac{a}{b}$ is greater than 1, and n indeterminate, the former term of the ratio may become greater than any aſſigned quantity, and therefore the ratio itſelf leſs than any ratio aſſigned.

The quantity $\frac{a}{a-b}$, having, therefore, the required conditions, is the limit of the above ſeries, or is equal to the ſum of all the terms continued *in infinitum*.

What has been proved above may be ſhewn more conciſely by dividing a by $a-b$, in the manner of diviſion in algebra, for the quotients will be the very ſeries propoſed in the example: for inſtance,

$$a-b)\ a\ \left(1+\frac{b}{a}+\frac{b^2}{a^2}+\frac{b^3}{a^3}+\&c.\right.$$
$$\underline{a-b}$$
$$b$$
$$b-\frac{b^2}{a}$$
$$\underline{\qquad}$$
$$\frac{b^2}{a}$$
$$\frac{b^2}{a}-\frac{b^3}{a^2}$$
$$\underline{\qquad}$$
$$\frac{b^3}{a^2}$$

And

And it may be further confirmed by multiplying the propoſed ſeries by $a - b$, for the product will be a, all the terms except the firſt deſtroying each other.

We may alſo obſerve, that if every term of the foregoing ſeries be multiplied by any number c, it will become $c + \frac{b\,c}{a} + \frac{b^2\,c}{a^2} + \frac{b^3\,c}{a^3}$ + &c.; a ſeries having the ſame ratio, but whoſe firſt term is c; and it is therefore evident, that, in this caſe, to find the ſum of all the terms, we muſt multiply the former limit by c, whence it will become $\frac{a\,c}{a-b}$.

Before we begin to conſider ratios, it may not be amiſs to caution the reader againſt confounding the terms of a ratio with the ratio itſelf: the terms of a ratio may vary in ſome caſes through all degrees of magnitude, and yet the ratio remain conſtant or invariable. In other inſtances, varying the terms *in infinitum*, likewiſe varies the ratio *in infinitum*; while in others, though varying the terms may alſo vary the ratio, yet the laſt ratio can never exceed certain limits.

Let x be any varying quantity; make $4x^2 + 3x = A$, and $2x^2 + x = B$, then will A and B alſo be varying quantities, as depending upon x; when x vaniſhes, A and B will both vaniſh; when x is infinite, they will be both infinite. I ſay then the ratio of A to B, while x decreaſes *in infinitum*, approximates to the ratio of 3 to 1.

For, firſt, A is to B, as $4x^2 + 3x$ is to $2x^2 + x$, or as $4x + 3$ to $2x + 1$; where it is obvious, that as x decreaſes, the quantities $4x$ and $2x$ alſo decreaſe, and conſequently the ratio of $4x + 3$ to $2x + 1$, or of A to B, approaches to that of 3 to 1. Secondly, the ratio of A to B can never exceed 3 to 1. For $6x^2 + 3x$ is to $2x^2 + x$, as 3 to 1; but $4x^2 + 3x$ is a leſs quantity than $6x^2 + 3x$, therefore $4x^2 + 3x$ is to $2x^2 + x$, or A is to B in a leſs ratio than $6x^2 + 3x$ to $2x^2 + x$; that is, leſs than the ratio of 3 to 1. Laſtly, the ratio of A to B will approach nearer to the ratio of 3 to 1, than any aſſigned difference. For in the terms of this ratio, $4x + 3$ to $2x + 1$, the varying parts $4x$ and $2x$, by diminiſhing x, may become leſs than any aſſigned quantity, while the other parts, 3 and 1, remain the ſame; therefore the ratio of A to B will approach nearer to the ratio of 3 to 1, than by any aſſigned difference.

In like manner the ratio of A to B, while x increaſes *in infinitum*, approximates to the ratio of 2 to 1, as its limit. For ſince A is to B as $4x + 3$ to $2x + 1$, or as $4x + \frac{3}{x}$ to $2 + \frac{1}{x}$, it is obvious, that as x increaſes, the quantities $\frac{3}{x}$ and $\frac{1}{x}$ decreaſe, and conſequently the ratio of $4 + \frac{3}{x}$ to $2 + \frac{1}{x}$, or of A to B, approaches to the ratio of 4 to 2, or of 2 to 1. For $4x^2 + 2x$ is to $2x^2 + x$, as 2 is to 1; but $4x^2 + 3x$, is a greater quantity than $4x^2 + 2x$, therefore $4x^2 + 3x$ is to $2x^2 + x$, or A is to B always in a greater ratio than 2 to 1. Laſtly, the ratio of A to B will approach nearer to that of 2 to 1, than by any aſſigned difference. For in the terms of this ratio, $4 + \frac{3}{x}$ and $2 + \frac{1}{x}$, the variable parts $\frac{3}{x}$ and $\frac{1}{x}$, by increaſing x, may become leſs than any aſſigned fraction, while the parts 4 and 2 remain the ſame; therefore the ratio of A to B will approach nearer to the ratio of 4 to 2, or 2 to 1, than the aſſigned difference. Hence then we ſee that though diminiſhing x, and conſequently diminiſhing the terms A and B, we increaſe their ratio, and on the contrary increaſing theſe terms, by increaſing the quantity x, we decreaſe their ratio, yet there is a limit both to the increaſe and decreaſe of this ratio, although there be none to the terms themſelves which compoſe it.

The ratio of 3 to 1, which limits the ratio of A to B, when theſe terms decreaſe *in infinitum*, is called the *ultimate ratio* of the evaneſcent quantities A and B. The ratio of 2 to 1, which is their other limit, is called the *ultimate ratio* of the quantities A and B increaſing *in infinitum*.

Another example of a ſimilar kind we have as follows. Let x be a varying quantity, and d a conſtant one, then will $x + d$ and x be two varying quantities capable of all degrees of magnitude, I ſay that the ratio of $x + d$ to x, while x increaſes, will continually decreaſe, but not beyond a certain limit, which is the limit of equality. On the contrary, if x decreaſe, the ratio of $x + d$ to x will continually decreaſe more and more *ad infinitum*, and never come to a limit. For $x + d$ is to x, as $1 + \frac{d}{x}$ to 1; now as x increaſes, the fraction $\frac{d}{x}$ decreaſes, and may become leſs than any aſſigned fraction; but the number 1, which is the other part of the antecedent of this ratio, remains the ſame, as does likewiſe the conſequent, therefore the ratio of $1 + \frac{d}{x}$ to 1, continually approximates to a ratio of equality. Secondly, it can never reach that ratio, becauſe $\frac{d}{x}$ has always ſome magnitude, and conſequently $1 + \frac{d}{x}$ always greater than 1. It therefore can never reach the ratio of equality, and much leſs can it paſs it, ſo as to become a ratio *minoris inæqualitatis*, or a ratio in which the antecedent is leſs than the conſequent. Laſtly, the varying fraction $\frac{d}{x}$, as x increaſes, will become leſs than any aſſigned fraction, while the other part of the antecedent, and likewiſe the conſequent of this ratio, remain the ſame. Therefore the ratio of $1 + \frac{d}{x}$ to 1, will approach nearer to the ratio of equality, than by any ratio that can be aſſigned, however ſmall ſuch ratio may be; therefore the ratio of equality is the limit of the ratio of $1 + \frac{d}{x}$ to 1, and conſequently the limit of the ratio of $x + d$ to x, which continually decreaſes, while the terms which compoſe this ratio continually increaſe *in infinitum*.

If x decreaſe then $\frac{d}{x}$ will increaſe, and may become greater than any aſſigned number, while the other part of the antecedent, and likewiſe the conſequent, remain invariable; therefore the ratio of $1 + \frac{d}{x}$ to 1, and conſequently the ratio of $x + d$ to x, as x decreaſes, will become greater than any aſſigned ratio whatever, having no limit to its increaſe.

We

We may farther obſerve, that though the terms of this ratio, *viz.* $x + d$ to x, never approximate nearer to each other, their conſtant difference being d, yet the ratio of the terms approximates to the ratio of equality; that is, though the terms get no nearer in their difference, yet, if we may be allowed the expreſſion, they get nearer in their ratio. The difference of the terms, and the ratio of the terms, are ideas very diſtinct from each other, and in no wiſe to be ſo connected, but that one may vary whilſt the other is conſtant. Although the ratio of equality may ſtrictly be called the *limit of the varying ratio* of the quantities $x + d$ and x, yet the terms of this ratio can never be ſtrictly ſaid to be equal, nor *ultimately equal*, as that ſuppoſes an ultimate ſtate in which they are equal; nor equal when they *vaniſh into infinity*, or, when they paſs out of finity into infinity. There is no finite quantity next to infinity, no number, for inſtance, which is the next number to infinity. Nor is there any ſtep from a ſtate of *nothingneſs* into finite exiſtence; there is no fraction ſo ſmall as to be the very next fraction to nothing; no fraction can be aſſigned ſo ſmall, but another fraction may be aſſigned that is ſmaller. Neither can we ſay, in ſtrictneſs, that two infinitely great numbers with a finite difference are equal, it being a propoſition obviouſly abſurd and contradictory. There is no ſuch thing in nature as an infinitely great number; and it is contradictory to ſay of any two numbers, both that they have a difference, and that they are equal. Whoever conſiders that the idea of infinity is a general or abſtract idea, that the idea of number is always particular, that infinity is a *property* of numbers, a *property* of extenſion, &c. itſelf, will readily perceive that theſe and ſuch like expreſſions have no literal meaning. (See Locke, b. ii. ch. 16. and ch. 17.) As to the metaphorical uſe of them, to avoid circumlocution, or the introduction of new terms, it may be allowed, when once the literal meaning has been explained, in this, as well as on various other occaſions both in ſcience and in common life.

When the difference between any two quantities decreaſes, ſo as to become a leſs fractional part of the one of them than any aſſigned fractional part whatever; or when the difference between the terms of a ratio becomes leſs in reſpect of one of them (the greater for example) than any aſſigned ratio, this may be expreſſed by ſaying, that ſuch difference *vaniſhes* in reſpect of that *greater* quantity.

But if the difference between two terms vaniſh in reſpect to one of them, it will alſo vaniſh in reſpect of the other. It is true that at any aſſigned time, when the terms have a particular magnitude, the difference between the terms will always be a leſs fractional part of the greater term than it is of the leſs term; but as this difference continually decreaſes, it will become the ſame fractional part of the leſs term that it was before of the greater, however ſmall that fractional part of the greater term may be; therefore, if the difference vaniſh with regard to one of them, it will vaniſh alſo with regard to the other. We may, therefore, inſtead of the third condition of our definition, ſay, that "the difference muſt vaniſh in reſpect either of the fixed or of the varying quantity, ſince one of theſe implies the other."

The above is true as well for the caſe of two variables, as for one fixed and one variable, though both of ſuch variables increaſe or decreaſe without limit. Thus, in the example above given, in which the terms were $x + d$ and x, and where x is continually increaſing, the terms themſelves both continually increaſe; for in this inſtance it is obvious, that if the difference vaniſh with reſpect to one of the terms, it will alſo vaniſh with reſpect to the other. Let x be to d, at any aſſigned point of time, as n is to 1, and d at that inſtant of time will be the $\frac{1}{n+1}$th part of the greater term, and the $\frac{1}{n}$th part of the leſs term: now, though the contemporary value of theſe fractions can never be equal, yet in ſucceſſion the value of the latter fraction will become whatever the former has been; therefore, if $\frac{1}{n+1}$ become leſs than any aſſigned fraction, ſo will $\frac{1}{n}$ likewiſe; and thus, if the difference vaniſhes with reſpect to one of the terms, $x + d$, ſo will it alſo vaniſh with reſpect of the other, x. And the ſame would be true if the terms were x and $x - d$, all things elſe being as before.

Again, if x by decreaſing vaniſh with reſpect to ſome fixed quantity n, then will x, multiplied by a given number n, or nx, vaniſh in reſpect of a; or, which is the ſame, if x vaniſh in reſpect of a, ſo likewiſe will the quantity nx; bearing to x the aſſigned ratio of n to 1. For though at any particular point of time x is a ſmaller fractional part of a than nx, yet x can be no aſſigned fractional part of a whatever; but by farther diminiſhing x, the quantity nx may become the ſame fractional part of a that x was before. If, then, x may become equal to, or leſs than, any aſſigned fractional part of a, ſo likewiſe may nx; that is, if x vaniſh in reſpect of a, ſo likewiſe will nx.

For a like reaſon, if x vaniſh in reſpect of any quantity, it will likewiſe vaniſh in reſpect to that quantity multiplied or divided by any number; or it will vaniſh in reſpect of a quantity, bearing to a any aſſigned ratio, as that of m to 1. Thus, if x vaniſh in reſpect of a, it will alſo vaniſh in reſpect of $3a$, $2a$, $\frac{1}{2}a$, &c. Or, if any fraction vaniſh in reſpect to the diameter of a circle, it will likewiſe vaniſh in reſpect of the radius. For whatever part of the diameter the line x may be at any aſſigned point of time, let x farther decreaſe, till it be half what it was at that aſſigned time, and it will now be the ſame part of the radius that it was before of the diameter; and the ſame with various other lines and quantities. We have ſhewn, in the preceding part of this article, that the ratio which two quantities bear to each other may have a limit, although the terms themſelves may increaſe or decreaſe perpetually without limit. 1. If the terms approximate towards each other; 2, if the leſs never paſs the greater; and, laſtly, if their difference vaniſh in reſpect of either term, then the limit of their varying ratio is that of equality: and this, whether the terms themſelves are ſuch, as by increaſing they both become greater than any aſſigned quantity, or, which is more common, ſuch as by decreaſing become leſs than any aſſigned quantity, or as it is called, *infinitely ſmall*. Becauſe the idea of the terms of a ratio is leſs abſtract than that of the ratio itſelf, it is more uſual to ſay that the terms themſelves in this caſe are ultimately equal, though, ſtrictly, it is the ratio only of the terms that comes to a limit, for the terms themſelves are ſuppoſed to increaſe or decreaſe without limit, or as we commonly ſay, *ad infinitum*.

Prop.—In a circle whoſe centre is C, (*Plate* XIII. *Analyſis, fig.* 9.) radius C A, diameter A *a*, let A B be the chord, F B the ſine, and A D the tangent of the arc A B. I ſay, that while the arc A B continually decreaſes without limit; 1ſt, the ſine continually approximates to the tangent; 2dly, the ſine never exceeds the tangent; 3dly, their difference will vaniſh in reſpect of either ſine or tangent.

Firſt; B F : D A :: C F : C A, but while the arc decreaſes, C F approximates to C A; B F approximates to

D A.

D A. 2dly. C F can never exceed C A; therefore B F can never exceed D A. 3dly. The arc continually decreaſing without limit, vaniſhes in reſpect of the diameter, which is fixed; therefore the chord A B, which is leſs than the arc, likewiſe vaniſhes in reſpect of the diameter A *a*. But A *a* : A B :: A B : A F; therefore, if A B vaniſhes in reſpect of A *a*, A F will vaniſh in reſpect of A B; and much more will A F vaniſh in reſpect of A *a*; but if A F vaniſh in reſpect of A *a*, it will alſo vaniſh in reſpect of $\frac{1}{2}$ A *a*, or C A.

Now C A : C F :: A D : F B, and by diviſion of proportion C A : A F :: A D : A D — F B. Therefore, as A F vaniſhes in reſpect of C A, ſo does A D — F B (the difference of the ſine and tangent) vaniſh in reſpect to A D the tangent, and conſequently in reſpect of F B the ſine. Whence we ſee, that while the arc continually decreaſes without limit, the ſine approximates to the tangent; 2dly, the ſine never exceeds the tangent; 3dly, although the ſine and tangent both vaniſh in reſpect of the radius, yet their difference vaniſh in reſpect of theſe quantities themſelves. Therefore the ratio of equality is the limit of the varying ratio which the ſine and tangent have to each other, while they both decreaſe perpetually without limit, or it is their *ultimate ratio*, or, as we may ſay, they are *ultimately equal*. The ſine is leſs than the chord; for in the right-angled triangle A F B, the ſide B F is leſs than the hypothenuſe A B; the chord is leſs than the arc; this is ſelf-evident, the chord being a ſtraight line, and the arc a curve, both terminated by the ſame points A and B. The arc is leſs than the tangent; for from the point D draw another tangent to the circle in H; and the lines A B H, A D H, will be terminated by the ſame points A and H; and will have the concavities turned the ſame way; therefore the included arc A B H will be leſs than the ſum of the two equal tangents D A and D H; conſequently half that arc, or A B, will be leſs than half the ſum of the tangents A D.

Cor. 1.—Hence the ſine, chord, arc, and tangent, are all ultimately in a ratio of equality. This may appear becauſe the chord and arc are included between the ſine and tangent, but perhaps more plainly thus. Of theſe four quantities, *viz.* the ſine, chord, arc, and tangent, the ſine is the leaſt, and the tangent the greateſt; therefore, the difference between the ſine and the tangent is greater than the difference between any other two of theſe four quantities. If, therefore, the greateſt of all thoſe differences vaniſh in reſpect of the leaſt of all thoſe quantities, much more will the difference between any other two of theſe four quantities vaniſh in reſpect of the quantities themſelves.

Cor. 2.—Join B *a*, and in the right-angled triangle B F *a*, the hypothenuſe B *a* is greater than the ſide F *a*; therefore A *a* — B *a* is leſs than A *a* — F *a*, or than A F; but while the arc A B decreaſes continually without limit, A F vaniſhes in reſpect of A *a*; much more then does A *a* — B *a*, the difference A *a* and B *a*, vaniſh in reſpect of A *a*; therefore the ultimate ratio of A *a* to B *a* is that of equality; and the ultimate ratio of $\frac{1}{2}$ A *a*, or B C to B A, is that of 2 to 1. See other applications of theſe principles in Ludlam's "Rudiments of Mathematics," from which the preceding article has been abſtracted; Newton's "Principia," lib. i.; Smith's "Fluxions;" and Saunderſon's "Algebra."

RATIO, in our *Law Writers*, is uſed for a judgment given in a cauſe.

Hence, *ponere ad rationem* is to cite one to appear in judgment. Walſingh. 88.

RATIO *Status*, *Ragione di ſtato*. See REASON *of State*.

RATIO *Vitus*. See VICTUS.

RATIOCINATION, the act of reaſoning.

RATION, or RATIAN, in the *Army*, a pittance or proportion of ammunition, bread, drink, or forage, diſtributed to each ſoldier for his daily ſubſiſtence.

Some write the word *racion*, and borrow it from the Spaniſh *racion*; but they both come from the Latin *ratio*. In ſome parts they call it a *reaſon*.

The horſe have rations of hay and oats, when they cannot go out to forrage. See FORRAGE.

The rations of bread are regulated by weight. The ordinary ration of a foot ſoldier is a pound and a half of bread *per* day. The officers have ſeveral rations, according to their quality, and the number of attendants that they are obliged to keep.

When the ration is augmented on occaſions of rejoicing, it is called a *double* ration.

The ſhips' crews have alſo their rations or allowances of biſcuit, water, &c. proportioned according to their ſtock. The uſual ration at ſea, particularly among the Portugueſe, &c. is a pound and half of biſcuit, a pint of wine, and a quart of freſh water *per* day; and each month an arrobe, or thirty-one pounds of ſalt meat, with ſome dried fiſh and onions.

RATIONABILES EXPENSÆ, *Reaſonable Expences*. The commons in parliament, as well as the proctors of the clergy in convocation, were anciently allowed *rationabiles expenſas*; that is, ſuch allowance as the king, conſidering the prices of all things, ſhall judge meet to impoſe on the people to pay for the ſubſiſtence of their repreſentatives.

This in the 17th of Edward II. was ſettled at ten groats *per* day for knights, and five for burgeſſes: afterwards, four ſhillings a day for knights, and two ſhillings for burgeſſes; which was then deemed an ample retribution, both for expences, for labour, attendance, neglect of their own affairs, &c. See BURGESS, and KNIGHTS *of the Shire*.

RATIONABILI *Parte Bonorum*, a writ which lies for the wife, againſt the executors of her huſband, denying her the third part of her huſband's goods, after debts and funeral expences paid.

Fitzherbert quotes Magna Charta, and Glanville, to prove, that, by the common law of England, the goods of the deceaſed, his debts firſt paid, ſhould be divided into three parts; of which his wife is to have one, his children a ſecond, and the executors a third; adding, that this writ lies as well for the children, &c. as the wife. Such is the general law of Scotland at this day. And whatever may have been the cuſtom of late years, in many parts of the kingdom, or however it was introduced in derogation of the old common law, the ancient method continued in uſe in the province of York, the principality of Wales, and the city of London, till very modern times; when in order to favour the power of bequeathing, and to reduce the whole kingdom to the ſame ſtandard, three ſtatutes have been provided; the one 4 & 5 W. & M. c. 2. explained by 2 & 3 Ann. c. 5, for the province of York; another, 7 & 8 W. III. c. 38. for Wales; and a third, 11 Geo. I. c. 18. for London (ſee CUSTOM *of London*); whereby it is enacted, that perſons within thoſe diſtricts, and liable to thoſe cuſtoms, may, if they think proper, diſpoſe of all their perſonal eſtates by will; and the claims of the widow, children, and other relations, to the contrary, are totally barred. Thus is the old common law now utterly aboliſhed throughout all the kingdom of England, and a man may deviſe the whole of his chattels as freely as he formerly could his third part or moiety. Blackſt. Com. b. ii.

Recto de RATIONABILI *Parte*. See RECTO.

RATIONABILIBUS DIVISIS, is a writ that lies where two lords have ſignories joining together, for him that finds his waſte encroached upon, within the memory of man, againſt the encroacher, thereby to rectify the bounds of the ſignories: in which reſpect, Fitzherbert ſays, it is of the nature of a writ of right.

RATIONABILIS DOS, a third part of ſuch lands and tenements as the huſband was ſeiſed of at the time of the eſpouſals, with which his wife was formerly endowed by the common law, if no ſpecific dotation was made at the church porch. See DOWER and JOINTURE.

RATIONAL, REASONABLE. See REASON.

RATIONAL *Fable*. See FABLE.

RATIONAL *Fractions*, in *Arithmetic* and *Analyſis*, are thoſe fractions into which no ſurd or radical quantity enters; as $\frac{7}{8}, \frac{19}{27}, \frac{x^2+1}{x^3+1}, \frac{x^3+x^2+ax}{x^4+bx^3+cx}$, &c.

The decompoſition of rational fractions into ſimple fractions, that is, the decompoſition of them into other fractions whoſe ſum is equal to that propoſed, is an important problem, as connected with the integral calculus, or inverſe method of fluxions, which was firſt inveſtigated by Leibnitz, but has ſince been much extended and ſimplified by the reſearches of Euler, La Grange, La Croix, and other eminent analyſts.

The decompoſition of numeral fractions into their partial fractions, is, perhaps, rather a ſubject of curioſity than utility, yet as connected with, and leading to, the decompoſition of rational algebraic fractions, it may not be amiſs to give here a ſketch of the proceſs by which it is accompliſhed, previous to entering upon the latter ſubject.

On the decompoſition of rational numeral fractions, into others having prime denominators.

It is to be obſerved, that this can only be effected in the caſe of a compoſite denominator, or rather, there will be no difficulty in any other caſe, as it will require only a ſeparation of the numerator into any parts at pleaſure, the ſum of which is obviouſly equal to the fraction propoſed; we ſhall therefore only conſider thoſe fractions having compoſite denominators, which are to be reſolved into others having prime denominators; and even in this caſe there may be fractions that will not admit of decompoſition, as will appear from what follows. This decompoſition is effected, when poſſible, by means of the indeterminate analyſis; *viz.* let $\frac{m}{n}$ be the given fraction, and ſuppoſe, in the firſt inſtance, that its denominator conſiſts of two prime factors, or $n = ab$, it will then be to find $\frac{m}{ab} = \frac{p}{a} + \frac{q}{b}$, or $aq + bp = m$; p and q being the required numerators of the two partial fractions, and which values of p and q are eaſily found from the above equation $aq + bp = m$, on the principles explained under the article INDETERMINATE *Analyſis*, ſubject however to the ſame limitation there mentioned; *viz.* the above equation is always poſſible, provided $m > ab - a - b$, but in other caſes it may or may not admit of ſolution.

If the given fraction be $\frac{m}{abc}$, then we may firſt reſolve it into two fractions, and one of theſe into two others; thus, let $\frac{m}{abc} = \frac{p}{ab} + \frac{q}{c}$, then we have $abq + cp = m$, from which equation p and q may be found. Again, let $\frac{p}{ab} = \frac{r}{a} + \frac{s}{b}$, which gives $as + rb = p$, whence r and s may be determined, and we ſhall thus obtain $\frac{m}{abc} = \frac{r}{a} + \frac{s}{b} + \frac{q}{c}$, as required. In all theſe caſes it is obvious, that the fraction may be decompoſed into partial fractions, in as many different ways as the indeterminate equation on which it depends admits of different anſwers.

Example.—Find two fractions, having prime denominators, whoſe ſum ſhall be equal to $\frac{19}{35}$, or to $\frac{19}{7 \cdot 5}$.

Let the required fractions be $\frac{p}{7} + \frac{q}{5}$, then $\frac{5p+7q}{35} = \frac{19}{35}$; therefore $5p + 7q = 19$, whence $p = 1$, and $q = 2$ (ſee INDETERMINATE *Analyſis*); and conſequently the required partial fractions are $\frac{1}{7}$ and $\frac{2}{5}$.

Example 2.—Find three fractions, whoſe ſum is equal to $\frac{401}{315}$.

The three factors of 315 are 5, 7, 9, which are of neceſſity the denominators of the required fractions. Suppoſe then firſt, that $\frac{401}{315} = \frac{p}{35} + \frac{q}{9}$, whence we have $9p + 35q = 401$, which gives $p = 29$, and $q = 4$; therefore $\frac{401}{315} = \frac{29}{35} + \frac{4}{9}$. Again, let $\frac{29}{35} = \frac{r}{7} + \frac{s}{5}$, or $5r + 7s = 29$; this gives $r = 3$ and $s = 2$, ſo that $\frac{29}{35} = \frac{3}{7} + \frac{2}{5}$, and conſequently $\frac{401}{315} = \frac{2}{5} + \frac{3}{7} + \frac{4}{9}$, as required. And in the ſame manner the decompoſition may be obtained in any other caſe, which falls within the limits above ſtated.

On the decompoſition of rational algebraic fractions, and its application to the integral calculus.

Let $\frac{N}{D} = \frac{a + bx + cx^2 + dx^3 + \&c. \ldots px^{m-1}}{a' + b'x + c'x^2 + d'x^3 + \ldots . p'x^{m-1} + q'x^m}$ be any rational fraction, whoſe decompoſition into ſimple fractions is required, and whoſe numerator is at leaſt one degree lower than its denominator, to which form it may always be reduced by diviſion, if it ſhould preſent itſelf under a different form.

The denominator of this fraction, from the known theory of equations, may be ſuppoſed to be made up of as many ſimple factors as is equal to the higheſt power of x contained in it, and which factors may be found by determining the roots of the equation formed by putting the whole denominator equal to zero. Let therefore $a' + b'x + c'x^2 + d'x^3 + \ldots . x^m = 0$, and ſuppoſe the roots of this equation to be r, r', r'', r''', r^{iv}, &c., and we ſhall have $a' + b'x + c'x^2 + d'x^3 + \ldots . x^m = (x - r)(x - r')(x - r'')(x - r''')$, &c.

And therefore our propoſed fraction $\frac{N}{D}$ may now be put under the form

$$\frac{N}{D} = \frac{a + bx + cx^2 + dx^3 + \ldots . px^{m-1}}{(x - r)(x - r')(x - r'')(x - r''')}, \&c.$$

and theſe factors are now to form the denominators of the

the ſimple fractions ſought. Let A, A′, A″, A‴, &c. repreſent their numerators, ſo that

$$\frac{N}{D} = \frac{A}{x-r} + \frac{A'}{x-r'} + \frac{A''}{x-r''} + \&c. \frac{A^{(n-1)}}{x-r^{(n-1)}}$$

Reduce now theſe ſeveral ſimple fractions to a common denominator by the uſual rule, and add their ſeveral numerators together; then comparing the co-efficients of the like powers of x in the numerator of this new fraction, with thoſe in the numerator propoſed, we ſhall obtain ſufficient equations for determining the proper values of A, A′, A″, A‴, &c. and the decompoſition will be effected as propoſed. This will be better underſtood from a partial example.

Let us therefore aſſume the fraction $\frac{6x^2-4x-6}{x^3-6x^2+11x-6}$, which it is required to reſolve into its ſimple fractions.

Here the roots of the denominator, by making it equal to zero, are 1, 2, and -3, whence the propoſed equation may be put under the form $\frac{x^2-4x-6}{(x-1)(x-2)(x+3)}$.

Make now this fraction $\frac{x^2-4x-6}{(x-1)(x-2)(x+3)} = \frac{A}{x-1} + \frac{A'}{x-2} + \frac{A''}{x+3}$, which being reduced to a common denominator, and added together, give $\frac{x^2-4x-6}{x^3-6x^2+11x-6}$

$$= \frac{A(x-2)(x+3)+A'(x-1)(x+3)+A''(x-1)(x-2)}{x^3-6x^2+11x-6}$$

$= (A + A' + A'')x^2 + (A + 2A' - 3A'')x - (6A + 3A' - 2A'')$ whence

$$\begin{aligned} A + A' + A'' &= 6 \\ A + 2A' - 3A'' &= -4 \\ 6A + 3A' - 2A'' &= 6 \end{aligned}$$

from which we readily draw $A = 1$, $A' = 2$, $A'' = 3$; ſo that the required fractions are $\frac{1}{x-1} + \frac{2}{x-2} + \frac{3}{x+3}$.

If therefore the fluent of $\frac{(6x^2-4x-6)\dot{x}}{x^3-6x^2+11x-6}$ were required, we might immediately reduce the problem to finding the fluents of $\frac{\dot{x}}{x-1} + \frac{2\dot{x}}{x-2} + \frac{3\dot{x}}{x+3}$, which are known, being hyp. log. $(x-1)$ + 2 hyp. log. $(x-2)$ + 3 hyp. log. $(x+3)$ = hyp. log. $[(x-1)(x-2)^2(x+3)^3]$

The ſame method may be employed for all rational fractions, whoſe denominators are reſolvable into unequal ſimple factors, but as this cannot be generally effected when the higheſt power of the variable quantity exceeds the fourth degree, we are neceſſarily limited in our application of the rule, in conſequence of the imperfection which ſtill attends the general ſolution of equations. In the caſe, however, of equal factors in the denominator, a different proceſs is required, which we will explain, after illuſtrating the above rule by two or three examples.

Required the fluent of $\frac{(1+x)\dot{x}}{x-x^2}$ by reſolving it into its ſimple fractions.

Here the factors of the denominator being x and $1-x$, we make

$$\frac{(1+x)\dot{x}}{x-x^2} = \frac{A\dot{x}}{x} + \frac{A'\dot{x}}{1-x} = \frac{(A+(A'-A)x)\dot{x}}{x-x^2},$$

whence $A = 1$, and $A' - A = 1$, or $A' = 2$, therefore

$$\text{fluent } \frac{(1+x)\dot{x}}{x-x^2} + \text{flu. } \frac{\dot{x}}{x} + \text{flu. } \frac{2\dot{x}}{1-x}$$

which are known.

Required the fluent of $\frac{(x-1)\dot{x}}{1-4x+2x^2}$, or of $\frac{\frac{1}{2}(x-1)\dot{x}}{\frac{1}{2}-2x+x^2}$.

Here, by making $x^2 - 2x + \frac{1}{2} = 0$, we have $x = 1 \pm \frac{1}{2}\sqrt{2}$; make, therefore,

$$\frac{(\frac{1}{2}x-\frac{1}{2})\dot{x}}{\frac{1}{2}-2x+x^2} = \frac{A\dot{x}}{x-1-\frac{1}{2}\sqrt{2}} + \frac{A'\dot{x}}{x-1+\frac{1}{2}\sqrt{2}}$$

$$= \frac{A(x-1+\frac{1}{2}\sqrt{2})\dot{x} + A'(x-1-\frac{1}{2}\sqrt{2})\dot{x}}{\frac{1}{2}-2x+x^2}$$

Here we have $A + A' = -\frac{1}{2}(1-\frac{1}{2}\sqrt{2})A + (1+\frac{1}{2}\sqrt{2})A' = -\frac{1}{2}$, whence we have $A = -\frac{1}{4}$, and $A' = -\frac{1}{4}$, therefore fluent of $\frac{(x-1)\dot{x}}{x-x^2} = \text{flu. } \frac{-\frac{1}{4}\dot{x}}{x-1+\frac{1}{2}\sqrt{2}} + \frac{-\frac{1}{4}\dot{x}}{x-1-\frac{1}{2}\sqrt{2}}$, which are known.

We have hitherto conſidered the factors of the denominators of the propoſed fractions to be all unequal; when any number of them are equal, a little difference in the operation is then required; for it is obvious that if two of our fractions were of the ſame form, for example $\frac{A}{x-r} + \frac{A'}{x-r}$, theſe two would form, in fact, but one fraction $\frac{A+A'}{x-r}$, which leads us to no uſeful reſult.

In caſe of equal factors, therefore, we muſt proceed as follows: let the propoſed fraction be

$$\frac{a+bx+cx^2+dx^2+\ldots.qx^{m-1}}{(x-p)^n(x-r)(x-r')(x-r'')} \&c.$$

Aſſume it equal to

$$\frac{B}{(x-p)^n} + \frac{B'}{(x-p)^{n-1}} + \frac{B''}{(x-p)^{n-2}} + \ldots. \frac{B^{(n-1)}}{x-p} + \frac{A}{x-r} + \frac{A'}{x-r'} + \frac{A''}{x-r''} + \&c.$$

Where the upper line repreſents the fractions due to the n equal factors, and the lower thoſe due to the $\frac{m}{n}$ unequal factors.

Let now theſe fractions be reduced to a common denominator, and the co-efficients equated as before, which will give us the required values of the ſeveral numerators ſought.

Example.—It is required to convert $\frac{1-5x}{(1-x)(1+x)^2}$ into its equivalent ſimple fractions.

Aſſume $\frac{1-5x}{(1+x)^2(1-x)} = \frac{B}{(1+x)^2} + \frac{B'}{(1+x)} + \frac{A}{(1-x)}$

$$= \frac{B+(1+x)B'}{(1+x)^2} + \frac{A}{1-x} =$$

$$\frac{B(1-x)+B'(1-x^2)+A(1+2x+x^2)}{(1+x)^2(1-x)} =$$

$$\frac{B+B'+A+(2A-B)x+(A-B')x^2}{(1+x)^2(1-x)}$$

whence $B + B' + A = 1$
$2A - B = -5$
$A - B' = 0$

therefore $B = 3$, $B' = -1$, and $A = -1$,
consequently

$$\frac{1-5x}{(1+x)^2(1-x)} = \frac{3}{1+x^2} - \frac{1}{1+x} - \frac{1}{1-x}$$

We have in both the preceding cafes extended the calculation to a greater length than it is neceffary to obferve in practical cafes, in order that the reader might fee diftinctly the principles on which the decompofition depends. We fhall now furnifh him with an eafier practical method, which we have extracted from Bonnycaftle's Algebra, vol. i.

1. When the factors of the denominator of the given fraction are all unequal, or of the form

$$\frac{N}{D} = \frac{A}{x-r}, \frac{A'}{x-r'} + \frac{A''}{x-r''} + \frac{A'''}{x-r'''} + \&c.$$

take that which conftitutes the denominator of the fimple fraction which is to be found, and let S denote the product of all the remaining fractions; then if the root or value of x, in that factor, be fubftituted for x in the formula $\frac{N}{S}$, it will give the numerator of the fraction required.

2. If fome of the factors are equal and others unequal, or of the form

$$\frac{N}{D} = \frac{A}{x-r}, \frac{A'}{x-r'} \&c. \ldots + \frac{B}{(x-p)^n} + \frac{B'}{(x-p)^{n-1}} + \&c.$$

let S denote the product of all the factors in the denominator, except one, as before; then find the fimple fractions due to the unequal fractions as above, and for thofe of the equal factors proceed as follows:

1. $B = \frac{N}{S}$, taking x in N, and $S = p$.

Let $Q = \frac{N - BS}{x-p}$, then

2. $B' = \frac{Q}{S}$, taking x in Q, and $S = p$.

Let $Q' = \frac{Q - B'S}{x-p}$, then

3. $B'' = \frac{Q'}{S}$, taking x in Q', and $S = p$.

Let $Q'' = \frac{Q' - B''S}{x-p}$, then

4. $B''' = \frac{Q''}{S}$, taking x in Q'', and $S = p$.

&c. &c.

Which operation being performed, the fum of the fractions thus obtained, together with the former, will give all the fimple fractions into which the given fraction is refolvable.

Example 1.—It is required to convert the rational fraction $\frac{1+x^2}{x-x^3}$ into its equivalent fimple fractions.

Here $\frac{1+x^2}{x-x^3} = \frac{A}{0+x} + \frac{A'}{1-x} + \frac{A''}{1+x}$; whence, by the preceding rule,

$A = \frac{N}{S} = \frac{1+x^2}{1-x^2} = 1$; being $0 = x$

$A' = \frac{N}{S} = \frac{1+x^2}{x+x^2} = 1$; being $1 = x$

$A'' = \frac{N}{S} = \frac{1+x^2}{x-x^2} = -1$; being $1 = -x$.

The required fractions are therefore

$$\frac{1}{x} + \frac{1}{1-x} - \frac{1}{1+x} = \frac{1+x^2}{x-x^3}.$$

Example 2.—It is required to convert the rational fraction $\frac{N}{D} = \frac{1}{x^3(1-x)^2(1+x)}$ into its equivalent fimple fractions. Here

$$\frac{N}{D} = \frac{A}{1+x} + \frac{B}{x^2} + \frac{B'}{x^3} + \frac{B''}{x} + \frac{C}{(1-x)^2} + \frac{C'}{1-x};$$

whence for $1+x$, the firft factor, we have

$A = \frac{N}{S} = \frac{1}{x^3 - 2x^4 + x^5} = \frac{1}{4}$, x being $= -1$

$B = \frac{N}{S} = \frac{1}{1-x-x^2+x^3} = 1$, x being $= 0$.

Let now $Q = \frac{N - BS}{x+p} = \frac{x+x^2-x^3}{x} = 1 + x - x^2$

$B' = \frac{Q}{S} = \frac{1+x-x^2}{1-x-x^2+x^3} = 1$, x being $= 0$.

Let $Q' = \frac{Q - B'S}{x-p} = \frac{2x-x^3}{x} = 2 - x^2$

$B'' = \frac{Q'}{S} = \frac{2-x^2}{1-x-x^2+x^3} = 2$, x being $= 0$.

Again, for $(1-x)^2$

$C = \frac{N}{S} = \frac{1}{x^3+x^4} = \frac{1}{2}$, $x =$ being $= 1$.

Let now $R = \frac{N - CS}{x-p} = \frac{1 - \frac{1}{2}x^3 - \frac{1}{2}x^4}{x-1} = 1 + x + x^2 + \frac{1}{2}x^3$

$C' = \frac{R}{S} = \frac{1+x+x^2+\frac{1}{2}x^3}{x^3+x^4} = \frac{7}{4}$, x being $= 1$.

Therefore $\frac{1}{x^3(1-x)^2(1+x)} = \frac{1}{x^3} + \frac{1}{x^2} + \frac{2}{x} + \frac{1}{2(1-x)^2} + \frac{1}{4(1-x)} - \frac{1}{3(0+x)}$, as required.

It is obvious, as we have before ftated, that this decompofition of rational fractions muft neceffarily be affected as to its general application, by the imperfection of the theory of equations, which will not admit of a practical refolution of the denominator into its fimple factors in all cafes. It will alfo further appear, that, in cafe of any of the roots being imaginary, the fame will neceffarily enter into the numerators of the fimple fractions. But this difficulty may be avoided: for fince the imaginary roots of equations always enter in pairs, and the product of fuch pairs of roots being always real, being of the form

$$x^2 + 2\alpha x + \alpha^2 + \beta^2,$$

we may, inftead of refolving the fractions into the fimple fractions $\frac{A}{x-r}, \frac{A'}{x-r'}, \frac{A''}{x-r''}$, &c. refolve it into as many of thefe fractions as it has rational fimple factors, and into as many fractions of the form $\frac{Bx+C}{x^2+\alpha x+\alpha^2+\beta^2}$, as it has pairs of imaginary factors, and then proceed as before.

We

We cannot extend our remarks to a greater length in this article; we muſt, therefore, refer the reader who wiſhes to ſee theſe principles more completely developed, to Euler's Analyſis Infinitorum, vol. i. ch. 2 and 11; to La Croix's Algebra, and his Calcul Differentiel et Calcul Integral. See alſo Bonnycaſtle's Algebra, and Simpſon's Fluxions.

RATIONAL or *true horizon*, is that whoſe plane is conceived to paſs through the centre of the earth; and which therefore divides the globe into two equal portions, or hemiſpheres. See HORIZON.

It is called the *rational* horizon, becauſe only conceived by the underſtanding; in oppoſition to the *ſenſible* or apparent horizon, which is viſible to the eye.

RATIONAL *integer*, or *whole number*, is that of which unity is an aliquot part. See NUMBER, and ALIQUOT *part*.

RATIONAL *mixt number* is that conſiſting of an integer, and a fraction; or of unity, and a broken number.

Commenſurable quantities are defined by being one to another as one rational number to another.

For unity is an aliquot part of a rational number; and a fraction has ſome aliquot part common with unity; in things, therefore, that are as a rational to a rational number, either the one is an aliquot part of the other, or there is ſome common aliquot part of both; therefore they are commenſurable.

Hence, if a rational number be divided by a rational, the quotient is always a rational.

RATIONAL *Phyſicians*, in ancient medical hiſtory, the phyſicians of the *dogmatic* ſect, who ſtood in oppoſition to the *empiric* ſect; the former appealing to certain theoretical principles in the application of remedies, while the latter reſted entirely upon experience, and diſclaimed all knowledge of firſt principles. The tenets of both theſe ſects have been handed down to us by a claſſic author, Celſus, and have been given at length under a former article. See EMPIRIC.

RATIONAL *Quantity*, or *number*, a quantity or number commenſurable to unity.

Suppoſing any quantity to be 1, there are infinite other quantities, ſome of which are commenſurable to it, either ſimply, or in power: theſe Euclid calls *rational quantities*. The reſt, that are incommenſurable to 1, he calls *irrational quantities*, or *ſurds*.

RATIONAL *Ratio*. See RATIO.

RATIONAL *Soul*. See SOUL.

RATIONALE, a ſolution or account of the principles of ſome opinion, action, hypotheſis, phenomenon, or the like. Hence,

RATIONALE is alſo the title of ſeveral books. The moſt conſiderable is the "Rationale of Divine Offices," by Guil. Durandus, a celebrated ſchool-divine, biſhop of Mende, finiſhed in 1286, as he himſelf tells us. See PRINTING.

RATIONALE alſo denotes an ancient ſacerdotal veſtment, worn by the high-prieſt under the old law; and called by the Hebrews, חשן, *hhoſchen*; by the Greeks, λογιον; by the Latins, *rationale* and *pectorale*; and by the Engliſh tranſlators, *breaſt-plate*.

The rationale was a piece of embroidered ſtuff worn on the breaſt, about a ſpan ſquare. Du-Cange deſcribes it as a double ſquare of four colours, interwoven with gold, and ſet with twelve precious ſtones in four rows, on which were engraven the names of the twelve tribes, and faſtened to the ſhoulder by two chains and two hooks of gold. The form of the rationale was preſcribed by God himſelf, Exod. xxviii. 15—29.

A rationale appears alſo to have been anciently worn by the biſhops under the new law. But authors are in doubt about its form; ſome will have it reſemble that of the Jews; others take it to be only the pallium.

RATIONALIS, an officer mentioned in ſeveral ancient inſcriptions.

Lampridius, in the life of Alex. Severus, uſes rationalis as ſynonimous with procurator.

The rationales were intendants or ſurveyors under the emperors; and though Lampridius pretends they were firſt eſtabliſhed by Severus, it is evident there were ſome under Auguſtus.

RATIONARIUM, among the Romans, a book which contained the accounts of the empire. It was otherwiſe called *breviarium*. See BREVIARY.

RATIONIS ENS. See ENS.

RATIONIS *Diſtinctio*. See DISTINCTIO.

RATIONIS *Os*, in *Anatomy*, the bone of the forehead, otherwiſe called os frontis.

RATISBON, or REGENSPERG, in *Geography*, an imperial city of Germany, in the circle of Bavaria, and capital of a biſhopric of the ſame name, ſituated at the conflux of the Regen and of the Danube. The town is large, populous, and fortified; and was anciently the capital of Bavaria, and the reſidence of its dukes. The emperor Frederic I. annexed it to the empire. This town is a ſtaple, but neither its manufactures nor trade are very conſiderable; corn, wood, and proviſions, are ſent by the Danube to Vienna. The number of inhabitants is about 24,000; 62 miles N.E. of Augſburg. N. lat. 48° 55'. E. long. 12° 50'.

The biſhopric of Ratiſbon comprehends about 1383 pariſhes; and was founded, as it has been ſuppoſed, by St. Boniface, in the year 736. The ſeat of the biſhop is at Ratiſbon, where, however, he has no juriſdiction.

RATISKA, a town of Immeritia; 35 miles N.E. of Cotatis.

RATKAI, GEORGE, in *Biography*, born in 1613, of a noble family, in Hungary, entered into holy orders, and was made canon of the church of Zagrab. He obtained the eſteem of the viceroy of Croatia, John Draſkovitz, who engaged him to compoſe the hiſtory of that province, and gave him free acceſs to its archives. He accordingly publiſhed, in 1652, a very learned work, entitled "Memoria Regum et Banorum regnorum Dalmatiæ, Crotiæ, Slavoniæ, inchoata ab origine ſua uſque ad annum." Gen. Biog.

RATLINES, or, as the ſeamen call them, *Rutlins*, or *Rattlings*, are certain ſmall lines which traverſe the ſhrouds of a ſhip horizontally, at regular diſtances above the dead-eyes upwards, and forming a variety of ladders, whereby to climb to any of the maſt-heads, or deſcend from them. Hence the term ſeems to be derived from *rath*, an obſolete word, ſignifying *a hill*. In order to prevent the rattling from ſlipping down by the weight of the ſailors, they are firmly attached by a knot, called a *clove-hitch*, to all the ſhrouds, except the foremoſt or aftmoſt; where one of the ends, being fitted with an eye-ſplice, is previouſly faſtened with twine-thread or pack-thread. Falconer.

RATNO, in *Geography*, a town of Lithuania, in the palatinate of Brzeſc; 50 miles S.E. of Brzeſc.

RATOATH, a poor village of the county of Meath, Ireland, which, before the union, had its repreſentatives in parliament. It gave name to a barony, and is 12½ miles N.W. by N. from Dublin.

RATOLY, a town of Hindooſtan, in the circar of Gohud; 25 miles S.E. of Raat.

RATONES, a ſmall iſland in the river La Plata, near Monte Video.

RATSCHA,

RATSCHA, or RETZKA, a fortreſs of Sclavonia, on the N. ſide of the Save, oppoſite to the mouth of the Drin; 35 miles S.W. of Peterwardein.

RATSCHITZ, a town of Moravia, in the circle of Brunn; 10 miles N.E. of Brunn.

RATSUR, a town of Hindooſtan, in the circar of Aurungabad; 65 miles E. of Aurungabad.

RATTAK, a town of Bengal; 14 miles S.S.E. of Curruckpour.

RATTAN. See RUATAN.

RATTAN *Canes*. See CANES.

RATTELSDORF, in *Geography*, a town of Bavaria, in the biſhopric of Bamberg; 9 miles N. of Bamberg.

RATTEN. See RATEEN.

RATTEN, in *Rural Economy*, a provincial word, uſed to ſignify a rat.

RATTENBERG, in *Geography*, a town of the county of Tyrol, with a citadel on the Inn; 16 miles E.N.E. of Inſpruck.

RATTKOW, a town of the duchy of Holſtein; 6 miles N.N.E. of Lubeck.

RATTLE, among the *Ancients*, a muſical inſtrument called by the Romans *crepitaculum*.

Mr. Malcolm takes the tintinnabulum, crotalum, and ſiſtrum, to have been only ſo many different kinds of rattles.

The invention of the rattle is aſcribed to the famous mathematician Archytas; whence Ariſtotle calls it Ἀρχύτα ῥαλαγη, Archytas's rattle. Diogenianus adds the occaſion of the invention; *viz.* that Archytas, having children, he contrived this inſtrument to prevent their tumbling over things about the houſe. So that how much ſoever ſome inſtruments have changed their uſes, the rattle, we are ſure, has preſerved its original application.

RATTLE, or *Rattel*, in *Commerce*, a weight in Arabia; a rattle of coffee contains, at Betelfagui, $14\frac{1}{2}$ vakias, and a farcel, or frazil, of 10 maunds, or 20 rattles, contains 290 vakias; a farcel weighs 20lb. 6oz. 4 dr. avoirdupois, and a bahar of 40 farcels = $815\frac{1}{4}$lb. avoirdupois; 10 farcels in Betelfagui are equal to 7 in Mocha; 16 vakias of dates, candles, and iron, are reckoned to a rattle; but of all other ſorts of goods 15 vakias make a rattle. The rattle is uſed in the bazar, or market, only. At Jiddah, another ſea-port of Arabia, in the Red ſea, the bahar contains 10 frazils, 100 maunds, or 500 rattles, and the rattle 15 vakias. The bahar weighs $222\frac{1}{2}$lb. Engliſh troy, or 183lb. avoirdupois; and the maund 29 oz. $4\frac{1}{2}$ dr. avoirdupois. Kelly's Un. Cambiſt.

RATTLE-*Graſs*. See RHINANTHUS.

RATTLE-*Net*. See WOLF *Net*.

RATTLE, *Red*. See PEDICULARIS.

RATTLE, *Yellow*. See RHINANTHUS.

RATTLE-SNAKE. See SNAKE.

RATTLE-SNAKE *Root*, *Senegaw*. See MILK-*wort*.

RATTLE-SNAKE *Root*, Dr. Witt's, a ſpecies of *Prenanthes*; which ſee.

RATTLE-SNAKE *Weed*, a ſpecies of *Eryngium*; which ſee.

RATTLE-SNAKE *Iſlands*, in *Geography*, a cluſter of ſmall iſlands at the weſtern extremity of lake Erie.

RATTLE-SNAKE *Mountains*, mountains of New Hampſhire; 38 miles N. of Concord.

RATTLING in horſes, a term applied to a diſagreeable noiſe produced in them by the entrance of the air between the internal parts of the ſheath and the prepuce or covering, principally taking place in trotting or going faſt.

RATTONNEAU, in *Geography*, a ſmall iſland at the entrance of the harbour of Marſeilles, which has a fortreſs erected in the 17th century by the duke of Guiſe.

RATTRAY HEAD, a cape of Scotland, on the N.E. coaſt of the county of Aberdeen; 7 miles N. of Peterhead. N. lat. 57° 12′. W. long. 1° 44′.

RATULAH, a town of Hindooſtan, in Oude; 15 miles N.E. of Fyzabad.

RATWAH, a town of Hindooſtan, in the circar of Gohud; 27 miles E. of Gwalior.

RATZE, in *Commerce*, the name of a ſmall coin, ſtruck at Friburgh, &c. nearly of the ſame value with the *blare*, which, in France, is worth two ſols and a denier.

RATZEBUR, in *Geography*, a town of Hinder Pomerania; 14 miles S. of New Stettin. N. lat. 53° 30′. E. long. 16° 14′.

RATZEBURG, a town of Germany, which gives name to a principality, ſituated on an iſland in a large lake; the lake is 30 miles long, and 9 broad, and boats paſs by it to Lubeck with goods and paſſengers. It was burnt by the Danes in 1693, and ſince that diſaſter the ſtreets have been regularly laid out, and the houſes are built after the Dutch manner. In the market-place is the regency-office, and here is held the chief court of juſtice and the conſiſtory; the garriſon is quartered in barracks; 20 miles S. of Lubeck. N. lat. 53° 43′. E. long. 10° 46′. The principality of the ſame name is ſituated between Mecklenburg and Saxe-Lauenburg, and extends about 10 miles each way. The ſoil is fertile, and produces a conſiderable quantity of wheat, beſides feeding a number of cattle. It was converted from a biſhopric into a principality by the peace of Weſtphalia. It belongs to Mecklenburg-Strelitz.

RATZENSTEIN, a town of the duchy of Stiria; 5 miles S. of Windiſch Gratz.

RATZKNITSCHA, a town of Hungary; 10 miles N.N.W. of Cſakathurn.

RAVA. See RAWA.

RAVALEMENT, Fr. equivalent, among organ-builders and harpſichord-makers, to *compaſs* in Engliſh. The complete ſet of keys, or whole ſyſtem of muſical ſounds, (ſaid Rouſſeau in 1768,) inſtead of confining itſelf to four octaves, like common keyed-inſtruments formerly, extends now to five octaves, adding a fifth below double C, and a fourth above C in alt., including five octaves between the loweſt F and the higheſt. (This was the common compaſs of our harpſichords made by Tabel, Kirckman, and Shudi, long before 1768.) The word *ravalement* is confined to keyed-inſtruments; there are no others of ſo extenſive a compaſs as five octaves. But in the year 1777, when Dr. Burney firſt compoſed and publiſhed duets "à quatre mains," or for two performers on one inſtrument, the ladies, at that time wearing hoops, which kept them at too great a diſtance from each other, had a harpſichord made by Merlin, expreſsly for duets, with ſix octaves; extending from the octave below double C in the baſe, to the octave above C in alt. in the treble. And as duets à quatre mains have been compoſed by all the great maſters in Europe ſince that time, inſtruments with additional keys are now become general. At firſt it was only in the treble that the compaſs was extended, except in the inſtrument above-mentioned by Merlin; but at preſent notes are added in the baſe to complete the ſix octaves: and, indeed, the additional notes in the baſe are better worth having for particular effects, than thoſe in the treble; which often, from the ſhortneſs of the ſtrings and feeble vibration, more reſemble the tone of wood than wire; whereas the tone of thoſe in the baſe of large piano fortes, by the beſt makers, is ſo rich and full,

that

that each ſound below double F reſembles that of an organ-pipe in ſlow notes, more than the tranſient tone of a ſtring.

Rouſſeau very juſtly obſerves, that almoſt all inſtruments are limited in their compaſs *below*, except harps and inſtruments with keys. The violoncello can go no lower than double C, its 4th ſtring, nor the violin below G. The flute and hautbois deſcend only to D and C. But the notes in alt. have been extended in the acute to ſounds that are ſeldom in tune, and never pleaſing. Like rapid notes of difficult execution, they *ſurprize*, and the performer's dexterity is applauded; but neither the harmony nor the melody of very high or rapid ſounds can excite rapture like thoſe of moderate quickneſs, when produced with feeling and expreſſion, in the middle of the ſcale.

RAVALSHE, in *Geography*, a town of Sweden, in Weſt Gothland; 24 miles N.W. of Uddevalla.

RAVANA, in *Hindoo Mythology*. See RAVENA.

RAVANAK, in *Geography*, a town of European Turkey, in Macedonia; 16 miles E.S.E. of Saloniki.

RAUAND, a town of Perſia, in the province of Kerman; 105 miles E. of Sirgian.

RAVA-POU, in *Botany*, Rheede Hort. Malab. v. 4. 99. t. 48, a plant erroneouſly cited by Linnæus for his very different *Nyctanthes hirſuta*. See GUETTARDA *Speciosa*.

RAUCA AVIS, in *Ornithology*, the name of a bird deſcribed by Nieremberg, as common about the lakes and rivers of America, and of the kingfiſher kind, but nearly as large as a duck, and black on the crown, and white on the breaſt and belly. Its neck is naturally very long in proportion to its body, yet it can occaſionally contract and ſhorten it in a very wonderful manner. It is a native of Mexico, and is eſteemed very good for the table. Mr. Ray has placed this among the birds, the accounts of which he is diſtruſtful of.

RAUCH, in *Geography*, a town of Germany, in the lordſhip of Schwarzenberg; 10 miles S.W. of Scheinfeld.

RAUCHENEGG, a town of Auſtria; 2 miles W. of Baden.

RAUCHT, a town of Ruſſia, in the government of Viborg, near lake Ladoga; 44 miles S.E. of Viborg.

RAUDANAGUR, a town of Bengal; 30 miles E. of Ramgur.

RAUDEN, a town of Pruſſia, in the palatinate of Culm; 10 miles N.E. of Culm.—Alſo, a town of Sileſia, in the principality of Ratibor; 12 miles N.E. of Ratibor.

RAUDNIZ, a town of Bohemia, in the circle of Schlan; 12 miles N.N.E. of Schlan.—Alſo, a town of Bohemia, in the circle of Chrudim; 16 miles N.N.W. of Chrudim.

RAUDRI, a name of the Hindoo goddeſs *Parvati*, conſort of *Siva*, the deſtroying power. In this character ſhe may be conſidered as his *Sakti*, or energy in his form of *Rudra*, or Fate. *Rudri*, and *Rudrani*, are other modes of writing this name of the goddeſs in her avenging character, in which ſhe does not apparently differ much from her attributes, as Sakti of *Mahakala;* under which name, and the others occuring in this article, diſtinguiſhed by italics, farther and ſufficient information may be ſought. See alſo TRISAKTI-DEVI, and TAMASI.

RAUDTEN, in *Geography*, a town of Sileſia, in the principality of Wohlau; 18 miles N.W. of Wohlau. N. lat. 51° 30′. E. long. 16° 15′.

RAVEL BREAD, a ſort of bread, called alſo *blackwhytlof*, as being of a middle fineneſs betwixt white and brown.

RAVELIN, in *Fortification*, was anciently a flat baſtion, placed in the middle of a curtain.

RAVELIN is now a detached work, compoſed only of two faces, which make a ſaliant angle, without and ſometimes with flanks; and raiſed before the curtain on the counterſcarp of the place; ſerving to cover it and the joining flanks from the direct fire of an enemy.

A ravelin is a triangular work, reſembling the point of a baſtion, with the flanks cut off. (See *Plate* V. *Fortification*, *fig.* 4. lit. i i i. &c.) Its uſe before a curtain is, to cover the oppoſite flanks of the two next baſtions. It is uſed alſo to cover a bridge or a gate, and is always placed without the moat.

What the engineers call a ravelin, the ſoldiers generally call a demi-lune, or half-moon. See DEMI-LUNE.

There are alſo *double* ravelins, which ſerve to defend each other. They are ſaid to be double when they are joined by a curtain.

Ravelins, or half-moons, are conſtructed by ſetting off 50 toiſes from the re-entering angle O of the counterſcarp (*Plate* VII. *Fortification*, *fig.* 4.) on the capital O L of the ravelin, or on the perpendicular produced, and from the point L drawing lines to the ſhoulders A, B; whoſe parts L M, L N, terminated by the counterſcarp, will be the faces M O, O N, the ſemi-gorges of the ravelin required. Others will have the faces of the ravelin to terminate on thoſe of the baſtions within three toiſes of the ſhoulders, in which caſe the ravelins cover the flanks better than the others. The ditch before the ravelin is 12 toiſes, and its counterſcarp parallel to the faces of the ravelins, and made in a circular arc before the ſaliant angle. When the ravelins are made with flanks, the faces ſhould terminate thoſe of the baſtions, at leaſt 5 toiſes from the ſhoulders. Theſe flanks are made by ſetting off 10 toiſes from the extremities of the faces, and from the points thus determined, the flanks are drawn parallel to the capital of the ravelin. When redoubts, or keeps, are formed in the ravelin, this is done by ſetting off 16 toiſes from the extremities of the faces, on the ſemi-gorges from N to *b*, and from M to *a*; and from the points *b*, *a*, the faces are drawn parallel to thoſe of the ravelin: the ditch before this redoubt is 6 toiſes, and its counterſcarp parallel to the faces. This work ſhould be covered in the faces by a wall, a foot or two thick, furniſhed with loop-holes for the muſketry to fire through; and it will ſerve to ſecure a retreat for the troops who defend the ravelin; they may thus prevent the enemy from making a lodgment in the outward part of the ravelin, or at leaſt greatly obſtruct their attempts for this purpoſe. Nor can they be drove from this place, until the enemy has erected a battery, and brought cannon on the ravelin to batter the redoubt. When the *counterguard* (which ſee) is placed before the ravelin, 40 toiſes are ſet off on the capital of the ravelin from its ſaliant angle to the ſaliant angle of the counterguard, and 10 on the counterſcarp of the ditch. For the conſtruction of crown-works before the ravelin, ſee HORN-*work*. Within the ravelin are conſtructed a rampart of about 16 or 20 yards, and a parapet of about 6 yards: ramps are alſo annexed in the ſlope of a rampart, and a barbet, when it is proper, is conſtructed in a ſaliant angle. In wet ditches, where the troops paſs from the town to the ravelin in boats, it is proper to make, in the gorge of the ravelin, a kind of harbour, where the boats may be covered from the fire of the enemy. In dry foſſes, there ſhould be ramps or ſtairs in the gorge of the ravelin, to preſerve a free communication, if the bridges ſhould be broken down by the enemy's ſhot. The celebrated general Coehorn, in the ravelins which he built at Bergen-op-zoom, contrived a very good defence for the covered way before the faces of the baſtions, by making retired flanks in the breaſts of the ravelin, where

one

one or two cannon might be placed as ſecure from the enemy's fire as thoſe behind the orillon of a baſtion. See *Military* CONSTRUCTION.

RAVELLO, in *Geography*, a ſea-port town of Naples, in Principato Citra, the ſee of a biſhop, united to Scala; 11 miles W.S.W. of Salerno. N. lat. 40° 39′. E. long. 12° 10′.

RAVELWATER, a river of the county of Antrim, Ireland, riſing in the mountains in the northern part, and flowing through Ravel glen to the river Main.

RAVEN, CORVUS, in *Aſtronomy*. See CORVUS.

RAVEN, *Corvus corax* of Linnæus, in *Ornithology*, a large bird of the crow kind, well known throughout the world, as being found in all climates, and all regions. The colour of the whole bird is black, finely gloſſed with a rich blue, the belly excepted, which is duſky. The ravens build in high trees, or upon the ruins of lofty buildings in the neighbourhood of great towns, being held in the ſame veneration as the vultures are in Egypt, and for the ſame reaſon; for devouring the carcaſes and filth that would otherwiſe prove a nuiſance. They lay five or ſix eggs, of a pale greeniſh colour, marked with ſmall browniſh ſpots. There are many fabulous ſtories of the longevity of the raven; but birds are in general long lived, and the crow kind not leſs ſo than the reſt. The raven is a very docile bird, and may be taught to ſpeak, as well as to fetch and carry. In clear weather, ravens are remarked to fly in pairs at a great height, making a deep loud noiſe, different from the common croaking; and their ſcent is remarkably good. See CORVUS *Corax*.

The quills of a raven are uſed in tuning the lower notes of a harpſichord, when the wires are ſet at a conſiderable diſtance from the ſticks.

It is rare to find this creature white, yet it happens ſometimes. Boyle mentions one. There was alſo one ſhewn to the Royal Society ſome years ago. Boyle's Works abr. vol. ii. p. 46.

RAVEN, *Night*, an Engliſh name for a heron, which flies in the night, and makes a very odd and hoarſe noiſe. It has been applied by ſome to the bittern, or *ardea ſtellaris*, but improperly, belonging of right to the ſmaller grey heron, called *nycticorax*. See HERON.

RAVEN, *Sea*, or *Corvorant*. See CORVUS *Aquaticus*.

RAVENA, in *Hindoo Mythology*, is the name of a celebrated king of Lanka, or Ceylon. Such was his proweſs, and the oppreſſion which he exerciſed over his ſubjects, that it became neceſſary for Viſhnu, the preſerving power of the deity, to deſcend on earth for his deſtruction, and the relief of the ſuffering world. He accordingly became incarnate in the perſon of Rama; and the wars that enſued between the forces of the tyrant and the divine general, for the recovery of Sita, his raviſhed ſpouſe, are the ſubject of the fine epic poem, the *Ramayana;* under which article of this work, and under *Rama*, and others thence referred to, the poem, and the hiſtorical traditions connected with theſe points, are ſufficiently deſcribed and diſcuſſed.

Although obſcured by mythological fables, theſe perſons and wars are admitted to have had hiſtorical exiſtence; and ſome important points of chronology hinge upon them. We have, therefore, in this and other articles, noticed at ſome length the legends connected with theſe ſubjects.

In the Hindoo theogony, the origin of Ravena is thus related. Two etherial warders of Viſhnu's palace carried the pride of office ſo far as to inſult the ſeven Maharſhis, (ſee MAHARSHI, or RISHI,) who had come to offer their adorations. The offended ſaints pronounced an imprecation on the inſolent warders, condemning them to be *adhoyoni*, or *born below*, thrice in mortal forms, before they could be re-admitted into the divine preſence. The imprecation of a Riſhi, even if provoked by a god, is ſcarcely to be averted; and the offenders, in conſequence, appeared in their firſt birth as Hiranyakſha, or golden-eyed, and Hiranyakaſipu, or clad in gold; ſecondly, as Ravena and Kumbhakarna; and laſtly, as Kanſa and Siſupala.

The hiſtory, if ſuch it may be called, of Ravena, Rama, &c. is perpetually alluded to in Hindoo writings; the Ramayana, containing an infinity of ſuch legends, being one of the moſt popular works of the Eaſt. Ravena, or Ravana, has become a generic name for a tyrant. He is alſo called Daſagriva, or the ten-necked; he being uſually repreſented with that number of heads, and twenty hands, ſymbolical of ſapience and proweſs. A couplet in the Ramayana may be thus tranſlated. "Where Ravana is, the ſun loſes his force, the winds ceaſe to blow, the fire ceaſes to burn: the rattling ocean, ſeeing him, ſtills its waves." Such are the hyperbolical relations of his potency, obtained by the uſual proceſs of ſelf-inflicted auſterities. So ardent was he in this irreſiſtible ſpecies of merit, that he offered to Siva nine of his ten heads ſucceſſively; and thus extorting the favour of the condeſcending deity, pleaſed with ſuch an important ſacrifice, he obtained a promiſe, with ſome equivocal ſtipulations, of whatever he ſhould deſire. This ſort of auſterity is called *Tapas*, under which word ſome account is offered of various modes of practiſing it. The gods and demi-gods, alarmed at Siva's promiſe, beſought him to recall it. But ſuch conduct is deemed unbecoming in deities, who, however, do not ſcruple to evade the performance of their promiſes by deceit or prevarication: and, on this occaſion, Nareda was deputed to ſound Ravena as to what he would demand, which, as uſual, was univerſal dominion, &c. Nareda artfully perſuaded Ravena that Mahadeva (or Siva) was drunk, and had promiſed him what he could not perform: whereupon the vindictive giant tears up Kailaſa, the paradiſe of Siva, which, being contrary to the ſtipulations, releaſes Siva from his promiſe, and he conſents to the deſtruction of Ravena, which is brought about by the avatara, or deſcent, of Viſhnu in the perſon of Rama. From this ſtory we are told to learn that all worldly affairs are the predeſtined ordainments of providence; whoſe will, that any event ſhould take place on earth, includes preſciently all the routine and detail of its accompliſhment; although we only ſee the links of a chain of cauſes leading naturally to its effect.

We will here add an extract from the Hindu Pantheon, whence a conſiderable part of this article is taken, ſhewing how unceaſingly the mythological machinery of that poetical people is introduced into their popular works. The names diſtinguiſhed by capitals imply that articles are given under thoſe words, in this work; and a reference may be made to them for any deſired information.

"Reſpecting Ravena," ſays the author of the publication adverted to, "I will notice but one more tale, as related to me by a Brahman; who, unable fully to make me feel the poetical beauties, or comprehend the morality of the Ramayana, bluſhed while he developed its follies; which, in conformity with popular taſte, or if taken ſeparately, are apparently very numerous; although it muſt be confeſſed, they are ſo contrived as to be intimately connected with the main action of the poem. The following idle tale is of this deſcription: but I ſhall not here explain the cauſes that led to the predicament, or the conſequences that enſued.

"Ravena, by his power and infernal arts, had ſubjugated all

all the gods and demi-gods, and forced them to perform menial offices about his perſon and houſhold. INDRA made garlands of flowers to adorn him withal. Agni, or PAVAKA, was his cook. SURYA, regent of the ſun, ſupplied light by day; and SOMA, regent of the moon, by night. VARUNA, the Hindoo Neptune, purveyed water for the palace. KUVERA, their Plutus, furniſhed caſh. The whole NAVA-GRAHA (the nine planetary ſpheres, including RAHU and KETU) ſometimes arranged themſelves into a ladder, by which, they ſerving as ſteps, the tyrant aſcended his throne. BRAMA (for the great gods were there alſo, and I give this anecdote as I find it in my memoranda, without any improved arrangement) was a herald, proclaiming the giant's titles, the day of the week, month, &c. daily in the palace; a ſort of ſpeaking almanac. MAHADEVA, in his character or incarnation of KANDEH-RAO, performed the office of barber, and trimmed the giant's beards. VISHNU had the honourable occupation of inſtructing and drilling the dancing and ſinging girls, and ſelecting the fairеſt for the royal bed. Ganeſa, or POLLEAR, had the care of the cows, goats, and herds. VAYU ſwept the houſe. YAMA waſhed the linen. And in this manner were all the gods employed in the menial offices of Ravena, who rebuked and flogged them in default of induſtry and attention. Nor were the female divinities exempted: for PARVATI, in her form of SATWI, was head Aya, or nurſe, to Ravena's children. LAKSHMI and SARASWATI were alſo among them, but it does not appear in what capacity. Earthly kings and queens were alſo forced into this degrading ſervitude, to the number of ninety-ſix royal families; as is ſaid to be detailed in the RAMAYANA. But I have ſome doubt if ſuch a relation be actually in this ſhape, in that poem: this we ſhall ſee, when its other books are tranſlated and publiſhed. In my abſtract of it, however, ſuch a godly predicament ſeems eſſential to the main action; RAMA being thereby impelled by every conſideration of piety and duty to immediate and energetic meaſures, for the relief and liberation of the degraded divinities."

Ravena, as we have noticed, is ſurnamed Daſagriva, or the ten-headed. He is alſo called Viſravana, or ſon of Viſrava, the father likewiſe of Kuvera. The brothers are ſometimes named *Pulaſtya*, or *Paulaſtya*. (See theſe articles.) Another of his names is equivalent to lord of Rakſhaſhas, a race of malignant beings, common agents in the hands of ſuperhuman tyrants for the annoyance of the virtuous portion of mankind, or thwarting the benificent views of the gods. Many ſpecific varieties of theſe demons are enumerated in the firſt book of the Ramayana, as aiding Ravena in defence of himſelf and his kingdom of Lanka. In pictures illuſtrative of the Ramayana, which are very common throughout India, they are depicted eſpecially ill-favoured, painted green, red, blue, &c. and engaged in fierce conteſts with Rama's ſimian ſoldiery. Several legions of theſe Rakſhas, each of 14,000, were deſtroyed by Rama. See RAKSHA.

RAVENALA, in *Botany*, Adanſ. Fam. des Plantes, v. 2. 67. Juſſ. 62. See URANIA.

RAUENBACH, in *Geography*, a town of Germany, in the principality of Anſpach; four miles S.S.W. of Anſpach.

RAVENGLASS, a market-town and ſea-port in the pariſh of Muncaſter, Allerdale ward, above Darwent, county of Cumberland, England, is ſituated on the Solway Frith, near the confluence of the rivers Eſk, Mite, and Irt. Though poſſeſſing many advantages for trade, it is but a poor place, and chiefly ſupported by its oyſter fiſhery, for which it is much celebrated. This town ſtands at the diſtance of 57 miles S.S.W. from Carliſle, and 287 N.W. by N. from London. The manor originally conſtituted part of the barony of Egremont, but was granted by Richard Lucy to the Penningtons, from whom the preſent owner, lord Muncaſter, is lineally deſcended. The market day is Saturday, weekly; and there are two annual fairs, one of which is held on the eve, day, and morrow, of St. James, and is remarkable for the ceremonies attending its proclamation and continuance. On the firſt day, the earl of Egremont, or his proxy, attends, accompanied by the ſerjeant of the borough of Egremont, with the inſignia, called the Bow of Egremont; by the foreſters, with their bows and arrows; and by all the tenants of the foreſt of Copeland, who hold their eſtates by the ſpecial ſervice of attending the earl, or his repreſentative, during the fair. On the third day, at noon, the earls, officers, and tenants of the foreſt, depart, after proclamation; and lord Muncaſter, and his tenants, take formal re-poſſeſſion of the place, and the day is concluded by horſe-racing, and various ruſtic diverſions.

Near Ravenglaſs, on the northern bank of the river Eſk, ſtands Muncaſter-houſe, the ſeat of lord Muncaſter; and eaſt from it, on the oppoſite ſide of the river, are ſeen ruins of conſiderable magnitude, reſpecting which no hiſtorical documents are known to exiſt. They are now called the *city of Barnſcar*; and its foundation is aſcribed, by tradition, to the Danes, who are ſaid "to have gathered for its inhabitants the men of Drig, and the women of Beckermont," whence the popular ſaying, "let us go together like lads of Drig and laſſes of Beckermont." Theſe ruins extend about three hundred yards in length from eaſt to weſt, and 100 in breadth, from north to ſouth; and are encloſed, except at the eaſt end, by a wall, nearly three feet in height. "There appears," ſays Hutchinſon, "to have been a long ſtreet, with ſeveral croſs ones; the remains of the houſe-ſteads within the walls are not very numerous; but on the outſide they are innumerable, eſpecially at the ſouth ſide and weſt end. The circumference of the city, and ſuburbs, is nearly three computed miles; the figure is an oblong ſquare. There is an ancient road through the city, leading from Ulpha to Ravenglaſs. About the year 1730, a conſiderable quantity of ſilver coin was diſcovered in the ruins of one of the houſes, concealed in a cavity formed in a beam." A Hiſtory of the County of Cumberland, &c. by William Hutchinſon, F.S.A., two vols. 4to. Beauties of England and Wales, vol. iii., 1802, by John Britton and Edward Wedlake Brayley.

RAVENNA, a very ancient city of Italy, in the department of the Amone, ſeated on the river Mentone, near the Adriatic. This city, as Strabo informs us, was built by the Theſſalians, on ſeveral iſlands, long before the war of Troy, and they were driven out by the Tuſcans. In the time of this Greek writer, it was ſituated in the midſt of a marſh, and attached to the continent, and in proceſs of time the Po accumulated mud and ſand, ſo that the land was raiſed and the ſea removed to a greater diſtance. The ſame writer informs us, that it was made a Roman colony by Auguſtus; and Dion ſays, that a fleet of 250 veſſels was ſtationed in this port by that prince, from which circumſtance it was called "portus claſſis," or the port of the fleet. He ſtationed, ſays Suetonius, one fleet at Miſenum, and another at Ravenna, for guarding the upper and lower ſea. Tiberius repaired its walls, and erected ſome new gates, which ſtill bear an inſcription to this purpoſe. Trajan alſo contributed towards embelliſhing this city. Honorius made it the place of his reſidence, both before and after Alaric had captured and burned Rome. When Odoacer made a conqueſt of Italy, he reſided at Ravenna, and ſuſtained here a ſiege

of three years, at the termination of which he was taken and ſlain by Theodoric. Theodoric fixed the ſeat of his empire in this place, and adorned it with magnificent churches and palaces, and re-conſtructed the aqueduct of Trajan. His daughter Amalaſoutha, and his grandſon Athalaric, contributed towards the improvement of this city. When the Goths were driven from Italy by Narſes, general of the emperor Juſtinian, he was made governor of Ravenna; and having continued in this ſtation for 16 years, he was recalled by Juſtin II., ſucceſſor to Juſtinian; and in the year 567 he was ſucceeded by Longinus, who took up his reſidence at Ravenna, under the title of exarch. (See EXARCH.) The famous battle of Ravenna was fought near this town between Gaſton de Foix, duke of Nemmes, and nephew of Louis XII. and the army of pope Julius II., Ferdinand, king of Spain, and the Venetians, in which the former young general, being only 24 years of age, having killed between 16 and 18,000 of the enemy, proved victorious, though he himſelf was killed by too ardently following the purſuit. This happened on Eaſter-day 1512. The French, enraged by the loſs of their brave general, took Ravenna by ſtorm, and pillaged the city with ſuch ſeverity that it has never recovered. On the road to Forli, by the banks of the little river Ronco, three miles from the city, a croſs ſhews the ſpot where Gaſton de Foix was killed. Freſh water has always been ſo ſcarce at Ravenna, that it has occaſioned a pleaſant epigram by Martial. This city was of late the capital of Romagna, with the title of an archbiſhopric. It has produced ſeveral perſons of eminence, as Fauſtinus, often mentioned by Martial; the ſophiſt Aſpaſius, who lived under the reign of Alexander Severus; Caſſiodorus, chancellor to Theodoric, king of the Goths in Italy; pope John XVII.; Peter Damien, cardinal of Offa, and ſeveral others. Ravenna was alſo the ſeat of many councils at ſucceſſive periods. The three laſt councils, in 1311, 1314, and 1317, were ſummoned for the purpoſe of reforming the corrupted manners of the eccleſiaſtics, which were, in thoſe days, very debauched. It is now a mean and inconſiderable town; the houſes are old and in a ruined ſtate, and the number of inhabitants ſcarcely amounts to 14 or 15,000. In the time of the Romans, it was ſeated on a kind of bay formed by the Adriatic, and its harbour was celebrated; but it is now three miles from the ſea. The mud thrown up by the tide having formed a tract of land, which is cultivated, and on which the city itſelf has been enlarged towards the ſea. The air is inſalubrious; but has been ſomewhat amended by conveying along the ſides of the city the rivers Mentone and Ronco, which carry off the fœtid water from the marſhy grounds. It contains ſeveral churches, and 24 convents; 42 miles E. of Bologna. N. lat. 44° 27′. E. long. 11° 5′.

RAVENPOINT, a headland of the county of Wexford, Ireland, at the N. ſide of the entrance into Wexford haven. N. lat. 52° 23′. W. long. 6° 18′.

RAVENSARA, in *Botany*, a barbarous appellation, altered by Sonnerat from the Madagaſcar name of the plant, *Raven-tſara*, or *Voaravendſara*, meaning, it ſeems, *a good leaf*, and applying to the aromatic qualities, and economical uſes, of the leaves. Hence Juſſieu was induced to contrive the apt generic name *Agathophyllum*, from ἀγαθος, *good or profitable*, and φυλλὸν, *a leaf*; under which this genus ought to have been deſcribed in its proper place, in our firſt volume. But one of our predeceſſors has, by miſtake, referred the reader to *Ravenſara*, as a genuine Linnæan name, attributing AGATHOPHYLLUM to profeſſor Martyn; ſee that article. To correct this error, and ſupply the conſequent deficiency, we ſubjoin an account of the tree in queſtion, under its proper and received denomination.

AGATHOPHYLLUM. Juſſ. 431. Schreb. 806. Willd. Sp. Pl. v. 2. 842. Mart. Mill. Dict. v. 1. Lamarck Illuſtr. t. 825. (Ravenſara; Sonnerat Ind. Occ. v. 2. 226. Euodia; Gærtn. t. 103. Lamarck Illuſtr. t. 404.)—Claſs and order, *Dodecandria Monogynia*. Nat. Ord. uncertain, perhaps akin to the *Lauri*, Juſſ.

Gen. Ch. *Cal.* Perianth inferior, very ſmall, abrupt, entire, permanent. *Cor.* Petals ſix, ovate, inſerted into the calyx, ſomewhat villous on the inſide. *Stam.* Filaments twelve, broadiſh, very ſhort, alternately inſerted into the baſe of the petals and the inſide of the calyx; anthers roundiſh. *Piſt.* Germen ſuperior, very ſmall; ſtyle very ſhort; ſtigma downy. *Peric.* Drupa nearly globoſe, umbilicated. *Seed.* Nut the ſhape of the drupa, tipped with a ſmall abrupt point, divided internally half way, into ſix coriaceous cells; kernel convex above, ſix-lobed below, one lobe being received into each cell.

Eſſ. Ch. Calyx abrupt, entire. Petals ſix, inſerted into the calyx. Drupa ſuperior, nearly globoſe. Nut with ſix incomplete cells. Kernel ſolitary, with ſix lobes.

Obſ. Schreber, by a caſual overſight, deſcribes the fruit as crowned with the calyx, though he juſtly terms the germen ſuperior.

1. A. *aromaticum*. Willd. n. 1. (Ravenſara aromatica; Sonnerat Ind. Or. v. 2. 226. t. 127. Euodia Ravenſara; Gærtn. v. 2. 101.)—Native of Madagaſcar. A large and tufted, ſomewhat pyramidal tree, with a reddiſh aromatic *bark*, and heavy, hard, inodorous, white *wood*, intermixed with red fibres. *Leaves* alternate, ſtalked, ſimple, obovate, entire, generally obtuſe; ſmooth on both ſides; pale and rather glaucous beneath; ſingle-ribbed, of a firm or coriaceous texture. *Flowers* very minute, numerous, in axillary panicles about the ends of the branches, ſhorter than the leaves. *Fruit* an inch in diameter, ſolitary at the end of each branch, ſo that, as Sonnerat remarks, one would think the *flowers* had grown on a different tree; the panicles being obliterated, probably, in conſequence of one flower alone, in each, bearing fruit. The tree produces fruit at the age of five or ſix years, which is ten months in coming to perfection. The inhabitants of Madagaſcar gather it at the age of ſix or ſeven months, as being, in that ſtate of growth, more fit for uſe as a ſpice. The kernel, when freſh, has a fine aromatic odour, but its taſte is bitter, and ſo highly acrid as to burn the throat very diſagreeably. The *leaves* are alſo very aromatic, and being made into a ſort of garlands, are left for a month in the open air to dry; after which they are plunged, for four or five minutes, into boiling water, and then dried, either in the ſun, or by a fire. The *fruits* are treated in the ſame manner. The *flowers* appear in January or February. The dried *leaves*, as well as the *fruit*, of this tree, are ſaid to partake of the flavours of the four moſt eſteemed ſpices. They have not, however, come into uſe as an article of commerce, though ſome of the French, reſident in Madagaſcar, have endeavoured to call the attention of their countrymen to this object. Gærtner found the odour of the fruit, though agreeable, too weak to promiſe much utility.

RAVENSBERG, in *Geography*, a county of Germany, lying between the biſhoprics of Munſter, Oſnaburgh, and Paderborn, the principality of Minden, and the counties of Schauenberg and Lippe. The ſoil is in ſome parts ſandy, but in others, eſpecially towards the principality of Minden, it produces corn, flax, and hemp; coal is found in ſome of the mountains, and good ſtone for building. Its name is derived from that of an ancient caſtle, and it had formerly its own counts. It lately belonged to the king of Pruſſia; but by the peace of Tilſit was transferred to the kingdom of Weſtphalia.

Weſtphalia. The approaching congreſs (1814) may poſſibly fix its future deſtination.

RAVENSBURG, a town of Bavaria, which anciently belonged to the Guelphs, counts of Altorf; but it was an imperial town before the time of king Rodolphus, and continued ſuch till the year 1802, when it was given, among other indemnities, to the elector of Bavaria. The Roman Catholics and Lutherans are united with regard to the temporal and ſpiritual concerns of the place, and the magiſtracy is ſhared betwixt them. They have one church in common; but the Lutherans are excluſively poſſeſſed of another, and the Roman Catholics have alſo two pariſh-churches; 21 miles N.E. of Conſtance. N. lat. 47° 41′. E. long. 9° 38′.

RAVENSBURG, a town of the Rheniſh palatinate, on the Elſaſs; 16 miles W. of Heilbronn.

RAVENSBURN, a ſmall ſtream of England, which runs into the Thames between Greenwich and Deptford.

RAVENSCROFT, THOMAS, in *Biography*, an active Engliſh muſician and publiſher, who flouriſhed from the beginning of the 17th century to 1635. He was the editor and compoſer of the beſt collection of pſalm tunes in four parts, which had till then appeared in England. He was a bachelor of muſic, and a profeſſor not only well acquainted with the practice of the art, but ſeems to have beſtowed much time in the peruſal of the beſt authors, and in meditation on the theory.

This book, publiſhed in ſmall octavo, 1621 and 1633, contains a melody for every one of the hundred and fifty pſalms, many of them by the editor himſelf, of which a conſiderable number is ſtill in uſe; as Windſor, St. David's, Southwell, and Canterbury. There are others, likewiſe, which are ſung by the German, Netherlandiſh, and French Proteſtants. To theſe the baſe, tenor, and counter-tenor parts have been compoſed by twenty-one Engliſh muſicians: among whom we find the names of Tallis, Dowland, Morley, Bennet, Stubbs, Farnaby, and John Milton, the father of our great poet. The tunes which are peculiar to the meaſure of the 100dth pſalm, the 113th, and 119th, were originally Lutheran, or perhaps of ſtill higher antiquity. And though Ravenſcroft has affixed the name of Dr. John Dowland to the parts which have been ſet to the 100dth pſalm, yet, in the index, he has ranked the melody itſelf with the French tunes; perhaps from having ſeen it among the melodies that were ſet to the French verſion of Clement Marot and Theodore Beza's Pſalms, by Goudimel and Claude le Jeune. Ravenſcroft, in imitation of theſe harmoniſts, always gives the principal melody, or, as he calls it, the *playn-ſong*, to the tenor. This part, indeed, he ſometimes erroneouſly terms *Fa-burden*. This is a corruption of *faux-bourdon*, and *falſo bordone*, which originally implied ſuch ſimple harmony as ariſes from a ſeries of thirds and ſixths to the baſe. His publication is, in ſome meaſure, hiſtorical: for he tells us not only who compoſed the parts to old melodies, but who increaſed the common ſtock, by the addition of new tunes; as well as which of them were orignally Engliſh, Welch, Scots, German, Dutch, Italian, French, and imitations of theſe.

No tunes of triple time occur in Claude le Jeune, and but five in Ravenſcroft: the principal of which are Cambridge, Martyrs, Manchester, and the 81ſt. This laſt is ſtill much uſed, and often played by chimes: it is called an imitation of a foreign tune, and has the name of Richard Alliſon prefixed to it. Muller's German edition of the pſalm tunes at Frankfort is exactly that of Claude le Jeune, in two parts only; except that he has tranſpoſed ſome of the melodies, and inſerted eaſy leading and connective notes, to aſſiſt, not only the ſinger, but ſometimes the tunes themſelves; which, without them, would now be very bald and uncouth. Many of theſe old melodies are ſtill ſung to German hymns as well as pſalms.

In 1614 Ravenſcroft publiſhed "A briefe Diſcourſe of the true, but neglected, Uſe of characterizing the Degrees by their Perfection, Imperfection, and Diminution in meaſurable Muſicke, againſt the common Practice and Cuſtome of the Times," 4to.

Ravenſcroft had been educated in St. Paul's choir, under Mr. Edward Pierce, and was particularly converſant with old authors; he, therefore, wiſhed to revive the uſe of thoſe proportions in time, which, on account of their intricacy, had been long diſcontinued.

Ravenſcroft practiſed theſe exploded doctrines ineffectually, though to his Diſcourſe he added examples to illuſtrate his precepts, expreſſed in the harmony of four voices, concerning the pleaſure of the five uſual recreations of hunting, hawking, dancing, drinking, and enamouring. He was not always very ſucceſsful in his attempts at imitative harmony; and melody was then ſo crude and uncouth throughout Europe, as to afford little aſſiſtance in imitative ſtrains.

Ravenſcroft was alſo the author of a collection of ſongs, entitled "Melcimata, Muſical Phancies, fitting the Court, City, and Country Humours, in three, four, and five Voyces," publiſhed in the year 1611.

RAVENSCROFT, JOHN, one of the waits of the Tower Hamlets, and in the band of the Goodman's-fields playhouſe, was a ripieno violin; yet, notwithſtanding ſo humble a ſtation, he was a performer of ſufficient abilities to lead in any ſuch band as that juſt mentioned; and could perform with great firmneſs a concerto of Corelli, or an overture of Handel. He was in great requeſt at balls and dancing parties; but excelled moſt others, not only in *playing* hornpipes with the true ſailor's *ſlang*, but in *compoſing* them: and there are two of his compoſitions, that a tar, if he had any leg to ſtand on, would irreſiſtibly be impelled to dance, the moment he heard them.

RAVENSPUR, or RAVENSER, in *Geography*, was formerly a noted ſea-port at the mouth of the Humber. It is celebrated by our hiſtorians for the deſcents of Henry IV. A.D. 1399, and of Edward IV. A.D. 1471, when theſe princes came to contend for the crown of England. It was ſhortly after, however, ſwallowed up by the ocean, together with many villages in its vicinity. The preciſe ſpot on which it ſtood is now unknown; but it is uſually ſuppoſed to have been placed very near to Spurn Head, the Ocellum Promontorium of Ptolemy. For ſome additional account of the coaſt here, ſee PATRINGTON.

RAVENSTAIN, a town of Saxony, in the circle of Erzgeburg; 8 miles N.N.W. of Wolkenſtein.—Alſo, a town of Hinder Pomerania; 7 miles E.S.E. of Zachan.

RAVESTEIN, a town of Brabant, on the S. ſide of the Meuſe, the capital of a ſigniory, including 14 towns and villages; 15 miles N.E. of Bois le Duc.

RAVI, a name, in Sanſcrit, of Surya, the Hindoo regent of the ſun. It means the *Riſer*, and has perhaps other meanings. See SURYA.

RAVIERES, in *Geography*, a town of France, in the department of the Yonne; 27 miles E. of Auxerre.

RAUJESHI, a circar of Bengal, bounded N. by Rajemal, E. by Bettooriah, S. by Mahmudſhi, Shahjole, and Kiſhenagur, and W. by Birboom and Hindooa; about 55 miles long, and 18 broad. The capital is *Moorſhedabad*; which ſee.

RAVILLE, a town of France, in the department of the Moſelle; 5 miles S. of Bouley.

RAVILLY, a ſmall town of the county of Carlow, Ireland, in the barony of the ſame name. It is ſituated on the river Slaney, 3 miles S. from Baltinglaſs, and 32 S. by W. from Dublin.

RAVINA, a town of European Turkey, in Albania; 52 miles E. of Valona.

RAVINE, in *Field Fortification*, a deep hollow, uſually formed by a great flood, or long continued running of water; frequently turned to good purpoſes in the field.

RAVIS, the ſame with *raucedo*. See HOARSENESS.

RAVISHMENT, in *Law*, denotes an unlawful ſeducing either a woman, or an heir in ward; for which there is a remedy by a writ of raviſhment, or action of treſpaſs *vi & armis*, *de filio vel filia rapto vel abducto*, in the ſame manner as the huſband may have it *de uxore raptâ et abductâ*, on account of the abduction of his wife. This action lay at the common law; and thereby the huſband ſhall recover, not the poſſeſſion of his wife, but damages for taking her away: and by ſtatute Weſtm. 1. 3 Edw. I. c. 13. the offender ſhall alſo be impriſoned two years, and fined at the pleaſure of the king. Both the king and the huſband may, therefore, have this action; and the huſband is alſo entitled to recover damages in an action on the caſe againſt ſuch as perſuade and entice the wife to live ſeparate from him, without a ſufficient cauſe.

Sometimes it is alſo uſed in the ſame ſenſe as *rape*; which ſee.

RAVISHMENT *de Gard*, is a writ which anciently lay, and ſtill lies, for the guardian in ſocage againſt him who took from him the body of his ward, or pupil: but then he muſt account to his pupil for the damages he ſo recovers. It is expreſsly provided by ſtatute 12 Car. II. c. 24. that teſtamentary guardians may maintain an action of raviſhment, or treſpaſs, for recovery of any of their wards, and alſo for damages, to be applied to the uſe and benefit of the infants.

RAVITZ, or RAWISCH, in *Geography*, a town of the duchy of Warſaw, moſt of the inhabitants of which are Lutherans: it has a conſiderable manufacture of cloth; 24 miles S. of Poſen.

RAVIUS, or RAVE, CHRISTIAN, in *Biography*, a learned German Orientaliſt, was born at Berlin in the year 1613. From a very early period he was attached to the ſtudy of the eaſtern languages, and after ſpending eight years in different univerſities on the continent, he came over to England in the year 1658, and took up his reſidence at the univerſity of Oxford. He brought with him recommendations from Voſſius, and other learned men; and was invited to Dublin by archbiſhop Uſher, primate of Ireland, who ſettled upon him a handſome ſtipend, and engaged him to take a voyage into the Eaſt, for the purpoſe of collecting ancient manuſcripts. About the ſame time he was invited by cardinal Richelieu to enter into his employment for a ſimilar purpoſe, which he declined, having already accepted the propoſals of Uſher. In 1639 he became acquainted with our countryman, the learned Edward Pococke, at Conſtantinople, where he improved himſelf in many languages, to which he had already applied his talents; and made himſelf maſter of the Turkiſh, Arabic, and Perſian languages. In the mean time he did not neglect the main object of his miſſion, but collected more than 300 choice manuſcripts. For this ſervice he was, on his return, amply rewarded. In 1642 he taught the Oriental languages at Greſham college, in London. During the following year he went to Holland, and was appointed profeſſor of the Oriental languages at Utrecht. We find him again in England in 1648, when he took the covenant, and was made fellow of Magdalen college, Oxford, by the parliamentary viſitors. In the courſe of a few months he left England, and went to Sweden, where he obtained the appointment of profeſſor of the Oriental languages at the univerſity of Upſal. This place he was obliged to leave about the year 1657; the revenues, that ought to have been devoted to the Upſal profeſſors, having been applied towards defraying the expences of the war between Sweden and Denmark. After this he for ſome time filled the chair of Oriental literature at the univerſity of Kiel, and from thence he removed to occupy the ſame profeſſorſhip at Frankfort on the Maine. He died in 1677, about the age of 64. His works are very numerous, of which the following are titles of the principal: "Obteſtatio ad univerſam Europam pro dicendis Rebus et Linguis Orientalibus, ac conjuganda Africæ atque Aſiæ Eruditione," 1644; "Orthographiæ et Analogiæ vulgo Etymologiæ Ebraiæ Delineatio, juxta vocis partes abſtractas;" "A Diſcourſe of the Oriental Tongues, *viz.* Hebrew, Samaritan, Chaldee, Syriac, Arabic, and Ethiopic," 1649; "Concordantiarum Hebraicarum et Chaldaicarum Epitome;" "Chronologia Biblica nova;" "Epiſtolæ variæ ad doct. Viros." He gave alſo to the world a tranſlation, from the Arabic language, of Apollonius's Conic Sections. He had a brother, named John Ravius, who was profeſſor of philoſophy at Roſtock, about the year 1638. In 1664-5 he was appointed counſellor and librarian to the elector of Brandenburg. He was author of "Commentarius in Cornelium Nepotem," 1635; "Summa Studiorum pro Nobilitate Danica;" "Aphoriſmi Militares," and other learned works.

RAULIN, JOHN, a French writer in the 15th century, was born at Toul in the year 1443. He purſued his ſtudies at the univerſity of Paris, where he obtained the degree of D.D. in 1480, and afterwards filled the profeſſor's chair in theology with great diſtinction. He was elected grand maſter of the college of Navarre, and founded a good library in that ſeminary. Becoming diſſatisfied with the world, he embraced the monaſtic life at the abbey of Cluny, in Burgundy, in 1497. He died in 1514, at he age of 71. He attracted much attention as a preacher, and ſeveral of his ſermons have been publiſhed, which exhibit ſtriking ſpecimens of the bad taſte which prevailed in France in the 15th century. The works of this author were collected, and publiſhed at Antwerp, in 6 vols. 4to., 1612. They are accompanied with a curious and valuable collection of "Letters," that illuſtrate the hiſtory, manners, and ſentiments of the age in which he lived. They were firſt publiſhed after his death, in quarto, in 1521, under the title of "Joannis Raulin Epiſtolæ Illuſtrium Virorum." Moreri.

RAULT, FELIX, the favourite performer on the German flute at Paris, in 1770; where we heard him ourſelves with as much pleaſure as a flute can give, by neat execution, perfect intonation, and a mellifluous embouchure. M. Laborde has rendered his biographical article intereſting by a detail of his profeſſional merits and private character.

"M. Felix Rault was born at Bourdeaux, in 1736. He was the ſon of Charles Rault, of the king's band, and firſt baſſoon at the opera. Felix was received there in 1753, and in the king's band in 1768. His talents are ſo well known at Paris, as to be above praiſe. Since Blavet's time, no one has brought the art of playing upon the German flute to ſuch perfection, eſpecially in accompanying the voice; a much more difficult art than playing concertos of great execution, generally well ſtudied at home previous to performance. But ſuch ſtudy is uſeleſs to Rault; for no

one reads muſic more readily and with more facility, or gives it more meaning, than this performer. The beauty of his tone, the preciſion of his execution, the richneſs of his embouchure, however extraordinary, merit ſtill leſs praiſe than his perſonal qualities, which endear him to all his acquaintance." Laborde.

RAUMO, in *Geography*, a ſea-port town of Sweden, in the province of Finland, on the E. coaſt of the gulf of Bothnia; 50 miles N. of Abo.

RAUNPIKED, in *Rural Economy*, a provincial word uſed to ſignify ſtag-headed, among trees, as an old overgrown oak, having the ſtumps of the boughs ſtanding out.

RAURAH, in *Geography*, a town of Thibet; 26 miles N. of Jemlah. N. lat. 31° 2'. E. long. 81° 40'.

RAURAVA, a Sanſcrit word meaning *dreadful*, and a name of one of the Hindoo hells; they reckoning twenty-one of theſe receptacles for ſinners. Naraka is called Maharaurava, or moſt dreadful.

RAURIS, in *Geography*, a town of the archbiſhopric of Salzburg; 32 miles S. of Salzburg.

RAUSCHENBERG, a town of Heſſe; 4 miles N. of Marburg. N. lat. 50° 53'. E. long. 8° 53'.

RAUSHENBERG, a town of Germany, in the principality of Culmbach; 7 miles N.N.E. of Neuſtadt.

RAUSNITZ, a town of Moravia, in the circle of Brunn; 10 miles E. of Brunn.

RAUTA Lambi, a town of Sweden, in the government of Kuopio; 27 miles S.W. of Kuopio.

RAUTENBURG, a town of Pruſſian Lithuania; 27 miles W. of Tilſit.—Alſo, a town of Pruſſia, in the province of Samland; 36 miles N.E. of Königſberg.

RAUTERN, a town of Auſtria; 6 miles W.N.W. of Droſendorf.

RAUTIO, a town of Sweden, in the government of Ulea; 36 miles S. of Braheſtad.

RAUTPOUR, a town of Hindooſtan, in Allahabad; 18 miles N.N.W. of Corah.

RAUTY Dungaree, a town of Hindooſtan, in Guzerat, on the coaſt; 50 miles S.W. of Noanagur.

Rauty-*Mummy*, or *Rauty-muddum*, *ſtone-mummy*, a name given by the people of the Eaſt Indies to a kind of foſſile ſubſtance, much valued for its medicinal virtues. It is of the nature of the ſelenites, and is found upon the high rocks, and ſuppoſed to be generated of the dew which falls from the heavens; but this is an idle opinion, and the formation of it is evidently the ſame with that of the European rhomboidal ſelenites. They beat it to powder, and after boiling it in milk, they give it in caſes of the venereal kind. In a common clap, they give half a ſcruple, night and morning.

RAUVEE, in *Geography*, a river of Aſia, which riſes on the borders of Thibet, and joins the Chunaub in the country of Lahore, 28 miles N.E. of Moultan. The Rauvee is the "Hydraotes" of Alexander, and though it is repreſented as a noble river, it is ſomewhat inferior in bulk to the Chunaub. Its ſources are in the mountains near Nagorkote, a famous place of Hindoo worſhip; and it enters the plains near Shahpour (called alſo Rajapour), from whence the famous canal of Shah Nahr was drawn to Lahore, 48½ common coſſes in length. The ſpace between the Rauvee and Chunaub, at their entry on the plains, is about 54 geographical miles; and they gradually approach each other during a courſe of 170 miles. The junction of the Rauvee with the Chunaub (or rather the Chunaub and Behut collectively) is effected nearly midway between Toulumba and Moultan. The Ayin Acbaree allows 27 coſſes between the junction of the Behut and Chunaub, and that of the Rauvee with the Chunaub; but this diſtance muſt be applied to the courſe of the river, not to the road by land. When theſe three rivers are united, they form a ſtream equal to the Indus itſelf, at the place of confluence; which is from 20 to 30 miles below Moultan. Rennell.

RAUWOLFIA, in *Botany*, was ſo named by Plumier, in memory of Leonard Rauwolf, a native of Augſburg, and a pupil of Rondelet. He ſailed from Marſeilles, in 1573, for the Levant, and performed a laborious and dangerous journey through Syria, Meſopotamia, Paleſtine and Egypt; of which he has left an account in German, full of curious information relative to medical and other rare plants, with ſeveral wooden cuts. He died phyſician to the Auſtrian army, at Hatvany, in Hungary, in 1606, according to Dryander, Bibl. Banks. v. 395, though Haller ſays 1596. The latter writer mentions his being obliged to quit his country on account of his religion, which was Proteſtant. His ſplendid herbarium, once the property of queen Chriſtina, and of Iſaac Voſſius, is preſerved in the univerſity of Leyden. From it Gronovius compoſed his *Flora Orientalis*.—Linn. Gen. 115. Schreb. 160. Willd. Sp. Pl. v. 1. 1217. Mart. Mill. Dict. v. 4. Ait. Hort. Kew. v. 2. 64. Juſſ. 148. Plum. Gen. 19. t. 40. Lamarck Illuſtr. t. 172. Gærtn. t. 52.—Claſs and order, *Pentandria Monogynia*. Nat. Ord. *Contortæ*, Linn. *Apocineæ*, Juſſ.

Gen. Ch. *Cal.* Perianth inferior, minute, with five ſegments, permanent. *Cor.* of one petal, ſalver-ſhaped; tube cylindrical, globular at the baſe; limb in five deep, roundiſh, emarginate, oblique ſegments. *Stam.* Filaments five, ſhorter than the tube; anthers erect, ſimple, acute. *Piſt.* Germen roundiſh; ſtyle very ſhort; ſtigma capitate. *Peric.* Berry nearly globoſe, marked with a furrow along one ſide, of one cell. *Seeds* two, convex at the baſe, tapering at the ſummit, compreſſed, divided, more or leſs completely, into two cells.

Eſſ. Ch. Corolla oblique, ſalver-ſhaped. Stamens included. Berry globoſe, with two ſeeds, each of two cells.

1. R. *nitida*. Shining Rauwolfia. Linn. Sp. Pl. 303. Hort. Cliff. 75. t. 9. Willd. n. 1. Ait. n. 1. (R. tetraphylla anguſtifolia; Plum. Ic. 232. t. 236. f. 1.)—Leaves in fours, lanceolate, pointed, very ſmooth and ſhining. Flowers axillary or terminal, cymoſe.—Native of mountainous woods in the Weſt Indies. A *ſhrub* about twelve feet high, erect, very ſmooth and ſhining, abounding with viſcid milk. *Leaves* four together at each joint of the branches, ſpreading, on ſhort ſtalks, lanceolate, with a blunt point, entire, unequal in ſize, from two to five inches, or more, with one rib, and many fine tranſverſe parallel veins. *Flowers* ſmall, white, inodorous, in axillary, rarely terminal, ſtalked *cymes*, ſhorter than the leaves. *Fruit*, according to Jacquin, at firſt yellow, then purpliſh-black, thrice the ſize of a pea, milky. Linnæus tells us his figure in the Hortus Cliffortianus was drawn by Ehret, from a plant in the Chelſea garden; ſo that this *Rauwolfia* muſt have flowered under Miller's care, in the year 1736. In Ait. H. Kew. a later date is given. The corolla in the figure juſt mentioned is more concave in the limb, as well as more notched, than Plumier repreſents it.

2. R. *glabra*. Smooth Rauwolfia. Cavan. Ic. v. 3. 50. t. 297. Willd. n. 2.—Leaves alternate, ovato-lanceolate, ſmooth. Cymes oppoſite to the leaves, of few flowers. Native of New Spain. The whole plant is ſmooth. *Stem* ſhrubby, a yard high, with pliant, round, leafy branches. *Leaves* ſcattered, rounded at the baſe, rather pointed, ſingle-ribbed, two or three inches long, on ſhortiſh *footſtalks*. *Flowers* ſmall, white, about four together, in ſmall cymes or cluſters,

clusters, opposite to the leaves. *Berry* obovate, with only one *seed;* at least in garden specimens, which very probably differ in those respects from wild ones. This species flowered at Madrid from August to October.

3. R. *canescens*. Hoary Rauwolfia. Linn. Sp. Pl. 303. Willd. n. 3. Ait. n. 2. (R. hirsuta; Jacq. Amer. 47. R. tetraphylla latifolia; Plum. Ic. 232. t. 236. f. 2.)—Leaves in fours, elliptic-obovate, acute, downy. Flowers axillary or terminal. Segments of the corolla obtuse.—Native of dry, sunny, bushy places in the West India islands, as well as on the neighbouring continent. It was cultivated by Miller at the same time with the first species. We received a specimen in flower, from the stove at Kew, in June 1807. Jacquin says this species varies greatly in the size of all its parts, according to soil and situation, and in the height of its *stem* from one to eight feet. The young *branches*, *flower-stalks*, *footstalks*, and both sides of the *leaves*, are clothed with short dense pubescence, which almost entirely disappears by culture, though the upper side of the *footstalks* continues rough with bristly glands. The *leaves* are from one and a half to two inches long, obovate, more or less inclining to elliptical, acute, unequal. *Flowers* in small, axillary, downy, stalked tufts, or umbels. *Corolla* green with a tinge of red, its segments obtuse. *Fruit* cloven at the top, first red, then black, containing two *seeds*, as Jacquin well describes it. One cell of each seed is usually, according to him, abortive.

4. R. *tomentosa*. Downy Rauwolfia. Jacq. Amer. 48. Obs. fasc. 2. 9. t. 35.—Leaves in fours, obovato-lanceolate, downy, tapering at each end. Flowers axillary or terminal. Segments of the corolla acute.—Native of rocky places about Carthagena; sometimes on the stone walls of the town. Jacquin alone seems to have known this species, which principally differs from the last, as far as we can judge, in having white *flowers*, the segments of whose *corolla* are ovate and acute. The *leaves* moreover are rather tapering at each end; but that circumstance varies. *Fruit* the size of a pea, first red, then black. We have seen no specimen.

5. R. *Pulaparia*. East Indian Rauwolfia. Roxb. MSS.—Leaves in threes, elliptical, bluntly pointed, smooth and shining. Flowers terminal, in forked panicles. Corolla many times longer than the calyx. Sent by Dr. Roxburgh, from Calcutta, with the above name. We rely on him for the genus, having seen no fruit. This *shrub* is smooth in nearly every part, with round *branches*. *Leaves* about three inches long, and above one broad, coriaceous and shining; their transverse veins very fine and numerous. *Flower-stalks* very minutely downy, as well as the imbricated *bracteas*, and keeled pointed segments of the *calyx*. *Corolla* apparently white, with a red tube, which is near three quarters of an inch long, cylindrical, swelling at the top: segments of the limb rounded.

Rauwolfia, in *Gardening*, contains plants of the tender, exotic, shrubby kind for the stove, of which the species cultivated are: the shining rauwolfia (R. nitida); and the hoary rauwolfia (R. canescens).

Method of Culture.—These may be increased by the seeds or berries, which should be sown in pots filled with light mould, in the autumn or spring, plunging them in a mild hot-bed. When the plants have attained some growth, they should be removed into separate pots, and have the management of other exotic stove plants. They may likewise be raised by layers and cuttings, laid down or planted out in pots, plunged in the hot-bed in the spring and summer months, till they have stricken root, being afterwards managed as those from seed.

They afford much ornament and variety in hot-house collections, both in their foliage and flowers.

Rauzan, in *Geography*, a town of France, in the department of the Gironde; 9 miles S.S.E. of Libourne.

Rauzzini, Venanzio, in *Biography*, a native of Italy, who, when he arrived here in 1774, to succeed Millico at the opera, was a beautiful and animated young man, with a soprano voice. He was an excellent musician, having studied counterpoint with as much application as the art of singing: so that he may truly be said not only to know his own business, but that of a maestro di cappella; having been as able to compose an opera as to perform a principal part in it. "Piramo e Tisbe," and "La Vestale," may be instanced in proof of this assertion.

His voice was not very powerful when he came hither from Munich, where we first knew him; and where he had enjoyed the highest favour several years. His taste, governed by science, was correct and exquisite. His voice, though not of great volume, was sweet, clear, flexible, and extensive; being in compass more than two octaves. But he is supposed to have injured his chest in early youth by a rage for counterpoint. He played the harpsichord neatly, accompanied well, and had real genius for composition, which inclined him to devote that time to the pen and the improvement of his hand, which, perhaps, in his station, would have been more usefully bestowed in nursing and exercising his voice.

It was some time before the extent of his merit and science were known in this country, and favoured by the public. Nothing can so speedily convey the merits of a singer to an audience, as a *great* and powerful voice. However, his taste, fancy, knowledge, and delicacy, together with his beautiful person, and spirited and intelligent manner of acting, before the first season was over, gained him general approbation and favour. And since he has quitted the stage, and made Bath his residence. Though he has been long obliged to discontinue singing in public, it is not too much to say that he has disseminated good taste throughout the kingdom, by the numerous scholars he has taught among the nobility and gentry, as well as by those whom he has prepared for public patronage, professionally.

Raw, in *Agriculture*, any sort of plant, substance, or material, which is in a green, unripe, or undigested condition, or which is employed in its more fresh and crude state; as, for instance, dung before it has been much reduced, and lost many of its nutrient principles or properties by the process of fermentation. See Dung.

Raw *Cream*, in *Rural Economy*, such as is raised in the natural way, not *scalded* or *clouted*.

Raw *Hide*. See Hide.

Raw *Lands*, in *Agriculture*, a term applied to wet, cold, heavy lands, which are unfit to receive the seed.

Raw *Silk*. See Silk.

Rawa, or Rava, in *Geography*, a town of the duchy of Warsaw, late capital of a palatinate of the same name. The castle is appropriated for the confinement of state prisoners; 45 miles S.W. of Warsaw. N. lat. 51° 55′. E. long. 20° 17.

Rawa, a town of Poland, in the palatinate of Belz; 18 miles S.W. of Belz.

Rawa. See Rava.

Rawak, a small island in the Pacific ocean, near the N. coast of the island of Waygoo, with which it forms a harbour. E. long. 131° 15′.

Rawapskitchwock, a small westerly branch of Machias river. See Machias.

Raway, or *Bridge-town*, a truly commercial village of Middlesex county, New Jersey, on Raway river, four or five miles S.W. of Elizabeth-town, and 75 from Philadelphia.

phia. It contains a poſt-office, a preſbyterian church, and about 50 or 60 houſes.

RAWDON, a town of Nova Scotia, 40 miles from Halifax, containing about 50 or 60 houſes.

Rawdon, a townſhip of the county of Haſtings, in Upper Canada, N. of Sidney.

RAWLINSON, Christopher, in *Biography*, of Cork-Hall, in Lancaſhire, was born in 1677, educated in Queen's college, Oxford, and died in 1733: he was much attached to Saxon and Northern literature, and publiſhed an edition of "King Alfred's Tranſlation of Boethius de Conſolatione," 8vo. 1698.

Rawlinson, Richard, a diſtant relation of the preceding, a learned antiquarian, was the ſon of ſir Thomas Rawlinſon, knight, and once lord mayor of London. He was educated at St. John's college, Oxford, and was admitted to the degree of doctor of the civil law in 1719. He devoted himſelf to antiquarian purſuits, and made large collections for a continuation of Wood's Athenæ Oxonienſes, and Hiſtory of Oxford, and publiſhed the life of that induſtrious antiquary. The principal work of Mr. Rawlinſon was "The Engliſh Topographer," or, An hiſtorical account of all the pieces that have been written relating to the ancient natural hiſtory or topographical deſcription of any part of England, 1720. He publiſhed the "Latin Letters of Abelard and Heloiſa," and "A Tranſlation of Du Freſnoy's New Method of Studying Hiſtory," 2 vols. 8vo. He died at Iſlington in 1755, and by his will ordered that his heart ſhould be depoſited in the chapel of St. John's college, Oxford. That univerſity was indebted to him for various benefactions of books, manuſcripts, medals, &c. as well as landed property, and an endowment for an Anglo-Saxon lecture.

RAWLLOW, in *Geography*, a town of Hindooſtan, in Palnaud; 27 miles W.S.W. of Timerycotta.

RAY, John, in *Biography*, whom Haller terms the greateſt botaniſt in the memory of man, and to whoſe tranſcendent merits we have already briefly adverted, in treating of the genus dedicated by Plumier to his name, ſee Raiania; was born at Black Notley, near Braintree, in Eſſex, Nov. 29, 1628. His father, Roger Ray, though in the humble ſtation of a blackſmith, gave him a learned education; firſt at the grammar-ſchool of his native town, at that time not very well conducted; and ſubſequently at Cambridge, where he entered at Catharine Hall, in his 16th year, June 28th, 1644, being deſigned for holy orders. In about a year and three quarters afterwards, he removed to Trinity College, where he found the young men occupied in a more liberal train of ſtudies, with leſs of ſcholaſtic diſputations and quibbles. Ray was fortunate in having for his tutor at Trinity, Dr. Duport, an eminent Greek ſcholar, under whoſe foſtering and partial care, he ſoon made up for all the deficiencies of his early education, in the learned languages, including Hebrew. By this gentleman he was always mentioned with peculiar regard. He was no leſs happy in a youthful literary friend and fellow-ſtudent, afterwards the celebrated Dr. Iſaac Barrow. Even at this early period, Ray began to cultivate natural hiſtory; and diſtinguiſhed himſelf by many ſchool exerciſes as an orator, no leſs than by his general taſte for ſtudy, his love of virtue, and his gentleneſs of manners, qualities which ſhone brighter and brighter to the lateſt period of his life. His merit occaſioned him to be choſen a Minor Fellow of Trinity, along with his friend Barrow, September 8th, 1649. On taking his degree of Maſter of Arts, he became a Major or Senior Fellow; and afterwards, October 1ſt, 1651, Greek Lecturer of the college. At the end of two years he was appointed Mathematical Lecturer, and in two years more, October 2d, 1655, Humanity Reader. He ſubſequently filled ſeveral reſpectable offices in his college, as Junior Dean, College Steward, &c., and during his reſidence in the univerſity, became tutor to many gentlemen of rank and fortune, who were ſenſible of their obligations to him; amongſt whom the moſt eminently diſtinguiſhed by perſonal worth, and congeniality of talents with himſelf, was Mr. Francis Willughby, of Middleton-hall in Warwickſhire, ſo well known by his poſthumous works on Birds and Fiſhes, edited by the affectionate care of Ray.

At this period it was uſual for young men of ability and learning, though not in orders, to deliver ſermons, and common-place readings, as they were called; not only in the chapels or halls of their own colleges, but even before the univerſity body, at St. Mary's church. In theſe Ray eminently diſtinguiſhed himſelf. He was among the firſt who ventured to lead the attention of his hearers, from the unprofitable ſubtleties of ſcholaſtic divinity, and the trammels of Ariſtotelian philoſophy, to an obſervation of nature, and a practical inveſtigation of truth. The rudiments of many of his ſubſequent writings originated in theſe juvenile eſſays, particularly his celebrated book on the "Wiſdom of God manifeſted in the Works of the Creation," known all over the world by its numerous editions and tranſlations, and univerſally admired for its rational piety, ſound philoſophy, and ſolid inſtruction. This book is the baſis of all the labours of following divines, who have made the book of nature a commentary on the book of revelation; a confirmation of truths, which Nature has not authority, of herſelf, to eſtabliſh. In it the author inculcates the doctrine of a conſtantly ſuperintending Providence; as well as the advantage, and even the duty, of contemplating the works of God. This, he ſays, is part of the buſineſs of a ſabbath day, as it will be, probably, of our employment through that eternal reſt, of which the ſabbath is a type. Archbiſhop Tenniſon is recorded to have told Dr. Derham, that "Mr. Ray was much celebrated, in his time, at Cambridge, for preaching ſolid and uſeful divinity, inſtead of that enthuſiaſtic ſtuff, which the ſermons of that time were generally filled with." Two of his funeral diſcourſes are mentioned with particular approbation; one on the death of Dr. Arrowſmith, maſter of his college; the other on that of one of his moſt intimate and beloved colleagues, Mr. John Nid, likewiſe a Senior Fellow of Trinity, who had a great ſhare in Ray's firſt botanical publication, the *Catalogus Plantarum circa Cantabrigiam naſcentium*, printed in 1660; which may be conſidered as the prototype of his *Synopſis*, hereafter mentioned. Indeed before this little volume appeared, its author had viſited various parts of England and Wales, for the purpoſe of inveſtigating their native plants, as he did ſeveral times afterwards; nor were his obſervations confined to natural hiſtory, but extended to local and general hiſtory, antiquities, the arts, and all kinds of uſeful knowledge. His amuſing Itineraries were publiſhed, along with his life, by Dr. Derham, and a few letters to that gentleman, by the care of Dr. George Scott, F.R.S., in 1760, under the title of "Select Remains of the learned John Ray, M.A., &c." Ray's firſt botanical tour occupied nearly ſix weeks, from Auguſt 9th to September 18th, 1658. On the 23d of December 1660, he was ordained, both deacon and prieſt at the ſame time, by Dr. Sanderſon, then biſhop of Lincoln. In 1661 he travelled with Mr. Willughby into Scotland, returning by Cumberland and Weſtmoreland; and the following year, with the ſame companion, he accompliſhed a more particular inveſtigation of Wales. How critically he ſtudied the botany of the countries

countries he viſited, is evident from the different editions of his *Catalogus Plantarum Angliæ*, and *Synopſis Methodica Stirpium Britannicarum*.

All this while Mr. Ray continued to enjoy his fellowſhip, and to cultivate his Cambridge connections; but in September 1662, his tranquillity was diſturbed by the too famous Bartholomew act, by which 2000 conſcientious divines were turned out of their livings, and many fellows of colleges deprived of their maintenance, and means of literary improvement. Among the latter was the ſubject of our memoir, with thirteen honeſt men at Cambridge beſides, of whoſe names he has left us a liſt. One of them, Dr. Dillingham, was maſter of Emanuel college; but Ray was the only perſon of his own college who ſuffered this deprivation. The reader muſt not ſuppoſe that he, or perhaps any other perſon in this illuſtrious catalogue, was, in the leaſt degree, deficient in attachment to the doctrine or diſcipline of the church of England, or that they had taken the oath called the Solemn League and Covenant; which Ray certainly had neither taken nor ever approved. They were required to ſwear to the infamous propoſition, that the ſaid oath was not binding to thoſe who had taken it, and on this ground they conſcientiouſly gave up their preferment. It is curious to read the apology made for Ray to Dr. Derham, on this ſubject, by a Mr. Brokeſby—"that he was at that time abſent from his college, where he might have met with ſatisfaction to his ſcruples; and was among ſome zealous non-conformiſts, who too much influenced him, by the addition of new ſcruples. And we may alſo aſcribe ſomewhat to the prejudice of education in unhappy times." By this it appears, that the "ſcruples" of non-conformiſts were moſt favourable to the ſanctity of an oath; and that the "unhappy times" alluded to, were more advantageous to principle, than the golden days of Charles II.; whoſe miniſters doubtleſs valued the obedience, far more than the honeſty, of any man; nor is this taſte, by any means, peculiar to them or their profligate maſter.

Mr. Ray, or, as he wrote his name, for a while, about this period, Wray, having thus the world before him, made an arrangement with Mr. Willughby for a tour on the continent; and in this plan two of his pupils were included, Mr. Nathaniel Bacon, and Mr., afterwards ſir Philip, Skippon. They ſailed for Calais in April 1663, but being prevented, by the ſtate of political affairs, from proſecuting their journey through France, they traverſed the Low Countries, Germany, &c. proceeding by Venice into Italy; moſt of whoſe cities they viſited, either by ſea or land; as well as Malta and Sicily; and returned, by Switzerland, through France, into England, in the ſpring of 1666. Mr. Willughby indeed ſeparated from the reſt of the party at Montpellier, and viſited Spain. An ample account of their obſervations was publiſhed by Ray, in 1673, making a thick octavo volume. The travellers appear to have been diligent and acute in every thing relative to politics, literature, natural hiſtory, mechanics, and philoſophy, as well as antiquities and other curioſities; but in the fine arts they aſſume no authority, nor diſplay any conſiderable taſte or knowledge. Mr. Willughby's account of Spain makes a part by itſelf; and a rich critical catalogue of ſuch plants, not, for the moſt part, natives of England, as were obſerved in this tour, concludes the volume. Haller gives to Ray the credit of having diſcovered ſeveral ſpecies in Switzerland, previouſly not known as natives of that country.

Ray paſſed the ſummer of 1666 partly at Black Notley, and partly in Suſſex, ſtudying chiefly the works of Hook, Boyle, Sydenham on Fevers, and the Philoſophical Tranſactions, "making few diſcoveries," ſays he, "ſave of mine own errors." The following winter he was employed at Mr. Willughby's, in arranging that gentleman's muſeum of natural hiſtory and coins, and in forming tables of plants and animals for the uſe of Dr. Wilkins, in his famous work on an Univerſal Character. He now alſo began to arrange a catalogue of the Engliſh native plants, which he himſelf had gathered; rather for his own uſe, than with any immediate view of publication; "at preſent," as he wrote to Dr. Liſter, "the world is glutted with Dr. Merret's bungling Pinax. I reſolve never to put out any thing which is not as perfect as is poſſible for me to make it. I wiſh you would take a little pains this ſummer about graſſes, that ſo we might compare notes." The above reſolution of our author is, no doubt, highly commendable, but the world has rather to lament that ſo many able men have formed the ſame determination, at leaſt in natural ſcience. If it were univerſally adhered to, ſcarcely any work would ſee the light; for few can be ſo ſenſible of the defects of any other perſon's attempt to illuſtrate the works of nature, as a man of tolerable judgment muſt be of his own. This is eſpecially the caſe with thoſe who, like Ray, direct their aſpiring views towards ſyſtem, and philoſophical theory. Happily he did not try this arduous path, till he had trained himſelf by wholeſome practical diſcipline, in obſervation and experience. His firſt botanical works aſſumed the humble form of alphabetical catalogues. His and Mr. Willughby's labours in the ſervice of biſhop Wilkins, were indeed of a ſyſtematical deſcription; and accordingly the authors themſelves were, more than any other perſon probably, diſſatisfied with their performance. They relaxed from theſe labours in a tour of practical obſervation through the weſt of England, as far as the Land's-End, in the ſummer of 1667, and returning by London, Mr. Ray was ſolicited to become a Fellow of the Royal Society, into which learned body he was admitted November 7th. Being now requeſted by his friend Wilkins to tranſlate the "Real Character" into Latin, he undertook, and by degrees accompliſhed, that arduous performance, depoſiting his manuſcript in the library of the Royal Society, where it has ever ſince repoſed. The following ſummer was agreeably ſpent, in viſits to various literary friends, and in a ſolitary journey to the north; for his former companion Willughby, being juſt married, ſtayed at home; there Ray joined him in September 1668, and remained for moſt part of the enſuing winter and ſpring.

The ſeclusion and leiſure of the country, with the converſe and aſſiſtance of ſuch a friend, were favourable to the proſecution of a new ſubject of enquiry, which now ſtrongly attracted the attention of our great naturaliſt, the theory of vegetation. The firſt ſtep of the two philoſophers, in this little-explored path, was an examination of the motion of the ſap in trees; and the reſult of their enquiries, communicated to the Royal Society, appeared ſoon after in the Philoſophical Tranſactions. Their experiments clearly prove the aſcent of the ſap through the woody part of the tree; which is eaſily detected by boring the trunk, at different depths, before the leaves are unfolded; and they obſerved alſo the mucilaginous nature of the flowing ſap, "precipitating a kind of white coagulum or jelly, which," ſays Ray, in a note preſerved by Derham, "may be well conceived to be the part which, every year, between bark and tree, turns to wood, and of which the leaves and fruit are made. It ſeems to precipitate more when the tree is juſt ready to put out leaves, and begins to ceaſe dropping, than at its firſt bleeding." The accuracy of the leading facts recorded by theſe ingenious men, is confirmed by ſubſequent obſervers, who have further purſued the ſame ſubject, which is now ſufficiently

ſufficiently well underſtood. They indeed, like the reſt of the world till lately, ſeem not to have ſuſpected, that the ſap was quieſcent till their perforations in the tree were made; nor did they advert, as they ought, to phenomena dependent on the principle of life, in the vegetable body. See CIRCULATION *of the Sap*.

At this time Ray began to prepare for the preſs his "Collection of Proverbs," a curious book in its way, by which he is perhaps better known to the generality of his countrymen, than by any other of his literary labours. The firſt edition was publiſhed in 1672; but the work was ſubſequently much enlarged, and the author may almoſt be ſaid to have exhauſted his ſubject. From its very nature, delicacy and refinement muſt often be diſpenſed with; but this is evidently not the fault, or the aim, of the writer. His learning and critical acuteneſs diffuſe light over the whole, and make us overlook the coarſe vehicle of our inſtruction.

The firſt edition of the Catalogue of Engliſh Plants, already mentioned, came out in 1670, and the ſecond in 1677. Their great author gave his work to the world with that diffidence, for which he alone perhaps could perceive any juſt foundation. We poſtpone our remarks till we ſpeak of the ſame work in its ſyſtematic form hereafter.

About this period the health of Mr. Ray ſeems to have been conſiderably impaired. He refuſed a tempting offer to travel again on the continent, as tutor to three young noblemen; nor could the powerful attractions of alpine botany, which made a part of his proſpect, overcome the reluctance to leaving home, which aroſe from a feeble ſtate of body. Indeed this very reluctance, or liſtleſsneſs, is accounted for, by the turn which his diſorder took, as it terminated in the jaundice. After this depreſſing complaint had left him, he reſumed, with freſh alacrity, his botanical travels at home, viſiting the rich ſtores of the north of England, with a companion named Thomas Williſel, whoſe name and diſcoveries he afterwards, on many occaſions, has gratefully commemorated. Nothing forms a more ſtriking feature in Ray's character, than the unreſerved and abundant commendation, which he always gave to his friends and fellow-labourers. We are about to narrate an event, which called forth all his affectionate feelings of this kind, as well as his moſt important and beneficial exertions; when, even to his own prejudice, he fulfilled the ſacred duties of friendſhip, and delighted in adorning the buſt of his friend with wreaths, that he himſelf might juſtly have aſſumed. On the 3d of July 1672, Mr. Willughby was unexpectedly carried off by an acute diſorder, in the 37th year of his age. The care of his two infant ſons was confided by himſelf to Mr. Ray, who was alſo appointed one of his five executors, and to whom he left an annuity of 60*l.* for life. The eldeſt of theſe youths was created a baronet at the age of 10 years, but died before he was 20. Their ſiſter Caſſandra afterwards married the duke of Chandos. Thomas, the younger ſon, was one of the ten peers created, all on the ſame day, by queen Anne, and received the title of lord Middleton. His early youth was much indebted to the care of his faithful guardian, who compoſed, for his and his brother's uſe, and publiſhed in 1672, a *Nomenclator Claſſicus*, far more exact, eſpecially in the names of natural objects, than any that had previouſly appeared. The care of his pupils, and of the literary concerns of their deceaſed parent, now interrupted Mr. Ray's botanizing excurſions, and cauſed him alſo to decline the offer of Dr. Liſter, then a phyſician at York, to ſettle under his roof. Biſhop Wilkins did not long ſurvive Mr. Willughby, and his death made another chaſm in the ſcientific and ſocial circle of our great natural philoſopher, who felt theſe loſſes as deeply and tenderly as any man. He ſought conſolation in a domeſtic attachment, fixing his choice on a young woman, of good parentage, whoſe name was Margaret Oakeley, and who reſided in the family at Middleton-hall. He was married at the pariſh church, June 5th, 1673, being then in the 45th year of his age, and his bride about 20. This lady took a ſhare in the early education of his pupils, as far as concerned their reading Engliſh. She is ſaid to have been recommended by her character, as well as her perſon, to the regard of her huſband. She bore him three daughters, who, with their mother, ſurvived him.

Ray's communications to the Royal Society became now very frequent, and extended to various ſubjects relative to the natural hiſtory of animals, as well as to the phyſiology, and even the botanical characters, of vegetables. He was, at the ſame time, in the courſe of the years 1674 and 1675, much occupied in digeſting Mr. Willughby's zoological papers. Theſe were compoſed in Latin, in which language the Ornithology firſt appeared in 1676, making a folio volume, accompanied by 77 plates, engraved, at the expence of the author's widow, from his own drawings. An Engliſh tranſlation by Ray, with ſtill more additions than he had ſupplied to the former publication, and one more plate, iſſued from the preſs in 1678. The account which Dr. Derham received from the lips of Mr. Ray, about eight months previous to his deceaſe, reſpecting the primary intentions of himſelf and his late friend, and which is recorded in his life, p. 48, is too curious to be omitted here, as their project and its execution form an epocha in the hiſtory of natural ſcience. "Theſe two gentlemen," ſays Derham, "finding the hiſtory of Nature very imperfect, had agreed between themſelves, before their travels beyond ſea, to reduce the ſeveral tribes of things to a method; and to give accurate deſcriptions of the ſeveral ſpecies, from a ſtrict view of them. And foraſmuch as Mr. Willughby's genius lay chiefly to Animals, therefore he undertook the Birds, Beaſts, Fiſhes, and Inſects, as Mr. Ray did the Vegetables." Derham adds, that Mr. Willughby, during his ſhort life, "proſecuted his deſign with as great application, as if he had been to get his bread thereby." The writer of the preſent article has elſewhere obſerved, (Introductory Diſcourſe, Tr. of Linn. Soc. v. 1,) that "from the affectionate care with which Ray has cheriſhed the fame of his departed friend, we are in danger of attributing too much to Mr. Willughby, and too little to himſelf." His own ſtatement, no doubt, was correct, as to their original aims; but it is impoſſible not to perceive that the ſurvivor executed or perfected what his friend, in many inſtances, could only have projected, or ſcarcely begun. Had Willughby lived, there can be little doubt of his career being as glorious in the ſequel as that of his friend; and poſſibly, from the advantages of fortune which he enjoyed, even more widely beneficial to ſcience. Yet who can tell that he might not have ſlackened his courſe? Though he glorioufly avoided the ſnares of luxury and folly in his youth, who ſhall ſay that politics or ambition might not have dazzled his riper age? or that he would always have eſcaped that ruinous vanity, which graſps at univerſal knowledge, or rather at univerſal fame; and knowing nothing deeply, is moſt flattered with any praiſe which is leaſt deſerved. So often has this laſt been the caſe with literary men, that one cannot but miſtruſt a character of the faireſt promiſe. What Ray has done, we know and can appreciate. Equal to his friend in learning, talents, and zeal, the advantages of ample fortune were compenſated by the leiſure and tranquillity of a ſequeſtered country life. His duties

went hand in hand with his ſtudies and recreations, and he enjoyed, as Haller obſerves, the rare felicity of giving 50 years uninterruptedly to his favourite ſcience. His long-protracted ſtudies, and ripened experience, enabled him to achieve what at firſt he could but regard at a diſtance, as the great object of his wiſhes, a ſyſtematic arrangement of the animal as well as vegetable kingdoms. Every body had, hitherto, been content with Ariſtotle's claſſification of animals, of whoſe imperfections Ray, daring to think for himſelf, could not but be aware. He invented a new one, founded on the ſtructure of the heart. "The Harveian experiments, and, doctrine of the circulation, had called the peculiar attention of philoſophers to every organ which has a ſhare in that phenomenon; and to this cauſe, probably, we owe the method of Ray." The mode of breathing in animals, whether by lungs or by gills, and the ſingle or double ſtructure of the heart, in the former caſe, conſtitute the baſis of his ſyſtem; which, in theſe particulars at leaſt, ſucceeding naturaliſts have adopted. His ſubordinate characters of the principal claſſes evince great ſkill and ſagacity, and the Linnæan ſyſtem of Quadrupeds is highly indebted to that of our illuſtrious countryman.

His zoological publications indeed did not follow each other in rapid ſucceſſion; for after the Ornithology had come forth in Engliſh, eight years elapſed before the *Hiſtoria Piſcium* of Willughby was given, by his care, to the world. This was printed in folio, with 188 plates of fiſhes, in 1686, at Oxford, owing to the intereſt of biſhop Fell, and the pecuniary aſſiſtance of the Royal Society. It does not appear why the relict of Mr. Willughby withheld, in this inſtance, the contributions which had ſo much benefited her huſband's former work, and which ſhe juſtly owed to his fame. It ſeems that the intimate connexion of Ray with this family, was much impaired by the death of lady Caſſandra Willughby, the mother of his friend, about the year 1675 or 1676; when the children were taken from his tuition, and he left Middleton-hall, fixing for a ſhort time at Sutton Cofeld, four miles diſtant. At Michaelmas 1677 he removed from thence to Falborne-hall, in Eſſex, not far from his native village. On the 15th of March following, his mother, at the age of 78, died at Black Notley, "in her houſe on Dewlands;" of whom he ſpeaks with that reverence and regret, which has peculiarly marked the characters of ſome of the greateſt and beſt men on the ſame occaſion. At Midſummer 1679, he finally ſettled at Black Notley, for the remainder of his days, or "for the ſhort pittance of time he had yet to live in this world," as he himſelf expreſſed it; which pittance, however, extended to more than twenty-five years.

The firſt fruit of our author's leiſure and retirement was his *Methodus Plantarum Nova*, publiſhed in 1682, making an octavo volume. His principles of arrangement are chiefly derived from the fruit. The regularity and irregularity of flowers, which take the lead in the ſyſtem of Rivinus, make no part of that of Ray. It is remarkable that he adopts the ancient primary diviſion of plants, into trees, ſhrubs, and herbs, and that he blamed Rivinus for aboliſhing it, though his own prefatory remarks tend to overſet that principle, as a vulgar and caſual one, unworthy of a philoſopher. That his ſyſtem was not merely a commodious artificial aid to practical botany, but a philoſophical clue to the labyrinth of Nature, he probably, like his fellow-labourers, for many years, in this department, believed; yet he was too modeſt, and too learned, to think he had brought this new and arduous deſign to perfection; for whatever he has incidentally or deliberately thrown out, reſpecting the value of his labours, is often marked with more diffidence on the ſubject of claſſification, than any other. He firſt applied his ſyſtem to practical uſe in a general *Hiſtoria Plantarum*, of which the firſt volume, a thick folio, was publiſhed in 1686, and the ſecond in 1687. The third volume of the ſame work, which is ſupplementary, came out in 1704. This vaſt and critical compilation is ſtill in uſe as a book of reference, being particularly valuable as an epitome of the contents of various rare and expenſive works, which ordinary libraries cannot poſſeſs, ſuch as the *Hortus Malabaricus*. The deſcription of ſpecies is faithful and inſtructive; the remarks original, bounded only by the whole circuit of the botanical learning of that day; nor are generic characters neglected, however vaguely they are aſſumed. Specific differences do not enter regularly into the author's plan, nor has he followed any uniform rules of nomenclature. So ample a tranſcript of the practical knowledge of ſuch a botaniſt, cannot but be a treaſure; yet it is now much neglected, few perſons being learned enough to uſe it with facility, for want of figures, and a popular nomenclature; and thoſe who are, ſeldom requiring its aſſiſtance. A mere catalogue or index, like the works of Tournefort and Caſpar Bauhin, which teach nothing of themſelves, are of readier uſe. The Species Plantarum of Linnæus unites the advantages of the cleareſt moſt conciſe ſpecific definition, and, by the help of Bauhin, of an univerſal index.

But if the fame or the utility of Ray's great botanical work has, neither of them, been commenſurate with the expectations that might have been formed, a little octavo volume, which he gave to the world in 1690, amply ſupplied all ſuch defects, and proved the great corner ſtone of his reputation in this department of ſcience. We ſpeak of the *Synopſis Methodica Stirpium Britannicarum*. The two editions of his alphabetical catalogue of Engliſh plants being ſold off, and ſome pettifogging reaſons of his bookſeller's ſtanding in the way of a third, with any improvements, he re-modelled the work, throwing it into a ſyſtematic form, reviſing the whole, ſupplying generic characters, with numerous additions of ſpecies, and various emendations and remarks. The uſes and medicinal qualities of the plants are removed to the alphabetical index at the end. A ſecond edition of this *Synopſis* was publiſhed in 1696, nor did its author ever prepare another. The third, now moſt in uſe, was edited twenty-eight years afterwards by Dillenius. (See that biographical article.) Of all the ſyſtematical and practical Floras of any country, the ſecond edition of Ray's *Synopſis* is the moſt perfect that ever came under our obſervation. "He examined every plant recorded in his work, and even gathered moſt of them himſelf. He inveſtigated their ſynonyms with conſummate accuracy; and if the clearneſs and preciſion of other authors had equalled his, he would ſcarcely have committed an error. It is difficult to find him in a miſtake or miſconception reſpecting Nature herſelf, though he ſometimes miſapprehends the bad figures, or lame deſcriptions, he was obliged to conſult." *Tr. of Linn. Soc. v.* 4. 277. Above a hundred ſpecies are added, in this ſecond edition, and the cryptogamic plants, in particular, are more amply elucidated. A controverſial letter from Rivinus to Ray, and its anſwer, with remarks upon Tournefort, are ſubjoined to this ſecond edition. Much of the diſpute turns upon the now obſolete diſtinction of plants, in a methodical ſyſtem, into trees, ſhrubs, herbs, &c. The letters are well written, in Latin: and liberal, though perhaps hypercritical, in their ſtyle. Ray took no delight in controverſy. Its in-

evitable

evitable aſperities were foreign to his nature. We muſt not omit to notice that, in the preface to both editions of his *Synopſis*, the learned author, venerable for his character, his talents, and his profeſſion, as well as by his noble adherence to principle in the moſt corrupt times, has taken occaſion to congratulate his country, and to pour out his grateful effuſions to Divine Providence. in a ſtyle worthy of Milton, for the eſtabliſhment of religion, law, and liberty, by the revolution which placed king William on the throne. An honeſt Engliſhman, however retired in his habits and his purſuits, could not have withheld this tribute at ſuch a time; nor was any loyalty ever more perſonally diſintereſted than that of Ray.

The year 1690 was the date of the firſt publication of his noble work on "The Wiſdom of God in the Creation," of which we have already ſpoken, and whoſe ſale, through many editions, was very extenſive. In 1700 he printed a book, more excluſively within the ſphere of his ſacred profeſſion, called "A Perſuaſive to an Holy Life;" a rare performance of the kind, at that day, as it would be at the preſent; being devoid of enthuſiaſm, myſticiſm, or cant, as well as of religious bigotry or party ſpirit, "and employing the plain and ſolid arguments of reaſon, for the beſt of purpoſes." His three "Phyſico-Theological Diſcourſes, concerning the Chaos, Deluge, and Diſſolution of the World," of which the original materials had been collected and prepared formerly at Cambridge, came out in 1692, and were reprinted the following year. A third edition, ſuperintended by Derham, was publiſhed in 1713. This able editor took up the ſame ſubject himſelf in a ſimilar performance, the materials of which, like Ray's, were firſt delivered in ſermons, at Bow church, he having been appointed reader of Mr. Boyle's lectures.

While Ray was from time to time intent on theſe moral and religious performances, in which he laboured equally to impreſs and elucidate the truths of natural and revealed religion, as well as to enforce its precepts and duties, he was no leſs attentive than formerly to his ſyſtematical ſtudies. Dr. Tancred Robinſon is recorded by Derham, as having firſt prompted our great naturaliſt to undertake a *Synopſis Methodica*, or claſſical arrangement, of the whole animal, as he had done of the vegetable, kingdom. He even wiſhed him to extend his attention to foſſils, anticipating, in ſhort, what Linnæus afterwards performed. Nor did he ſhrink from the taſk. Though now for ſome time oppreſſed with bodily infirmity, and particularly with very troubleſome ulcers in his legs, his mind was tranquil and unimpaired. He ſoon finiſhed his *Synopſis Methodica Animalium Quadrupedum et Serpentini Generis*, which came out in 1693, making a thin, but cloſely printed, octavo volume. We have already ſpoken of the originality of his method. The volume in queſtion, however, is not confined to dry ſyſtematical arrangement. It enters deeply into the general and particular hiſtory of animals, their external forms, and internal ſtructure, with abundance of entertaining and curious facts and obſervations. Linnæus was poſſeſſed of this book from the year 1734, and appears to have ſtudied it well. A ſimilar volume on birds, and another on fiſhes, were prepared by the author; but the manuſcripts of theſe lay neglected in the hands of ſome careleſs or ignorant bookſeller, till they were diſcovered by Dr. Derham, and publiſhed in 1713. They contain more of particular deſcriptions and hiſtories, than of general remarks; but otherwiſe accord with the plan of the Synopſis of Quadrupeds. Many things are ſupplied from materials obtained ſince the publication of Willughby's Ornithology and Ichthyology, and ſeveral figures of fiſhes were added by Derham, at the perſuaſion of Petiver, whoſe works they ſomewhat reſemble.

Having accompliſhed ſo many great and laborious publications, our venerable naturaliſt began, as Dr. Derham informs us, to enjoy the thoughts of repoſing from his labours. He was nevertheleſs ready, at the call of his friends, to reviſe a tranſlation of Rauwolf's Travels, the original having even then become very ſcarce, beſides being unintelligible to mere Engliſh readers. This tranſlation, with ſome other rare tracts annexed, and a catalogue of Grecian, Syrian, Egyptian, and Cretan plants, drawn up by Mr. Ray, iſſued from the preſs in 1693. See RAUWOLFIA.

Poſſibly the *Stirpium Europæarum extra Britannias naſcentium Sylloge*, which appeared in 1694, originated in the author's attention being recalled, by the laſt-mentioned publication, to the contemplation of exotic plants. In this volume he collects from Cluſius, Bauhin, Columna, and others, various additions to his own diſcoveries, and the whole are diſpoſed in alphabetical order. A geographical view of the plants, which he had himſelf gathered in his foreign travels, is ſubjoined; and the volume concludes with alphabetical catalogues, ſelected from Boccone's Sicilian plants, and other recent authors. It is in the preface to this book, that he firſt adverts to the ſyſtem of Rivinus, not without juſt applauſe of that author's work, a copy of which had been preſented to Ray. He commends the apt diſtribution of the genera, the clearneſs and conciſeneſs of the ſtyle, the purity of the Latin, and the beauty as well as exactneſs of the plates. He, however, contends for the ancient diſtinction of plants into trees and herbs, which, as we have ſeen, he had himſelf mentioned as unphiloſophical. In the reſt of his criticiſms, though "much may be ſaid on both ſides," and though theſe controverſialiſts, like others, profit of the intricacies and anomalies of Nature, to make good their arguments, concealing themſelves, like the cuttle-fiſh, in their ink; ſtill we cannot but give our teſtimony to the greater ſolidity of Ray's principles, as derived from the fruits and ſeeds of plants, than to the ſeemingly more elegant ones of Rivinus, deduced from the flower; which laſt undoubtedly lead, in their practical application, to ſome paradoxical combinations. But on this ſubject we may ſay more in its proper place. (See RIVINUS.) In this preface Ray points out the importance and uſe of the ſtamens and piſtils, ſuccinctly explaining the ſexual doctrine, as now univerſally admitted.

One advantage aroſe from the epiſtolary altercation of Rivinus and Ray, that it led the latter to reviſe his own ſyſtem, and to republiſh it, in an improved ſtate. Happy if ſuch were more generally the fruit of contention, that each party ſhould correct himſelf. inſtead of aggravating the defects of his adverſary. Some notice is taken, in the preface to this edition, both of the ſyſtem of Tournefort and that of Hermann, which laſt was moſt congenial to the principles of Ray. The work was finiſhed in 1698, but not given to the public till 1703, recourſe having been had to a Dutch bookſeller, who thought it for his intereſt to place an Engliſh publiſher's name in the title-page; a proceeding which, however harmleſs, ſhocked the honeſt feelings of the author; and this perhaps excited the thrifty Hollander's ſurprize. By his exertions, however, the book, and the fame of its author, became more widely diffuſed, and continental botaniſts were much further initiated into Ray's ſyſtem than they had previouſly been.

But now the mortal career of this eminent man was drawing towards a cloſe. He complained in his letters, that, ſo far from being able to viſit the London gardens, as he wiſhed,

in order to make obſervations upon plants, for the greater perfection of this laſt edition of his *Methodus*, he was not able to walk into his neighbouring fields. He ſtill, nevertheleſs, kept up to the laſt his correſpondence with his friends, in the vivacity and clearneſs of ſtyle which was natural to him. Latin and Engliſh, it is ſaid, were equally ready to his pen. So indefatigable was he in the cultivation of the ſtudy of Nature, that within a year or two of his death, he began to collect his ſcattered notes for a work on Inſects, and actually drew up a *Methodus Inſectorum*, which was printed, ſoon after his deceaſe, in a little octavo of ſixteen pages, and republiſhed in the front of his *Hiſtoria Inſectorum*. This laſt book, compriſing all his own and Mr. Willughby's deſcriptions of inſects, came from the preſs in 1710, at the expence of the Royal Society, and under the ſuperintendance of Dr. Derham. It conſiſts of 375 quarto pages, beſides an appendix of twenty-three more, on Britiſh Beetles, by Liſter. Ray attributes to Willughby that part of his ſyſtem which concerns inſects ſuppoſed to undergo no metamorphoſis. Theſe are moſtly the *aptera* of Linnæus, excluding the *cruſtacea*, but admitting inteſtinal *vermes*, earth-worms, and even leeches. All the deſcriptions and remarks of his departed friend are marked with the initials F.W. This work is a maſs of accurate and authentic obſervation; but, for want of plates, has never come into popular uſe. Linnæus ſtudied it much, and has often cited the deſcriptions, the appropriation of which is, however, too difficult and uncertain to render them of general or extenſive ſervice. Thoſe which regard the *Lepidoptera*, and their caterpillars, are moſt copious.

The ſtudy of inſects was probably the laſt that engaged the attention of this great and wiſe man; who, though on the verge of eternity, in the full poſſeſſion of himſelf, and in the anticipation of the moſt glorious manifeſtations of his Creator, did not diſdain or neglect to contemplate him in his leaſt and loweſt works. Such an example might ſerve for an occaſional anſwer to thoſe who affect to think the ſtudy of any of the works of God below the dignity of their philoſophy; for the moſt inordinate vanity muſt look with reſpect on what formed the abſtruſe ſtudies of ſo diſtinguiſhed a perſon as Ray. His laſt letter to Dr. Derham, who had juſt been to viſit him, is dated Auguſt 16, 1704. He ſpeaks of having lately obtained Mr. Willughby's entomological papers, and deſcribes himſelf as then entering on his Hiſtory of Inſects. How well he employed his time during the autumn, is evident from what we have related concerning this work, for he never ſaw another ſpring. He died at Black Notley, in a houſe of his own building, Jan. 17, 1705, in the 77th year of his age. His character is thus conciſely given by Derham. "In his dealings, no man more ſtrictly juſt; in his converſation, no man more humble, courteous, and affable; towards God, no man more devout; and towards the poor and diſtreſſed, no man more compaſſionate and charitable, according to his abilities." The friend who wrote this eulogium, in his "Life of Mr. Ray," aſſerts, that he was buried, according to his own deſire, in *the church* of Black Notley; but the authors of the Biographia Britannica are probably more correct, in ſaying, that he declined the offer made him by the rector, of a place of interment in the chancel, chooſing rather to repoſe with his anceſtors, in the church-yard. He perhaps thought, with biſhop Hall, that "the houſe of God ought not to be made a repoſitory for dead carcaſes." However this might be, the latter account is confirmed by the original ſituation of his monument, erected at the expence, in part at leaſt, of biſhop Compton. The long and elegant Latin epitaph has often been publiſhed. Its author was the Rev. William Coyte, M.A., father of the late Dr. Coyte of Ipſwich, and the original manuſcript is now before us, containing the information that Ray was interred in the church-yard. In 1737, the monument in queſtion, which ſeems to have been a ſort of altar tomb, being nearly ruined, was reſtored at the charge of Dr. Legge, and removed for ſhelter into the church; where therefore it became *a cenotaph*, as an inſcription added on this occaſion terms it. Forty-five years afterwards the tomb again underwent a repair, by the care of the preſent ſir Thomas Gery Cullum and others, who ſubjoined a third inſcription, as follows:

Tumulum hunc,
a nonnullis humanitati, et ſcientiæ
naturali, faventibus,
olim conditum,
et aliorum bonâ diligentiâ
poſteà reſtauratum, 1737,
nunc e vetuſtatis ſitu et ſordibus
pauci de novo revocarunt, 1792.
ανδρων επιφανων πασα γη ταφος.

A more laſting monument was dedicated to the memory of our great Engliſh naturaliſt, in the genus of plants which bears his name. (See RAIANIA.) The opinion we have there, in few words expreſſed, of his high rank in botanical ſcience, it is hoped the preſent more diffuſe account will juſtify. It muſt be lamented that he made, as far as we can learn, no collection of dried plants, which might ſerve to aſcertain, in every caſe, what he deſcribed. The great Herbariums of Buddle, Uvedale, &c. ſtill kept in the Britiſh Muſeum, are indeed ſuppoſed to ſupply, in a great meaſure, this defect; they having been collected by perſons who had frequent communication with Ray, and were well acquainted with his plants. Whatever he had preſerved relative to any branch of natural hiſtory, he gave, a week before his death, to his neighbour Mr. Samuel Dale, author of the *Pharmacologia*. Nothing is ſaid of his library, which was probably inconſiderable. His pecuniary circumſtances were very limited, for he merely conformed as a layman to the church of England, and was unwilling to ſubſcribe what was requiſite for receiving preferment. He is recorded nevertheleſs to have diſapproved of ſeparatiſts from the national church; juſtly diſguſted, probably, by the contentions and fanaticiſm he had ſeen throughout the greater part of his life. His principles and feelings ſoared far above the faſtidious diſtinctions, which marked the orthodox or the heterodox of thoſe times, and his mind was uncontaminated with their paſſions. His good ſenſe might well lead him to regret, that thoſe who had ſo lately eſcaped a moſt tremendous common enemy, ſhould be ſo prone to quarrel amongſt themſelves. It is an honour to both theſe parties that they have been emulous to claim him as their ally.

In the preceding review of the literary productions of Ray, more numerous, as Haller ſays, than thoſe of any other botaniſt, Linnæus excepted, we have been obliged to paſs over ſeveral things of leſs note; ſuch as his liſts of native Britiſh plants, for Gibſon's edition of Camden's *Britannia*; and even a variety of communications to the Royal Society. Neither have we touched on the principles of his botanical ſyſtem, that ſubject being explained at length by our predeceſſor, the late Rev. Mr. Wood, under the article CLASSIFICATION. Thoſe who are anxious to peruſe a more full and critical inveſtigation of his works and ſtudies, than it has been poſſible to give in this place, will do well to conſult Dr. Pulteney's "Sketches of the Progreſs of Botany in England." The "Philoſophical Letters," collected and publiſhed in 1718, by Dr. Derham, containing 68 written by Ray, and

many more by his correfpondents, throw much light on his character and purfuits. We cannot help remarking that his hand-writing was peculiarly fair and elegant. A fpecimen of it exifts among fir Henry Spelman's vaft and curious collection of manufcripts, now in the poffeffion of John Patterfon, efq. late M. P. for Norwich.

The portraits of Ray are not numerous. One in oil, taken at an advanced period of his life, remains in the Britifh Mufeum, and Dr. John Sims is poffeffed of a miniature, of an earlier date, of which its owner has given an engraving, by way of frontifpiece to the firft volume of the "Annals of Botany," publifhed in 1805. The latter is rather deficient in that ftrength of character which appears in the more common prints, after a picture by Faithorne, often prefixed to the third edition of the *Synopfis*, and fometimes to the *Hiftoria Plantarum*. One of thefe prints was engraved by Elder; the other by Vertue. Neither of them is ftrictly appropriated to any particular book. That in the German edition of his "Wifdom of God in the Creation," publifhed at Leipfic in 1732, appears to be copied from one of thefe, and yet is fo unlike them in expreffion, that if it were poffible, one would fuppofe it taken from fome other portrait of the fame perfon. Ray's Works. His Life by Dr. Derham. Haller's Bibl. Bot. Pulteney's Sketches. Aikin's General Biography. S.

Ray, in *Geography*, a town of France, in the department of the Upper Saone; 12 miles E. of Champlitte.

Ray, in *Geometry*. See Radius.

Ray, *Radius*, in *Optics*, a beam or line of light, propagated from a radiant point, through any medium.

Sir Ifaac Newton defines rays to be the leaft parts of light, whether fucceffive in the fame line, or contemporary in feveral lines.

For, that light confifts of parts of both kinds, appears hence, that one may ftop what comes this moment in any point, and let pafs that which comes the next; and again, one may ftop what comes in this point, and let pafs that in the next. Now, the leaft light, or part of light, which may be thus ftopped alone, he calls a *ray of light*.

A ray of light is, therefore, confidered as an infinitely narrow portion, or an evanefcent element of a ftream of light; and a pencil, as a fmall detached ftream, compofed of a collection of fuch rays accompanying each other. As we cannot exhibit to the fenfes a fingle mathematical line, except as the boundary of two furfaces; in the fame manner, we cannot exhibit a fingle ray of light, except as the confine between light and darknefs, or as the lateral limit of a pencil of light.

If the parts of a ray of light do all lie ftraight between the radiant and the eye, which is the cafe when it moves through the fame uniform fubftance or a vacuum, called a medium, the ray is faid to be *direct:* the laws and properties of which make the fubject of optics. If any of them be turned out of that direction, or bent in their paffage, the ray is faid to be *refracted:* and that branch of optics which treats of thefe refracted rays, is called *dioptrics;* which fee. See alfo Refraction.

If it ftrike on the furface, or medium attached to the furface, of any body, and be driven back, it is faid to be *reflected:* and that branch of optics which treats of thefe refracted rays, is called *catoptrics;* which fee. See alfo Reflection.

In each cafe, the ray, as it falls either directly on the eye, or on the point of reflection, or of refraction, is faid to be *incident:* and the angle which the incident ray makes with the perpendicular to the reflecting furface at the point of incidence, is called the angle of incidence; and the angle which the reflected ray makes with the fame perpendicular, is called the angle of reflection; and alfo, the angle which the refracted ray makes with a perpendicular to the refracting furface produced, is called the angle of refraction.

Again, if feveral rays be propagated from the radiant equidiftantly from one another, they are called *parallel* rays. If they come inclining towards each other, they are called *converging* rays. And if they go continually receding from each other, they are called *diverging* rays.

It is evident that the rays of light, which come from a luminous point, muft fall divergingly upon any given furface; yet when the object is very diftant, compared with the interval that feparates thefe rays, the divergency of the rays becomes infenfible; hence the rays of the fun, of the moon, of the ftars, &c. are deemed parallel rays. When the luminous point is near, then the rays are fenfibly diverging.

It is from the various circumftances of rays, that the feveral kinds of bodies are diftinguifhed in optics. A body, *e. gr.* that diffufes its own light, or emits rays of its own, is called a *lucid*, or *luminous* body. If it only reflect rays which it receives from another, it is called an *illuminated* body.

This diftinction, however, is not always obferved; for a luminous body, in common language, means any vifible object, whether it be vifible by the emiffion of original light, like the fun, a candle, &c. or by reflected light, like the moon, or any other celeftial or terreftrial object that has no native light, or that does not emit its own light.

If an object only tranfmit rays, it is called a *tranfparent* body. So that tranfparent bodies, fuch as water, glafs, &c. are thofe through which light will pafs, or through which our eyes can perceive objects fituated on the other fide, and all fuch bodies, as alfo a vacuum, are denominated mediums in optics.

If it intercept the rays, or refufe them paffage, fo that nothing can be feen through it, it is called an *opaque* body.

Hence no body radiates, *i. e.* emits rays, unlefs it be either luminous, or illumined.

It is by means of rays reflected from the feveral points of illumined objects to the eye, that they become vifible, and that vifion is performed; whence fuch rays are called *vifual* rays.

When an eye views any object directly, fome of the rays, which proceed from every perceivable point of the object, enter the eye, and the whole number of rays, or quantity of light, which thus enters the eye, is circumfcribed by the rays which proceed from the extreme points of the object: and the angle which thefe extreme rays form at the eye is called the *vifual angle*, from the magnitude of which we principally judge of the diftance of a known object. Thus, if the fame object is repreſented at different diftances, it is evident that the farther the object is from the eye, the fmaller will the vifual angle be. Suppofing alfo the diftance between the eye and the object to remain the fame, if by any means the rays of light are bent fo as to enlarge the vifual angle, then the object will appear larger, or it is faid to be magnified; and on the contrary, if the vifual angle be diminifhed, then the object will appear fmaller, in which cafe it is faid to be diminifhed.

In effect, we find that any point of an object is feen in all places to which a right line may be drawn from that point: but it is allowed, nothing can be feen without light; therefore every point of an object diffufes innumerable rays every way. Again, from other experiments it appears, that the images of all objects, whence right lines may be drawn to

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he eye, are painted in the eye, behind the cryſtalline, very ſmall, but very diſtinct.

And laſtly, from other experiments, that each ray produces an image of the radiating point: and that the ſeveral rays emitted from the ſame point are again united in one point, by the cryſtalline, and other humours of the eye, and thus thrown on the retina.

It is the ſpiſſitude or cloſeneſs of the rays emitted from a luminous body, that conſtitutes the intenſeneſs of the light. Yet the direction in which the rays ſtrike the eye, has a conſiderable influence. In effect, a perpendicular ray, ſtriking with more force than an oblique one, in the ratio of the whole ſine to the ſine of the angle of obliquity (as follows from the laws of *percuſſion*, which ſee,) a perpendicular ray will affect the eye more vividly than an oblique one, in that ratio.

If then the ſpiſſitude of the rays be equal, the intenſity will be as the direction: if the direction be the ſame, the intenſeneſs will be as the ſpiſſitude: if both differ, the intenſeneſs will be in a ratio compounded of the direction and the ſpiſſitude.

Hence, firſt, if light be propagated in parallel rays through an unreſiſting medium, its intenſity will not be varied by diſtance.

Secondly, if light be propagated in diverging rays through an unreſiſting medium, its intenſity will decreaſe in a duplicate ratio of the diſtances from the radiant point, reciprocally.

Thirdly, if light be propagated in converging rays through an unreſiſting medium; its intenſity will increaſe in a duplicate ratio of the diſtances from the point of concourſe, reciprocally.

Fourthly, if the breadth of an illumined plane be to the diſtance of the radiant point as 1 to 2,000,000, it is the ſame thing as if the ray ſtruck upon it parallel: and hence, ſince the diameter of the pupil of the eye, when largeſt, ſcarcely exceeds $\frac{1}{4}$th or $\frac{1}{5}$th of an inch; the rays will fall upon it parallel as to ſenſe, at the diſtance of 3860 Engliſh feet, which is nearly ſix furlongs. See LIGHT.

The effect of concave lenſes, and convex mirrors, is to make parallel rays diverge; converging rays become parallel; and diverging rays to become more divergent.

The effect of convex lenſes, and concave mirrors, is to make diverging rays become parallel; parallel rays become convergent; and converging rays to converge the more. See LENS.

The rays of light are not homogeneous, or ſimilar, but differ in all the properties with which we are acquainted; *viz.* refrangibility, reflexibility, and colour.

It is probable that from the different refrangibility the other differences have their riſe; at leaſt it appears, that thoſe rays which agree or differ in this, do ſo in all the reſt. Thus, from the different ſenſations the differently diſpoſed rays excite in us, we call them *red* rays, *yellow* rays, &c.

The effect of the priſm is to ſeparate and ſort the different kinds of rays, which come blended promiſcuouſly from the ſun; and to throw each kind by itſelf, according to its degree of refrangibility and colour, red to red, blue to blue, &c.

Beſides refrangibility, and the other properties of the rays of light already aſcertained by obſervation and experiment, ſir Iſaac Newton ſuſpects they may have many more: particularly, a power of being inflected, or bent, by the action of diſtant bodies; and thoſe rays which differ in refrangibility, he conceives likewiſe to differ in this flexibility.

In paſſing by the edges and ſides of bodies, he conceives that the rays may be bent ſeveral times backwards and forwards, with a motion like that of an eel; and that thoſe rays which appear to fall on bodies are reflected or refracted before they arrive at the bodies: and adds, that they may be refracted, reflected, and inflected, all by the ſame principle acting in different circumſtances. See INFLECTION and LIGHT. See alſo REFLECTION and REFRACTION.

Again, do not the rays, falling on the bottom of the eye, excite vibrations in the retina; which, being propagated along the fibres of the optic nerve into the brain, cauſe viſion? and do not ſeveral ſorts of rays make vibrations of ſeveral bigneſſes, which excite ſenſations of ſeveral colours, much after the manner as the vibrations of the air, according to their ſeveral bigneſſes, excite ſenſations of ſeveral ſounds?

Particularly, do not the moſt refrangible rays excite the ſhorteſt vibrations, to make a ſenſation of a deep violet; and the leaſt refrangible the largeſt, to make a ſenſation of a deep red? and the ſeveral intermediate kinds of rays, vibrations of intermediate bigneſſes, to make ſenſations of the intermediate colours?

And may not the harmony and diſcord of colours ariſe from the proportion of theſe vibrations; as thoſe of ſound depend on the vibrations of the air; for ſome colours, if viewed together, are agreeable, as gold and indigo; others diſagreeable. See COLOUR.

Again, have not the rays of light ſeveral ſides endued with ſeveral original properties? It is certain we find, that every ray of light has two oppoſite ſides, originally endued with a property, on which the unuſual refraction of iſland cryſtal depends, and other two oppoſite ſides endued with that property.

Laſtly, are not the rays of light very ſmall bodies emitted from ſhining ſubſtances?

Such bodies may have all the conditions of light: and there is that action and re-action between tranſparent bodies and light, which very much reſembles the attractive force between other bodies. Nothing more is required for the production of all the various colours, and all the degrees of refrangibility, but that the rays of light be bodies of different ſizes; the leaſt of which may make violet the weakeſt and darkeſt of the colours, and be the moſt eaſily diverted by refracting ſurfaces from its rectilinear courſe; and the reſt as they are bigger and bigger, may make the ſtronger and more lucid colours, blue, green, yellow, and red. (See COLOUR and LIGHT.) Nor is any thing more requiſite for the putting of the rays into fits of eaſy reflection, and eaſy tranſmiſſion, than that they may be ſmall bodies, which, by attraction, or ſome other force, excite vibrations in the bodies they act upon; which vibrations, being ſwifter than the rays, overtake them ſucceſſively, and agitate them ſo as by degrees to increaſe and diminiſh their velocity, and thereby put them into thoſe fits. Laſtly, the unuſual refraction of iſland cryſtal appears very much as if it were performed by ſome attractive virtue lodged in certain ſides both of the rays, and of the cryſtal.

RAYS *of Heat* denote ſeparate portions of that emanation, which proceeds from an heated body, when placed in a colder temperature, and which expands itſelf in every direction, provided it be not prevented by the interpoſition of particular ſubſtances. This appellation is adopted and thus applied, not becauſe that emanation is certainly known to conſiſt of ſeparate ſtreams, but merely for the convenience of explanation. The rays of heat are not the ſame with the rays of light. If this were the caſe, a certain quantity

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of heat ought to be accompanied with the ſame quantity of light; whereas it is found, that ſeveral ſubſtances emit a conſiderable quantity of light without any ſenſible heat, and others give out a conſiderable portion of heat without any light. But that theſe are two diſtinct powers of nature is a propoſition, that has been amply illuſtrated, and moſt ſatisfactorily eſtabliſhed by the diſcoveries and experiments of Dr. Herſchel. This celebrated aſtronomer cautions thoſe, who peruſe the account of his experiments and obſervations upon them, from concluding, that in uſing the word rays, he means to oppoſe, much leſs to countenance, the opinion of thoſe philoſophers, who ſtill believe, that light itſelf comes to us from the ſun, not by rays, but by the ſuppoſed vibration of an elaſtic ether, every where diffuſed through ſpace: he merely claims the ſame privilege for the rays that occur in heat, which they do not ſcruple to allow to thoſe that illuminate objects. For in what manner ſoever this radiance may be effected, he undertakes to prove, that the evidence, either for rays, or for vibrations, which occaſion heat, ſtands on the ſame foundation on which the radiance of the illuminating principle, light, is built.

Propoſing to give a comparative view of the operations that may be performed on the rays that occaſion heat, and of thoſe which are known to have been effected on the rays that occaſion light, he ſelects ſuch facts as are well known with regard to the latter. Light, he ſays, both ſolar and terreſtrial, is a ſenſation occaſioned by rays emanating from luminous bodies, which have a power of illuminating objects; and, according to circumſtances, of making them to appear of various colours. The rays of light are ſubject to the laws both of reflection and of refraction; but they are of different refrangibility. They are liable to be ſtopped in certain proportions, when tranſmitted through diaphanous bodies; and alſo to be ſcattered on rough ſurfaces. They are alſo ſuppoſed to have a power of heating bodies; but this is a ſubject "ſub judice." The ſimilar propoſitions, which it is his deſign to prove, and which by a variety of curious and well-conducted experiments he has confirmed, are ſuch as follow. Heat, both ſolar and terreſtrial, is a ſenſation occaſioned by rays emanating from candent ſubſtances, which have a power of heating bodies. Theſe rays are ſubject to the laws of reflection and of refraction; and they are of different refrangibility. They are liable to be ſtopped, in certain proportions, when tranſmitted through diaphanous bodies; and to be ſcattered on rough ſurfaces: and in a certain ſtate of energy, they may be ſuppoſed to have a power of illuminating objects, which latter property remains to be examined.

In the examination of the illuminating and heating power of the priſmatic colours, our author obſerves, that the red-making rays are very far from having the former in an eminent degree: the orange poſſeſſes more of it than the red; and the yellow rays illuminate objects ſtill more perfectly. The maximum of illumination lies in the brighteſt yellow, or paleſt green. The green itſelf is nearly equally bright with the yellow; but from the full deep green, the illuminating power decreaſes very ſenſibly; that of the blue is nearly upon a par with that of the red; the indigo has much leſs than the blue; and the violet is very deficient. Our author infers from other experiments, that the heating power of the priſmatic colours is very far from being equally diſtributed; and that the red rays are chiefly eminent in this reſpect. Allowing that the power of heating is chiefly lodged in the red-making rays, it accounts for the comfortable warmth that is thrown out from a fire, when it is in the ſtate of a red glow, and for the heat which is given by charcoal, coke, and balls of ſmall coal mixed up with clay, uſed in hot-houſes; all which throw out red light. It alſo explains the reaſon, why the yellow, green, blue, and purple flames of burning ſpirits mixed with ſalt, occaſion ſo little heat that a hand is not materially injured, when paſſed through their coruſcations.

Having aſcertained, that radiant heat is ſubject not only to the laws of refraction, but to thoſe alſo of the different refrangibility of light, Dr. Herſchel is led to ſurmiſe, that this heat conſiſts of particles of light of a certain range of momenta, which range may extend a little farther, on each ſide of refrangibility, than that of light. In a gradual expoſure of the thermometer to the rays of the priſmatic ſpectrum, beginning from the violet, he found that he arrived at the maximum of light long before he came to that of heat, which lies at the other extreme. By ſeveral experiments it appears, that the maximum of illumination has little more than half the heat of the full red rays; and from other experiments our author concludes, that the full red falls ſtill ſhort of the maximum of heat, which perhaps lies even a little beyond viſible refraction. In this caſe, radiant heat will at leaſt partly, if not chiefly, conſiſt, if the expreſſion may be allowed, of inviſible light, that is, of rays coming from the ſun, that have ſuch a momentum as to be unfit for viſion. Admitting it as highly probable, that the organs of ſight are only adapted to receive impreſſions from particles of a certain momentum, this will explain why the maximum of illumination ſhould be in the middle of the refrangible rays, as thoſe which have greater or leſs momenta, are likely to become equally unfit for impreſſions of ſight. Whereas, in radiant heat, there may be no ſuch limitation to the momentum of its particles. From the powerful effects of a burning lens, however, we derive information, that the momentum of terreſtrial radiant heat is not likely to exceed that of the ſun; and that, conſequently, the refrangibility of *calorific* rays cannot extend much beyond that of *colourific* light. Hence we may alſo infer, that the inviſible heat of red-hot iron, gradually cooled till it ceaſes to ſhine, has the momentum of the inviſible rays, which, in the ſolar ſpectrum viewed by daylight, go to the confines of red, and this will afford an eaſy ſolution of the reflection of inviſible heat by concave mirrors.

Our author deduces from various experiments with the thermometer abundant evidence, that there are rays coming from the ſun, which are leſs refrangible than any of thoſe that affect the ſight. They are inveſted with a high power of heating bodies, but with none of illuminating objects; and on this account they have hitherto eſcaped notice. At the diſtance of fifty-two inches from the priſm, there was ſtill a conſiderable heating power exerted by the inviſible rays, an inch and a half beyond the red ones, meaſured upon their projection on a horizontal plane. Moreover, the power of heating is extended to the utmoſt limits of the viſible violet rays, but not beyond them; and it is gradually impaired, as the rays become more refrangible. The maximum of the heating power is found to be veſted among the inviſible rays, and it is probably not leſs than half an inch beyond the laſt viſible ones. It is alſo ſhewn, that the ſun's inviſible rays, in their leſs refrangible ſtate, and conſiderably beyond the maximum, ſtill exert a heating power fully equal to that of red-coloured light; and conſequently, if we may infer the quantity of the efficient from the effect produced, the inviſible rays of the ſun probably far exceed the viſible ones in number. The general concluſion with which Dr. Herſchel cloſes his account of one ſeries of

of experiments and his reaſoning upon them, is in the following manner: "if," ſays he, "we call *light* thoſe rays which illuminate objects, and *radiant heat*, thoſe which heat bodies, it may be inquired whether light be eſſentially different from radiant heat? In anſwer to which I would ſuggeſt, that we are not allowed by the rules of philoſophizing to admit two different cauſes to explain certain effects, if they may be accounted for by one. A beam of radiant heat emanating from the ſun, conſiſts of rays that are differently refrangible. The range of their extent, when diſperſed by a priſm, begins at violet-coloured light, where they are moſt refracted, and have the leaſt efficacy. We have traced theſe calorific rays throughout the whole extent of the priſmatic ſpectrum, and found their power increaſing, while their refrangibility was leſſened, as far as to the confines of red coloured light. But their diminiſhing refrangibility, and increaſing power, did not ſtop here: for we have purſued them a conſiderable way beyond the *priſmatic ſpectrum* into an inviſible ſtate, ſtill exerting their increaſing energy, with a decreaſe of refrangibility up to the maximum of their power; and have alſo traced them to that ſtate, where, though ſtill leſs refracted, their energy, on account, we may ſuppoſe, of their now failing denſity, decreaſed pretty faſt; after which the inviſible *thermometrical ſpectrum*, if I may ſo call it, ſoon vaniſhed."—"If this," continues our author, "be a true account of ſolar heat, for the ſupport of which I appeal to my experiments, it remains only for us to admit, that ſuch of the rays of the ſun as have the refrangibility of thoſe which are contained in the priſmatic ſpectrum, by the conſtruction of the organs of ſight, are admitted, under the appearance of light and colour; and that the reſt, being ſtopped in the coats and humours of the eye, act upon them, as they are known to do upon all other parts of our body, by occaſioning a ſenſation of heat."

Although, as we have above ſtated, the rays of light and thoſe of heat poſſeſs many ſimilar properties, yet Dr. Herſchel has ſhewn, that there are ſome ſtriking and ſubſtantial differences between them. The rays of heat are of a much more extenſive refrangibility than thoſe of light, as our author has clearly and inconteſtibly demonſtrated both by reaſoning and experiment: nor do thoſe rays agree either in their mean refrangibility, nor in the ſituation of their maxima. Where we have moſt light, there is but little heat, and where we have moſt heat, we find no light at all. (See REFRANGIBILITY.) It is found, that the ſines of refraction of the heat-making rays are in a conſtant ratio to the ſines of incidence; but that the focus of the rays of heat in burning glaſſes is different from the focus of the rays of light: that of heat being farther removed from the lens than the focus of light, probably not leſs than a quarter of an inch: the heat at half an inch beyond the focus of light being ſtill equal to that in the focus. Although light and heat are both refrangible, the ratio of the ſines of incidence and refraction of the mean rays is not the ſame in both. Heat is evidently leſs refrangible than light. From experiments relating to the tranſmiſſion of light and heat through diaphanous bodies it appears, that no kind of regularity takes place in the proportion of rays of one ſort and of another, which are ſtopped in their paſſage. Heat and light ſeem to be entirely unconnected, and the rays that occaſion them are different. We have ſeveral tables, formed from the author's experiments, and ſhewing the quantities of light and heat intercepted by different ſubſtances. The blueiſh-white and flint-glaſſes, *e. gr.* ſtop nearly three times as much heat as light, whereas the greeniſh crown glaſs ſtops only about one-fourth more of the former than of the latter.

From a table exhibiting the effects of coloured glaſſes, it appears, that a yellow glaſs ſtops only 333 rays of heat, but ſtops 819 of light; on the contrary, a pale blue ſtops 812 rays of heat, and but 684 of light. Again, a dark blue glaſs ſtops only 362 rays of heat, but intercepts 801 of light; and a dark red glaſs ſtops no more than 606 rays of heat, and yet intercepts nearly all the light, ſcarcely one ray out of 5000 being able to make its way through it. For the concluſions deduced from theſe tables, as they evince the non-identity of the rays of heat and thoſe of light, and for the tables themſelves, we muſt refer to the author's own paper, *ubi infra*. We are reſtrained by our limits from purſuing this curious ſubject, and from entering on a detail of Dr. Herſchel's experiments, illuſtrating and confirming principles, the diſcovery of which muſt be allowed to be one of the greateſt that has been made ſince the days of Newton, although the theories of ſome ſpeculative philoſophers might have led to it a few years earlier. Dr. Herſchel was occupied in determining the properties of various kinds of coloured glaſs, which rendered them more or leſs fit for enabling the eye to view the ſun through a teleſcope; and for this purpoſe it was neceſſary to inquire which of the rays would furniſh the greateſt quantity of light, without ſubjecting the eye to the inconvenience of unneceſſary heat. He firſt obſerved that the heat became more and more conſiderable as the thermometer approached the extreme red rays in the priſmatic ſpectrum; and purſuing the experiment, he found not only that the heat continued beyond the viſible ſpectrum, but that it was even more intenſe where the thermometer was at a little diſtance without the limits of the ſpectrum, than in any point within it; as we have already ſtated. For Dr. Herſchel's communications to the Royal Society on this ſubject, we refer to the 90th volume of the Philoſophical Tranſactions for the year 1800, part ii. p. 255, &c. p. 284, &c. p. 293, &c. part iii. p. 437, &c.

Sir Henry Engleſield has repeated Dr. Herſchel's experiments with many precautions, and Mr. (ſir H.) Davy was a witneſs of their perfect accuracy. The exceſs of heat beyond the ſpectrum was even conſiderable enough to be aſcertained by the ſenſe of warmth occaſioned by ſhewing it on the hand.

It was firſt obſerved in Germany by Ritter, and ſoon afterwards in England by Dr. Wollaſton, that the muriate of ſilver is blackened by inviſible rays, which extend beyond the priſmatic ſpectrum, on the violet ſide. It is therefore probable, that theſe black or inviſible rays, the violet, blue, green, perhaps the yellow, and the red rays of light, and the rays of inviſible heat, conſtitute ſeven different degrees of the ſame ſcale, diſtinguiſhed from each other into this limited number, not by natural diviſions, but by their effects on our ſenſes; and we may alſo conclude that there is ſome ſimilar relation between heated and luminous bodies of different kinds. See Young's Phil. Lect. vol. i. p. 639. See HEAT and REFRACTION.

M. Delaroche has found, that the rays of inviſible heat traverſe glaſs with difficulty at a temperature below that of boiling water; but that they traverſe it with a facility, always increaſing with the temperature, as it approaches the point when bodies become luminous, and from theſe experiments it would appear, that the modification, whatever it be, which muſt be impreſſed upon the inviſible rays to render them more and more capable of paſſing through glaſs, makes them approach more and more to the ſtate in which they muſt be when they penetrate our eyes, and occaſion the ſenſation of viſion. The ſame ingenious philoſopher has likewiſe found, that the rays of heat which have paſſed through

through a plate of glaſs are proportionably more adapted to paſs through a ſecond plate; and from this circumſtance we deduce a new proof of the peculiar ſtate of theſe rays, and of the modification which they acquire. Meſſrs. Gay-Luſſac and Thenard have proved that all the changes of colour produced by light may be imitated and produced by heat, and by an elevation of temperature not exceeding 212°. Other phenomena previouſly obſerved indicated, that in the compariſon of the actions of heat and light in heating bodies, or producing chemical changes in them, there is a great difference in the rays of different colours. M. Rochon announced the fact amply confirmed by Dr. Herſchel, that the heat produced by the different rays of the priſmatic ſpectrum was unequal. As Dr. Herſchel fixed the maximum effect beyond the red rays, and ſhewed, as we have already ſtated, that the moſt heating rays of the ſpectrum were entirely, or nearly, inviſible; Dr. Wollaſton, and Meſſrs. Ritter and Beckmann, having examined the oppoſite, or violet end of the ſpectrum, found that this likewiſe poſſeſſed peculiar properties, and that, beyond the violet, there are inviſible rays, which poſſeſs, in greateſt perfection, the power of determining chemical combinations. It has been a ſubject of intereſting reſearch, whether the inviſible, or almoſt inviſible rays, ſituated beyond the extremities of the ſpectrum, poſſeſs any other properties of light. *E. gr.* If the reflection of them from poliſhed glaſs can give them that modification which Malus has diſtinguiſhed by the name of "polarization." (See LIGHT.) M. Berthollet engaged Meſſrs. Malus and Berard to undertake this double object. M. Malus's death prevented his proſecution of the ſubject; but what he began M. Berard accompliſhed with the utmoſt poſſible exactneſs. By means of the helioſtate, which Malus cauſed to be conſtructed for the philoſophical cabinet of M. Berthollet, he obtained a ray of light, perfectly fixed, on which he could make experiments at pleaſure. By decompoſing this ray with a priſm, he obtained an immoveable coloured ſpectrum; and by placing very ſenſible thermometers in the ſpaces occupied by the different colours, he was enabled to compare their calorific effects with the utmoſt certainty. He alſo aſcertained their chemical properties by ſubſtituting, in place of the thermometers, chemical compounds eaſily altered. He firſt of all obſerved the calorific power of the different rays, which, it is known, are in this reſpect unequal. M. Rochon, who is ſaid to have firſt obſerved this inequality, placed the maximum of heat in the yellow ray, where the illuminating power is the greateſt. Dr. Herſchel, as we have before ſhewn, placed it out of the ſpectrum, and beyond the red ray. The experiments of Herſchel have been confirmed by thoſe of Berard, as far as they reſpect the progreſſive heating power of the rays from the violet to the red; but he found the greateſt heating power at the extremity of the ſpectrum itſelf, and not beyond it. He fixed it at the point, where the bulb of the thermometer was ſtill entirely covered with the red ray; and he found that the thermometer ſunk progreſſively, in proportion as the diſtance of its bulb from the red ray increaſed. When he placed the thermometer quite beyond the viſible ſpectrum, on the ſpot where Herſchel fixed the maximum of heat, its elevation above that of the ambient air was only one-fifth of what it had been in the red ray itſelf. The abſolute intenſity of the heat produced was likewiſe leſs in the experiments of Berard than in thoſe of Herſchel.

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To the ray of ſolar light employed in this experiment, M. Berard ſubſtituted a pencil of radiant heat proceeding from a body hot, but not red, and even not luminous. The effect was the ſame as before. The thermometer roſe when the ſecond glaſs was ſo ſituated as to reflect light, and it did not riſe when the ſecond could not reflect light. Therefore the particles of inviſible radiant heat are modified by reflection, preciſely like light.

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of experiments and his reaſoning upon them, is in the following manner: "if," ſays he, "we call *light* thoſe rays which illuminate objects, and *radiant heat*, thoſe which heat bodies, it may be inquired whether light be eſſentially different from radiant heat? In anſwer to which I would ſuggeſt, that we are not allowed by the rules of philoſophizing to admit two different cauſes to explain certain effects, if they may be accounted for by one. A beam of radiant heat emanating from the ſun, conſiſts of rays that are differently refrangible. The range of their extent, when diſperſed by a priſm, begins at violet-coloured light, where they are moſt refracted, and have the leaſt efficacy. We have traced theſe calorific rays throughout the whole extent of the priſmatic ſpectrum, and found their power increaſing, while their refrangibility was leſſened, as far as to the confines of red coloured light. But their diminiſhing refrangibility, and increaſing power, did not ſtop here: for we have purſued them a conſiderable way beyond the *priſmatic ſpectrum* into an inviſible ſtate, ſtill exerting their increaſing energy, with a decreaſe of refrangibility up to the maximum of their power; and have alſo traced them to that ſtate, where, though ſtill leſs refracted, their energy, on account, we may ſuppoſe, of their now failing denſity, decreaſed pretty faſt; after which the inviſible *thermometrical ſpectrum*, if I may ſo call it, ſoon vaniſhed."—"If this," continues our author, "be a true account of ſolar heat, for the ſupport of which I appeal to my experiments, it remains only for us to admit, that ſuch of the rays of the ſun as have the refrangibility of thoſe which are contained in the priſmatic ſpectrum, by the conſtruction of the organs of ſight, are admitted, under the appearance of light and colour; and that the reſt, being ſtopped in the coats and humours of the eye, act upon them, as they are known to do upon all other parts of our body, by occaſioning a ſenſation of heat."

Although, as we have above ſtated, the rays of light and thoſe of heat poſſeſs many ſimilar properties, yet Dr. Herſchel has ſhewn, that there are ſome ſtriking and ſubſtantial differences between them. The rays of heat are of a much more extenſive refrangibility than thoſe of light, as our author has clearly and inconteſtibly demonſtrated both by reaſoning and experiment: nor do thoſe rays agree either in their mean refrangibility, nor in the ſituation of their maxima. Where we have moſt light, there is but little heat, and where we have moſt heat, we find no light at all. (See REFRANGIBILITY.) It is found, that the ſines of refraction of the heat-making rays are in a conſtant ratio to the ſines of incidence; but that the focus of the rays of heat in burning glaſſes is different from the focus of the rays of light: that of heat being farther removed from the lens than the focus of light, probably not leſs than a quarter of an inch: the heat at half an inch beyond the focus of light being ſtill equal to that in the focus. Although light and heat are both refrangible, the ratio of the ſines of incidence and refraction of the mean rays is not the ſame in both. Heat is evidently leſs refrangible than light. From experiments relating to the tranſmiſſion of light and heat through diaphanous bodies it appears, that no kind of regularity takes place in the proportion of rays of one ſort and of another, which are ſtopped in their paſſage. 'Heat and light ſeem to be entirely unconnected, and the rays that occaſion them are different. We have ſeveral tables, formed from the author's experiments, and ſhewing the quantities of light and heat intercepted by different ſubſtances. The blueiſh-white and flint-glaſſes, *e. gr.* ſtop nearly three times as much heat as light, whereas the greeniſh crown glaſs ſtops only about one-fourth more of the former than of the latter.

From a table exhibiting the effects of coloured glaſſes, it appears, that a yellow glaſs ſtops only 333 rays of heat, but ſtops 819 of light; on the contrary, a pale blue ſtops 812 rays of heat, and but 684 of light. Again, a dark blue glaſs ſtops only 362 rays of heat, but intercepts 801 of light; and a dark red glaſs ſtops no more than 606 rays of heat, and yet intercepts nearly all the light, ſcarcely one ray out of 5000 being able to make its way through it. For the concluſions deduced from theſe tables, as they evince the non-identity of the rays of heat and thoſe of light, and for the tables themſelves, we muſt refer to the author's own paper, *ubi infra*. We are reſtrained by our limits from purſuing this curious ſubject, and from entering on a detail of Dr. Herſchel's experiments, illuſtrating and confirming principles, the diſcovery of which muſt be allowed to be one of the greateſt that has been made ſince the days of Newton, although the theories of ſome ſpeculative philoſophers might have led to it a few years earlier. Dr. Herſchel was occupied in determining the properties of various kinds of coloured glaſs, which rendered them more or leſs fit for enabling the eye to view the ſun through a teleſcope; and for this purpoſe it was neceſſary to inquire which of the rays would furniſh the greateſt quantity of light, without ſubjecting the eye to the inconvenience of unneceſſary heat. He firſt obſerved that the heat became more and more conſiderable as the thermometer approached the extreme red rays in the priſmatic ſpectrum; and purſuing the experiment, he found not only that the heat continued beyond the viſible ſpectrum, but that it was even more intenſe where the thermometer was at a little diſtance without the limits of the ſpectrum, than in any point within it; as we have already ſtated. For Dr. Herſchel's communications to the Royal Society on this ſubject, we refer to the 90th volume of the Philoſophical Tranſactions for the year 1800, part ii. p. 255, &c. p. 284, &c. p. 293, &c. part iii. p. 437, &c.

Sir Henry Engleſield has repeated Dr. Herſchel's experiments with many precautions, and Mr. (ſir H.) Davy was a witneſs of their perfect accuracy. The exceſs of heat beyond the ſpectrum was even conſiderable enough to be aſcertained by the ſenſe of warmth occaſioned by ſhewing it on the hand.

It was firſt obſerved in Germany by Ritter, and ſoon afterwards in England by Dr. Wollaſton, that the muriate of ſilver is blackened by inviſible rays, which extend beyond the priſmatic ſpectrum, on the violet ſide. It is therefore probable, that theſe black or inviſible rays, the violet, blue, green, perhaps the yellow, and the red rays of light, and the rays of inviſible heat, conſtitute ſeven different degrees of the ſame ſcale, diſtinguiſhed from each other into this limited number, not by natural diviſions, but by their effects on our ſenſes; and we may alſo conclude that there is ſome ſimilar relation between heated and luminous bodies of different kinds. See Young's Phil. Lect. vol. i. p. 639. See HEAT and REFRACTION.

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M. Berard wiſhed to know if theſe properties would exiſt in each of the pencils into which the ray divides itſelf in paſſing through a rhomboid of Iceland ſpar. In this caſe each of the two ſpectra exhibited the ſame properties. In both, the calorific power diminiſhed from the violet to the red end; and it exiſted beyond the laſt viſible red rays. In this operation the luminous molecules are polarized by the cryſtal. In order to determine whether the inviſible rays of heat experience the ſame effect, M. Berard received the ſolar ray upon a poliſhed and tranſparent glaſs, which polarized a portion of it by reflection. This reflected ray was then received upon a ſecond glaſs, fixed in an apparatus, which permitted it to be turned round the ray under a conſtant incidence, and this incidence itſelf was determined in ſuch a manner, that in a certain poſition of the glaſs the reflection ceaſed to take place. We know, from the experiments of Malus, that a glaſs may be always diſpoſed in ſuch a manner that this condition is fulfilled. Things being thus diſpoſed, by collecting with a mirror the calorific and luminous rays reflected from the ſecond glaſs, and directing them upon a thermometer, M. Berard found, that as long as light was reflected the thermometer was elevated, and of courſe the heat was reflected likewiſe; but when, from the poſition of the ſecond glaſs, the light was totally tranſmitted, the heat was tranſmitted at the ſame time, and the thermometer was not elevated. In this experiment, then, as well as the preceding, the calorific principle, whatever it may be, never ſeparates from the luminous molecules.

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ble alteration. On the other hand, when expoſed to the other pencil, which was much leſs bright, and leſs hot, it was blackened in leſs than ſix minutes. M. Berard concluded, from this experiment, that the chemical effects produced by light are not ſolely owing to the heat developed in the body by its combining with the ſubſtance of the body; becauſe, on ſuch a ſuppoſition, the faculty of producing chemical combinations ought to be greateſt in thoſe rays which poſſeſs the faculty of heating in the greateſt perfection: but perhaps we ſhould find leſs oppoſition between theſe two opinions, if we attended to the different reſults which may be produced by the ſame agent placed in different circumſtances, and if we conſidered that agents of a nature quite diſſimilar may determine the ſame combinations when they are employed.

Various hypotheſes have been ſuggeſted in order to account for the properties above ſtated. If we wiſh to conſider ſolar light as compoſed of three diſtinct ſubſtances, one of which occaſions light, another heat, and the third chemical combinations; it will follow that each of theſe ſubſtances is ſeparable by the priſm into an infinity of different modifications, like light itſelf; ſince we find, by experiment, that each of the three properties, chemical, colorific, and calorific, is ſpread, though unequally, over a certain extent of the ſpectrum. Hence we muſt ſuppoſe, on that hypotheſis, that there exiſt three ſpectrums one above another; namely, a calorific, a colorific, and a chemical ſpectrum. We muſt, likewiſe, admit that each of the ſubſtances which compoſe the three ſpectrums, and even each molecule of unequal refrangibility which conſtitutes theſe ſubſtances, is endowed, like the molecules of viſible light, with the property of being polarized by reflection, and of eſcaping from reflection in the ſame poſitions as the luminous molecules, &c.

Inſtead of this complication of ideas, let us conceive ſimply, according to the phenomena, that light is compoſed of a collection of rays unequally refrangible, and of courſe unequally attracted by bodies. This ſuppoſes original differences in their ſize and velocity, or in their affinities. Why ſhould thoſe rays, which differ already in ſo many things, produce upon thermometers, or upon our organs, the ſame ſenſations of heat or light? Why ſhould they have the ſame energy to form or ſeparate combinations? Would it not be quite natural that viſion ſhould not operate on our eyes, except within certain limits of refrangibility; and that too little or too much refrangibility ſhould render it equally incapable of producing that effect. Perhaps theſe rays may be viſible to other eyes than ours, perhaps they are ſo to certain animals, which would account for certain actions that appear to us marvellous. In a word, we may conceive the calorific and chemical faculty to vary through the whole length of the ſpectrum, at the ſame time with the refrangibility, but according to different functions; ſo that the calorific faculty is at its minimum at the violet end of the ſpectrum, and at its maximum at the red end; while, on the other hand, the chemical faculty expreſſed by another function is at its minimum at the red end, and at its maximum at the violet end, or a little beyond it. This ſimple ſuppoſition, which is only the ſimple ſtatement of the phenomena, equally agrees with all the facts hitherto obſerved, and accounts for thoſe eſtabliſhed by M. Berard, and even enables us to predict them. In fact, if all the rays, which produce theſe three orders of phenomena, are rays of light, they muſt of courſe be polarized in paſſing through Iceland cryſtal, or in being reflected from a poliſhed glaſs with a determined incidence: and when they have received theſe modifications, they muſt be reflected by another glaſs, if it is properly placed, to exert its reflecting energy on the luminous molecules. On the other hand, if that force is null on the viſible luminous molecules, the inviſible light will not be any longer reflected: for the cauſe which occaſions or prevents reflection appears to act equally upon all the molecules, whatever their refrangibility may be. It ought, therefore, to act upon the molecules of inviſible light, the condition of viſibility or inviſibility relating merely to our eyes, and not to the nature of the molecules which produce theſe ſenſations in us.

This mode of viewing the facts appeared to Meſſrs. Berthollet, Chaptal, and Biot, who made a report to the Inſtitute on the Memoire of Berard, the moſt natural and ſimple; though the modeſt reſerve of Berard reſtrained him from deciding in a caſe, not ſufficiently examined by the teſt of experiment. Annal. de Chimie, vol. lxxxv. p. 309. or Thomſon's Annals of Philoſophy, N° 9.

RAY, *Common*, in *Optics*, is ſometimes uſed for a right line drawn from the point of concourſe of the two optical axes, through the middle of the right line which paſſes through the middle of the centres of the pupils of the two eyes.

RAYS, *Cone of.* See CONE.

RAYS, *Deflection of.* See DEFLECTION.

RAYS, *Inclination of incident.* See INCLINATION.

RAYS, *Optic.* See OPTIC.

RAYS, *Reflexibility of.* See REFLEXIBILITY.

RAY, *Principal*, in *Perſpective*, is the perpendicular diſtance between the eye and the vertical plane or table, as ſome call it. See PERSPECTIVE.

RAYS, *Pencil of.* See PENCIL *of Rays.*

RAYS, *Pyramid of.* See OPTIC *Pyramid.*

RAY *of Curvature*, in *Geometry*, is uſed to ſignify the ſemi-diameter of the circle of curvature. See RADIUS and CURVATURE.

RAY, *Raia*, in *Ichthyology.* See RAIA.

RAY, *Clavated.* See RAIA *Clavata*, and THORNBACK.

RAY, *Eagle.* See RAIA *Aquila.*

RAY, *Electric* or *Smooth*, a ſpecies of the raia. See RAIA, TORPEDO, and *Anatomy of* FISH.

RAY, *Fulier*, *Raia fullonica*, a ſpecies of ray, deriving its name from the inſtrument which fullers uſe in ſmoothing cloth, the back being rough and ſpiny. See RAIA *Fullonica.*

RAY, *Oblong.* See RAIA and RHINOBATOS.

RAY, *Oculated.* See RAIA and MIRALETUS.

RAY, *Rough.* See RAIA *Rubus.* At Scarborough, where it is common, it is called the white hans or gullet.

RAY, *Shagreen*, called at Scarborough the French ray, is about the ſize of the ſkate, but narrower in its form than the common kinds. The upper part of the body is covered cloſely with ſmall ſhagreen-like tubercles, reſembling the ſkin of the dog-fiſh; and from the noſe to the beginning of the pectoral fins is a tuberculated ſpace. Pennant.

RAY, *Sharp-noſed.* See RAIA *Oxyrinchus.* This fiſh makes a ſnorting noiſe, and is ſuppoſed to be the *bos* of the ancients, which Oppian deſcribes as the broadeſt among fiſhes, and fond of human fleſh; adding, that the method it takes of deſtroying men is by overlaying and keeping them down by its vaſt weight till they are drowned. Pennant.

RAY, *Sting.* See RAIA *Paſtinaca*, and PASTINACA *Marina.*

RAY, in our *Old Writers*, a word appropriated to cloth never coloured, or dyed, 11 Hen. IV. c. 6. Blount, Cowel.

RAYS, in *Botany*, the ſpreading marginal florets of a compound flower; ſee RADIUS. The ſame term is applied to the ſub-diviſions of an umbel, more properly denominated

its general and partial ſtalks; unleſs we, like Linnæus, conſider the whole umbel as one aggregate flower. See UMBELLA, and INFLORESCENCE.

RAY-*Graſs*, in *Agriculture*, an uſeful ſort of early graſs that has long been, and ſtill is, much cultivated by the farmer in ſome diſtricts. There are ſaid to be different varieties of this graſs, but that grown by Mr. Peacey, of Devonſhire, has been found, on experience, much ſuperior to the common ſort. This graſs has ſometimes the title of rye-graſs. See LOLIUM *Perenne*.

It has been remarked by the Rev. Mr. Duncan, of Kilmarnock, in the fourth volume of Communications to the Board of Agriculture, that it has been found of late that there is an annual and perennial kind; that the latter ſhould only be ſown; but that the annual ſeed, he thinks, affords the greateſt and moſt palatable crop of hay, and may be ſown on thoſe light ſoils which more readily tend to graſs, at leaſt a conſiderable proportion of it ſhould be blended with the perennial ſeed. He adds, that the two kinds of ſeeds are readily diſtinguiſhed by a careful obſerver, as the perennial is ſmaller, and fairer in colour, than the annual, and likewiſe much lighter. Good annual ſeed weighs from 21 to 24lbs. avoirdupois weight *per* buſhel, but the perennial only from 16 to 18lbs. As no diſtinction of theſe ſorts was formerly made by farmers, he ſuggeſts it as probable that they have come to be known and diſtinguiſhed, from the circumſtance of no ray-graſs diſappearing wholly the firſt year, by which ſome perſons have been tempted, from the high price of the ſeed, to allow what remained in the ſecond year to advance to maturity, though to the great injury of the paſture. It is therefore from the ſeed of the ſecond year's crop that he ſuppoſes the perennial graſs has gradually originated; and its inferiority in point of ſubſtance ſeems, he thinks, to prove the ſuppoſition. By this means the farmer may, by allotting a ſmall portion of good land for the purpoſe, ſupply himſelf with what is ſaid to be the perennial ſeed, without ſubmitting to the impoſition of an extravagant price, and may probably enſure or improve upon the durability of it, by collecting ſeed from the third or fourth year's growth.

It is found to be an excellent graſs for paſture as well as hay. It has an early, but not very abundant, foliage. It is highly reliſhed by cattle and ſheep. From its being apt to run up into flowering ſtems, it ſhould be kept well fed down. From its ſecreting and depoſiting much ſaccharine matter in the joints of the ſtems, it affords a large proportion of nutritious matter for the ſupport of animals, both in its green ſtate and when made into hay. And it is ſaid not to affect the wind of horſes, which renders it particularly valuable for hunting and racing horſes.

It has, however, been objected to by ſome, from the quantity of flower ſtems which it ſends up; but this is aſſerted by others to be only the caſe when it grows in dry upland ſituations. It is found, of courſe, to vary much under different circumſtances and ſituations.

The ſoils that are moſt ſuitable for it are thoſe of the loamy and ſandy kinds, but it is capable of being grown on thoſe of the clayey ſorts when not too ſtiff. On the two firſt ſorts, in mixture with other graſſes, it frequently becomes permanent, and affords an uſeful ſpring food, eſpecially for ſheep ſtock.

As it is found to produce a thick well-connected ſward in ſoils of the rich fertile kinds, it has been ſuppoſed only ſuited to them, though occaſionally met with in thoſe of the poorer deſcriptions.

In Eſſex it is found very bad for the ſtrong wet heavy lands. But in other diſtricts it is moſt ſown in ſtiff clayey ſoils, where clover is liable to fail in coming up well. Some, however, find that a light ſoil is quite as ſuitable for it as one of a clayey nature; and that though it may be moſt ſown in ſtiff heavy lands, it is not from the notion that lighter ſoils are leſs ſuited to it, but that ſuch lands may be covered with this graſs, ſhould the clover crop not turn out well in conſequence of the great ſtiffneſs of theſe clayey ſoils.

On the ſtiff clayey ſoils the proportion of ſeed is uſually from one buſhel to one buſhel and a half of ray-graſs, with eight or ten pounds of red clover ſeed, to the acre. On other ſoils from ſix to ten gallons of ray-graſs, with from five to eight pounds of red clover ſeed, and from two to four pounds of trefoil ſeed, are uſed to the acre; ſome adding to theſe, two, three, or more, pounds of white clover ſeed.

In Suſſex, for a layer for one or two years, they employ of ray-graſs ſeed three gallons, and of red clover and trefoil ſeed each one gallon, to the acre.

But for permanent paſture the proportion is this. Of ray-graſs ſeed four gallons, Dutch clover and trefoil ſeed, of each two gallons to the acre. Other different proportions are made uſe of in different caſes.

It has been well remarked by Dr. Campbell, in the third volume of Communications to the Board of Agriculture, that when land is in a proper ſtate of manure, ray-graſs united with white clover, will form a perfect ſward the latter end of the ſecond year after it is ſown. A particular field, of about five acres, that was ſown with theſe two graſſes only, was, he ſays, more perfectly graſſed over, than others, which had the addition of trefoil and rib-graſs, and which were ſown at the ſame time. A neighbour of his, the only man in the county that had tried ray-graſs, told him it would not anſwer, and referred him to a particular field where ſome had been ſown. The fact was, the doctor ſays, that he had cropped his field with oats until it was no longer worth ploughing, and then, with his laſt ſeed, he ſowed ray-graſs, which certainly did not flouriſh. But his argument would, he thinks, have been equally concluſive againſt any graſs or grain whatever. The ray-graſs languiſhed, and finally died away, giving place to the vegetation ſuited to the ſtate of the land. If it be expected that ray-graſs, or any other good graſs, ſhould thrive and produce abundant crops on exhauſted or poor land, it muſt not, he ſays, be in the ſoil which occurs here. And he adds the following uſeful remarks, on converting ray-graſs into hay; it is neceſſary to cut it at a period previous to its being ſo ripe as to have perfected its ſeed, and changed to a yellow colour; for in this caſe a great part of the juices of the plant, which conſtitute a principal part of the nutriment it is to afford, will be converted into a ſpecies of ſtraw, and its nutritive properties be proportionably diminiſhed. When it is made into hay, perſons not acquainted with its qualities are apt to object to its apparent coarſeneſs, which proceeds from its conſiſting almoſt entirely of flowering-ſtems, the ray-graſs having a comparatively ſmaller proportion of leaves than any other graſs. Whether this be a defect or a merit will, he thinks, depend upon a ſolution of this queſtion: Do the ſtems and flowering parts of graſs, or the leaves taken weight for weight, contain the greater proportion of nutriment? It does not appear, he ſays, that this has been determined by experiments inſtituted for the purpoſe; but it ſeems probable, from the ſtems being ſo much ſweeter than the leaves, (which is particularly perceptible upon chewing them when about half dry,) and from thoſe vegetables which contain much ſaccharine matter being particularly nutritious, that the greater proportionate quantity of

nutriment will be found to reſide in the ſtalks; and if ſo, the advantages of ray-graſs will be deciſive. But, however this may be, it is certain that, ſuppoſing wet weather comes on during the proceſs of hay-making, the firſt part of the graſs that decays is the leaf, which ſoon becomes yellow, and then black, loſing all pretenſions to nutritive properties; in which caſe it is evident that almoſt the whole nutriment contained in the hay muſt reſide, excluſively, in the flowering-ſtalks. Ray-graſs then has, in unfavourable hay-ſeaſons, an advantage, he thinks, over all others, inaſmuch as from having fewer leaves it is not ſo apt to be injured by a continuance of rain; and it is, beſides, when in the cocks, more acceſſible to the air and wind from lying more open and light; and conſequently not ſo apt to heat and mould as other graſſes in ſimilar ſituations and ſeaſons. And he concludes that it certainly poſſeſſes the following valuable properties. 1. That there are few graſſes ſo early in the ſpring. 2. That there are none better reliſhed by cattle, or more nutritive. 3. That it has the power of reſiſting the effects of bad weather, in tickliſh ſeaſons, in a greater degree than other graſſes. 4. That there is a greater facility in collecting its ſeed than of any other graſs.

It is ſuppoſed that the prejudices againſt it have proceeded, 1. From its having been ſown in land not capable of producing a full crop of any good vegetable. 2. From allowing it to ſhoot up ſo far, as to have formed the ſeed in the flowering-ſtalk, before cattle have been turned into paſture, or that it has been cut for hay. Ray-graſs appears, he thinks, to partake more of the nature of grain than any other graſs. Hence, when it has perfected its ſeeds, it ſhoots out no more ſtalks, and but few leaves that ſeaſon, as lord Kaimes has juſtly obſerved. Hence it is neceſſary to turn cattle into a field of this graſs early in the ſpring, and to keep it well under by a ſufficient quantity of ſtock; in which caſe it will continue to put out freſh flowering-ſtalks and leaves during the whole ſeaſon. 3. The hay, for the reaſon juſt aſſigned, ſhould be cut before it becomes a mere ſtraw. Common hay-graſs, being compoſed of graſſes in various ſtages of growth and ripeneſs, admits of greater latitude than a field of ray-graſs, becauſe many of them will generally be in a proper ſtate for cutting, although others may have paſſed their prime.

He adds the following facts in ſupport of its nutritious properties. No hay, ſays he, could be better reliſhed by my horſes than this was; not a particle of it was waſted by them, or left in the rack; no animals could thrive, coat, or do their work better, than they did, whilſt they had this ray-graſs hay to take to. Never was there a greater contraſt than when they were put to the natural hay-graſs of the country, after they had finiſhed the other. They were literally ſtarved into the eating of it; and in ſpite of an additional quantity of corn, they fell away (agreeable to his farming man's mode of expreſſion) a limb a-piece. This year nothing can look better than his horſes do upon this hay, (with which ſome red clover is mixed,) and this, with the addition of very little corn, and that moſtly light, the tailings of oats and barley.

Theſe facts place the utility of this graſs in a very ſtriking point of view. And the following, given by Mr. Duncan, are of the ſame tendency, as he found in a comparative experiment of pieces of ground laid to paſture with it, and meadow ſoft-graſs alone and in mixture, that the ray-graſs portion was not only more early ready for the ſcythe by nearly three weeks, but the hay of it always more greedily eaten by the horſes and cattle, as well as the paſture in ſucceeding years, on the ray-graſs diviſion, conſtantly eaten bare before the cattle ſtock would touch that of the ſoft graſs.

In the county of Eſſex the farmers in many places have, however, a very indifferent opinion of ray-graſs, believing it to do great injury to the land, eſpecially when of the better kind. When ſown with red clover, it does not do ſo well or is ſo good as a preparation for wheat, but it anſwers well for peaſe. In trying it mixed and unmixed with clover, ſome have found that when without it, it is all the better for the wheat; and that the wire-worm after ray is ſure to deſtroy the wheat.

In weaning calves it is found extremely uſeful and advantageous, as it agrees very well with them, far better than tares, which are liable to run through them, or ſcour.

In Suſſex this ſort of graſs is employed in mixture with others, as a ſheep-feed, with great benefit and ſucceſs.

The farmers in the tillage parts of Oxfordſhire alſo conſider ray-graſs as preparing badly for wheat; they conceive that the wheat which follows will never be found ſo good where it is ſown as where there is none. It is thought far from having any ameliorating effects on the land, as it *draws* too much. It is never ſown alone by ſome. It makes the very worſt hay, unleſs cut at an early period, or very young, in the opinion of many.

In Berkſhire this graſs is ſown in the chalk diſtrict, and found to a certainty leſs nutritious than many other ſorts, as well as more exhauſting in its nature. When intended for permanent paſture, it is found, in general, to fail in a very few years; and, unleſs the ſeed is changed, it will degenerate under any mode of management. It, however, poſſeſſes the advantage of being cheap, and of producing early ſeed, which are objects of no inconſiderable importance on a farm. Some find that the Peacey variety furniſhes feed a fortnight or three weeks ſooner than the common ſort. It is ſeldom ſown ſingly, but in mixture with many other artificial graſſes, in proportions to ſuit the difference of ſoil. In ſome places it is ſown with different other artificial graſſes in variety, every four years, on different parts of the land, ſo as to prevent it getting ſick of the ſame kind of ſeeds.

In the intention of hay, it ſhould be cut early, or its juices will be much exhauſted. Horſes fed on this ſort of hay are found to preſerve their wind better than on hay of other graſſes.

In Cheſhire the dairy farmers do not conſider it a good graſs for producing milk, on which account it is not ſo much cultivated; its earlineſs, however, has made it eſteemed by many; as on almoſt any ſoil, ſome ſuppoſe it will be a paſture a week or ten days ſooner than any other kind. And its having the property of correcting the tendency of clover to produce flatulency, renders it alſo highly worthy of the farmer's attention.

When for hay, if not cut early, the produce is ſcarcely ſo nutritious as ſtraw.

This graſs-ſeed is ſometimes ſown alone, and the quantity of ſeeds which the plants afford, and the facility of collecting it, are probably the reaſons of its being very common; while the advantages of its earlineſs have led to its more frequent cultivation. It is ſuggeſted, however, that ſeveral graſſes, as the vernal, the fox-tail, the meadow poa, and ſome others, are equally as early as this graſs, and that the meadow feſcue, the oat-graſs, and ſome others, ſeem to be as well deſerving of the attention of the farmer.

According to the ingenious experiments on this graſs, made under the direction of the duke of Bedford, as ſtated in the appendix to ſir Humphry Davy's Agricultural Chemiſtry, the reſults were as follow.

	lbs. per Acre.		
The quantity of produce from a rich brown loam, taken at the time of the plant's flowering, was -	7827	3	0
Weight when dry - - -	3322	4	13
Weight of produce loſt by drying -	4494	14	3
Quantity of nutritive matter - -	305	11	15
The quantity of produce taken at the time when the ſeed was ripe -	14973	12	0
Weight when dry - - -	4492	2	0
Weight of produce loſt in drying -	10481	10	0
Quantity of nutritive matter - -	643	6	7
Loſs of weight in nutritive matter by taking the crop at the time of flowering, nearly half its value -	337	8	8

Proportional value of the flowering graſs to that taken at the time the ſeed is ripe, as 10 to 11.

The quantity of latter math produce -	3403	2	0
Quantity of nutritious matter - -	53	2	12

Proportional value of the latter math graſs to that of the time of flowering, as 4 to 10, and to that of the time the ſeed is ripe, as 4 to 11. See GRASS.

RAYA, in *Geography*, a river on the W. coaſt of Java, which runs into the ſea, S. lat. 7° 27′. E. long. 107° 30′.

RAYEN, a town of the Rheniſh palatinate; 11 miles N.W. of Heilbronn.

RAYGEN, or RAYHRAD, a town of Moravia, in the circle of Brunn; 8 miles S. of Brunn.

RAYLEIGH. See RALEIGH.

RAYMANGUR, a fortreſs of Hindooſtan, in Myſore, taken in 1791 by the Britiſh troops; 15 miles E. of Nundydroog.

RAYMATLA, a river of Bengal, which runs into the bay of Bengal, N. lat. 21° 35′. E. long. 88° 49′.

RAYMON, a town of France, in the department of the Cher; 14 miles S.E. of Bourges.

RAYMOND DE PEGNAFORT, in *Biography*, a ſaint in the Roman calendar, was a Spaniard by nation, and born at the caſtle of Pegnafort, in Catalonia, in the year 1175. He received the early part of his education at Barcelona, from whence he removed to the univerſity of Bologna, where he ſtudied the law, took his degrees, and afterwards taught the canon law for ſome time with great reputation. He was afterwards called to Barcelona, by Berenger, biſhop of that city, who made him a canon, and provoſt of his cathedral church. He held theſe poſts in the year 1218, when he eſtabliſhed an inſtitution which led the way to the foundation of the *Order of* MERCY, (ſee that article.) In 1222 he reſigned his dignities, and became a member of the Dominican order of preaching friars at Barcelona. In 1230, pope Gregory IX. ſent for him to Rome, appointed him his chaplain and confeſſor, and devolved on him the care of carrying on the compilation of the "Decretals." The pontiff would willingly have recompenſed him for his labours by preſenting him with very conſiderable church preferment, but he choſe rather the quiet of a monaſtery to the honours and emoluments of the richeſt ſees in Spain and Portugal, which were offered to him. In 1238 he was called to aſſume the poſt of general of his order; but upon the plea of his infirmities, he was ſuffered, in about two years, to return to his monaſtery, where he ſpent the remainder of his long life. He died in 1275, having entered on the 100th year of his age. To his everlaſting diſgrace, he is ſaid to have been principally inſtrumental in introducing the Inquiſition in the kingdom of Arragon, and into Languedoc, a circumſtance which probably was the means of his canonization in the year 1601. He was author of "Summa de Caſſibus pœnitentialibus, ſeu de Pœnitentia et Matrimonio," which was long popular in the Catholic world, and went through numerous impreſſions. The beſt edition of it is that publiſhed by father Laget, at Lyons, in 1708. Raymond's chief work is "Lib. V. Decretalium," commencing with the papacy of Alexander III., where the decretals of Gratian terminate, which was approved by pope Gregory IX., and conſtitutes the ſecond volume of the papal canon law. Moreri.

RAYMOND LULLY, a philoſopher of much celebrity in the dark ages, was born at Majorca in 1234. He was brought up a ſoldier, and led the life of a man of pleaſure. Falling in love with a young woman, who was deaf to his addreſſes, on account of a cancer with which ſhe was afflicted, and which ſhe exhibited to his view, in order to make him deſiſt from his importunities, he was ſo much affected with the ſight, that he retired from the world, devoting himſelf to pious purſuits, and in the ſearch of a remedy for the diſeaſe with which the object of his affection was afflicted; this was the chief motive for the chemical ſtudies for which he became ſo famous. He undertook a courſe of travels into the Eaſt, for the purpoſe of converting the Mahometans to the Chriſtian faith, and incurred very great hardſhips, and the moſt ſerious dangers. So great was his zeal for this object, that being unable to perſuade certain Chriſtian princes to engage in it, he entered into the Franciſcan order, and returned to Africa, with the hope of obtaining the honour of dying a martyr. He was accordingly thrown into priſon, and after ſuffering much torture, and long impriſonment, he was freed through the intereſt of ſome Genoeſe traders, who took him on board their ſhip to convey him home. He died juſt when he had arrived within ſight of his native land, in the year 1315. As a chemiſt, his chief object was the purſuit of the philoſopher's ſtone, and the univerſal remedy for all diſorders. Boerhaave, who had peruſed the works of Lully, ſpeaks highly of their merit; he finds them, he ſays, "beyond all expectation, excellent, ſo that he doubted whether they could be the work of that age. So full are they of the experiments and obſervations which occur in later writers, that either they muſt be ſuppoſititious, or the ancient chemiſts muſt have been acquainted with many things which paſs for modern diſcoveries." Lully is ſuppoſed to have derived his chemical knowledge from his travels in the Eaſt, particularly from the writings of Geber. A complete edition of all the writings attributed to him, was printed at Mentz. Raymond Lully is chiefly celebrated for an invention by which he pretended to enable any one, mechanically, to invent arguments and illuſtrations upon any ſubject, and thus to reach the ſummit of ſcience at a ſmall expence of time and labour. This "Great Art" profeſſes to furniſh a general inſtrument for aſſiſting invention in the ſtudy of every kind of ſcience. For this purpoſe, certain general terms, which are common to all ſciences, are collected and arranged, not according to any natural diviſion, but merely according to the caprice of the inventor. An alphabetical table of ſuch terms was provided, and ſubjects and predicates taken from theſe were inſcribed in angular ſpaces, upon circular papers. The eſſences, qualities, affections, and relations of things, being thus mechanically brought together, the circular papers of ſubjects were fixed in a frame, and thoſe of predicates were ſo placed upon them as to move freely, and in their revolutions to produce various combinations of ſubjects and predicates; whence would ariſe definitions, axioms, propoſitions, varying infinitely, according to the different application of general terms to particular ſubjects. Such is the general idea of the Lullian art, which, however applauded by certain writers of that

that period, may be pronounced as unworthy of notice, except as a ſpecimen of the artifice with which men frequently impoſe upon vulgar credulity. Enfield's Hiſtory of Philoſophy.

RAYMOND, in *Geography*, a townſhip of America, in Rockingham county, New Hampſhire, incorporated in 1764, containing 898 inhabitants; 12 or 14 miles W. of Exeter.

RAYMOND, or *Raymond-town*, a poſt-town in Cumberland county, and diſtrict of Maine, containing 825 inhabitants; 142 miles N.N.E. of Boſton. The land is generally level, excepting one large hill, called Rattleſnake-hill, from its abounding with thoſe reptiles. The greater part of the growth is pine and white oak, and the ſoil is difficult of culture.

RAYNAL, WILLIAM-FRANCIS, in *Biography*, a French writer of celebrity, was born at St. Genies, in the Rovergue, in 1713. He entered at a very early age among the Jeſuits, and by his abilities excited high expectations of his future celebrity. His diſlike of reſtraint induced him to quit the ſociety in the year 1748, although he had made his profeſſion, and had been ordained prieſt. He now entered his career of authorſhip, and diſtinguiſhed himſelf as a political, hiſtorical, and miſcellaneous writer. His firſt piece, publiſhed the ſame year in which he quitted the ſociety, was entitled "Hiſtoire du Stadhouderat;" he next publiſhed "Hiſtoire du Parlement d'Angleterre," which gained him much reputation, though it had little claim to the dignified title of hiſtory, and was, moreover, tinged with many prejudices, religious and political. He alſo compoſed "Anecdotes Literaires," in three vols. 12mo.; and "Memoires de Ninon de l'Enclos," and was much employed in the "Mercure de France." The great work of the abbè Raynal was entitled "Hiſtoire Philoſophique et Politique des Eſtabliſſemens et du Commerce des Europeens dans les deux Indes," to the compoſition of which he was led by his engaging in ſome commercial ſpeculations, thinking them likely to turn out more profitably than literary purſuits. His hiſtory was publiſhed in 1770, and as it contained hiſtory, deſcription, and calculation, intermixed with political and philoſophical reflections, and was, through the whole, animated by an ardent ſpirit of philanthropy, and hatred of tyranny, civil and religious, it became popular, and the author was looked up to as one of the reformers of the age. Critics, however, ſoon found that, as a literary and philoſophical work, it would not bear the teſt of examination. The ſtyle, though rich, was exceedingly declamatory; the images were frequently inflaming; and his principles vitiated by the licentiouſneſs of his country; and the facts upon which the whole was founded were derived from incorrect or dubious documents. The author, it ſhould ſeem, was ſoon made ſenſible of the imperfections of his work, and determined to improve it by travel: with this view he viſited the principal commercial towns in France, and paſſed into England and Holland, at every place making inquiries among travellers and merchants with the moſt unremitting aſſiduity. On his return, he publiſhed at Geneva an improved edition of his work, in 10 vols. 8vo. containing many additions and corrections. Its tone was unaltered, and its attacks upon exiſting authorities were ſo bold, that the parliament of Paris ordered it to be burnt, and iſſued a decree for apprehending the author. He retired to Spa, whence he travelled through Germany, and after having viſited all the principal places, he returned to France, and lived ſome time quietly in the ſouthern provinces. At the academies of Marſeilles and Lyons he founded ſeveral prizes for eſſays on given ſubjects, of which the moſt remarkable was whether the diſcovery of America had been more uſeful or prejudicial to Europe.

America has now, owing to the quarrel and war ſubſiſting between Great Britain and its colonies, become an object of peculiar intereſt; and the abbè Raynal, in 1781, publiſhed "Tableau et Revolutions des Colonies Angloiſe dans l'Amerique Septentrionale," which was commented upon and expoſed by Thomas Paine, who was a zealous and able defender of the American cauſe, againſt the mother country.

The abbè came to Paris in the important year 1788, when the revolution was juſt ready to burſt forth. He had not been long in the city, before the National Aſſembly was convoked, and one of its early acts annulled the decree paſſed againſt him; for this favour, he addreſſed a letter of thanks to the preſident, containing a retraction of certain principles contained in his work. Obſerving, afterwards, that the conſtituent aſſembly were occupied in decrees which he thought were violent infringements on the rights of property, and in others calculated to augment the popular effervescence, he wrote, in May 1791, a long letter of advice and remonſtrance. It was ſoon ſeen that the ſentiments in this letter were very different from thoſe which were generally expected from the author of the "Hiſtoire Philoſophique," their tendency being to repreſs popular licence, and to ſtrengthen the hands of civil authority. Raynal, like many other philoſophers of that day, had aided all in his power to produce the change, at which, when put into practice, he and they were greatly alarmed. But it was now too late to return: they had ſhewn the people their power, had taught them their rights, which it was in vain to expect they would be induced to abandon for any arguments he could produce. In the letter referred to, he ſays, "I have long dared to ſpeak to kings of their duty, ſuffer me now to ſpeak to the people of their errors, and to their repreſentatives of the dangers which threaten us. I am, I own to you, deeply afflicted at the crimes which plunge this empire into mourning. It is true that I am to look back with horror at myſelf for being one of thoſe who, by feeling a noble indignation againſt arbitrary power, may perhaps have furniſhed arms to licentiouſneſs. Do then religion, the laws, the royal authority, and public order, demand back from philoſophy and reaſon the ties which united them to the grand ſociety of the French nation, as if, by expoſing abuſes, and teaching the rights of the people and the duties of princes, our criminal efforts had broken theſe ties? But no!—never have the bold conceptions of philoſophy been repreſented by us as the ſtrict rule for acts of legiſlation." He next proves, that it was not the buſineſs of the aſſembly to aboliſh every ancient inſtitution; that the genius of the French people is ſuch, that they can never be happy or proſperous but under a well regulated monarchical government; and that if they wiſhed not the nation to fall under the worſt kind of deſpotiſm, they muſt increaſe the power of the king. Raynal was conſidered to be in his dotage, and himſelf and his writings were now diſregarded. He retired in the midſt of ſtorms to Paſſy, where, being reduced to a ſtate of indigence, he died in March 1794, at the age of 85. Beſides the works already mentioned, the abbè Raynal publiſhed "The Hiſtory of the Divorce of Catharine of Arragon, by Henry VIII.;" and "A Hiſtory of the Revocation of the Edict of Nantes," in four volumes; but he committed many of his papers to the flames during the bloody reign of the monſter Robeſpierre.

RAYNERIUS, a learned Italian monk, who flouriſhed moſt probably in the 13th century, was a native of Piſa. He

He acquired the character of a conſummate divine and civilian, and was appointed profeſſor of divinity, as well as raiſed to the moſt conſiderable offices of truſt and honour belonging to his order. It is uncertain at what period he died. He left behind him many works, of which the chief is entitled "Pantheologia, ſeu, Summa univerſæ Theologiæ." This is a dictionary of theology, with the ſubjects diſpoſed of in alphabetical order; it has been held in high eſtimation among the members of the Catholic communion. It has gone through ſeveral editions in folio and quarto. The laſt edition was printed at Paris in 1655, in 3 vols. folio, with additions of father Nicolai.

RAYNHAM, in *Geography*, a townſhip of Maſſachuſetts, in Briſtol county, taken from Taunton, and incorporated in 1731. It contains 1154 inhabitants. Beſides the great river Taunton, this townſhip is watered by ſeveral ſtreams, upon which are ſix ſaw-mills, three griſt-mills, a furnace, a forge, and fulling-mill. Here are alſo numerous ponds, of which Nippanniquit, or Nippahonſit, is two miles long and one broad. In this pond millions of alewives annually reſort and leave their ſpawn in it. An excellent kind of ore, and various kinds of fiſh, are found in this townſhip. Beſides the uſual occupations of huſbandry and mechanics, many of the inhabitants are employed in the manufactories of bar-iron, hollow ware, nails, iron for veſſels, iron-ſhovels, potaſh, ſhingles, &c. The firſt forge ſet up in America was introduced into this town by James and Henry Leonard, natives of England, in 1652. The ſame family, in the 6th generation, now poſſeſs it. King Philip's hunting houſe ſtood on the northern ſide of Fowling pond, about one mile and a quarter from the pond. When the war broke out in 1675, which terminated in the death of the king and the ruin of his tribe, he left ſtrict orders to all his Indians not to hurt the Leonards. Before Philip's time, Fowling pond was two miles long, and three miles and a quarter wide. But the water is now almoſt gone, and the large tract it once covered is grown up to a thick-ſet ſwamp of cedar and pine. The vicinity has abounded with excellent ore, which has ſupplied the forge for 80 years; it is, however, incapable of being wrought into iron of the beſt quality.

RAYNOLDS, or RAINOLDS, JOHN, in *Biography*, a learned Engliſh divine, was born at Pinhoe, near Exeter, in the year 1549. In 1562 he was admitted a ſtudent at Merton college, Oxford, whence he was removed, in 1563, to a ſcholarſhip of Corpus Chriſti college. In 1572, having taken his degrees in the arts, he was appointed Greek lecturer in his college, in which department he acquitted himſelf with great applauſe. Fuller ſpeaks of him in the higheſt terms as a commentator of Ariſtotle's Rhetoric. He had hitherto been zealouſly attached to the Popiſh religion, while his brother William was equally zealous for the Reformation. The difference in their ſentiments leading them to frequent conferences and diſputations, they made converts of each other, William becoming a determined Papiſt, and John a ſteady Proteſtant. He frequently appeared in the pulpit, and was greatly admired as a preacher. In the year 1588 he was admitted to the degree of doctor of divinity, and ſoon afterwards the fame of his great learning induced queen Elizabeth to appoint him profeſſor extraordinary in that faculty at Oxford; after which ſhe gave him the deanery of Lincoln, which he held only a ſhort time, when he exchanged it for the preſidentſhip of Corpus Chriſti college, of which he was a fellow. He made this exchange from his attachment to an academical life, and his love of retirement and ſtudy. Similar motives led him afterwards to refuſe a biſhopric which queen Elizabeth offered him. He retrieved the finances of his colleges, which had been ſuffered to fall into dilapidation, and he reſtored its decayed diſcipline, ſtrictly obeying the ſtatutes himſelf, and compelling all the other members to obſerve them. After the acceſſion of James, he was appointed, with Dr. Sparks, Mr. Chadderton, and Mr. Knewſtubs, to appear on behalf of the Puritans in the pretended conferences at Hampton Court; of which we have a full account in the ſecond volume of Neal's "Hiſtory of the Puritans," by Dr. Toulmin, p. 10—20. Dr. Raynolds did not on this occaſion act according to his uſual ſpirit, and, ſuffering himſelf to be browbeaten by the royal tyrant, loſt much of the reſpect which his character uſually laid claim to. It was at the concluſion of this conference, that the king ſaid to Dr. Raynolds and his friends, in anſwer to their arguments; "If this be all your party hath to ſay, I will make them conform themſelves, or elſe I will harrie them out of the land, or elſe do worſe, only hang them, that's all." When James gave directions for undertaking a new and more correct tranſlation of the bible, Dr. Raynolds was one of the Oxford divines who were commiſſioned to give a new verſion of the four greater prophets, the book of Lamentations, and the twelve minor prophets. While employed in this great work he was ſeized with the gout, under which he had been a ſufferer many years, and which at length proved fatal to him. In the midſt of the ſevereſt pains, he perſevered in the taſk aſſigned to him, and once a-week his fellow-labourers at Oxford regularly aſſembled in his apartments, where they compared the fruits of their reſpective ſtudies, determining what appeared to them to be the moſt faithful tranſlation, till they had accompliſhed their taſk. Dr. Raynolds died in the year 1607, highly reſpected for his erudition, his piety, his modeſty, and humility. Several of his biographers ſpeak of him in the higheſt terms. Wood ſays he was moſt prodigiouſly ſeen in all kind of learning, and had turned over all writers, profane, eccleſiaſtical, and divine, all the councils, fathers, and hiſtories of the church. He was author of many theological works, of which we may mention "De Romanæ Eccleſiæ Idolotria, in Cultu Sanctorum, Reliquiarum, Imaginum," &c. 1596; and "Cenſura Librorum Apocryphorum Veteris Teſtamenti, adverſus Pontificios," which was a poſthumous work, and printed at Oppenheim, in Germany, 1611, in 2 vols. 4to.

RAYNPOUR, in *Geography*, a town of Hindooſtan, in Bahar; 40 miles N.W. of Chuprah.

RAYNULLAH, a town of Hindooſtan, in Bahar; 32 miles E. of Bahar.

RAYPOUR, a town of Bengal; 55 miles W.S.W. of Burdwan. N. lat. 22° 48′. E. long. 87° 5′.—Alſo, a large and commercial town of Hindooſtan, in the country of Ruttunpour; 55 miles S. of Ruttunpour. N. lat. 21° 24′. E. long. 82° 28′.

RAYPOUR, or *Ray-Gaut*, a remarkable paſs on the Beyah river, about 17 or 18 coſſes from Noorpour; ſituated a conſiderable way within the level country of the Panjab.

RAYTE, or RYCHE, in *Ichthyology*, a name given by Joannes Cuba, Albertus, and others, to the common ſkate, or flaire. See RAIA *Batis*.

RAZANT. See RASANT.

RAZANT *Flank*. See FLANK.

RAZANT *Line of Defence*. See DEFENCE.

RAZBOINIKOVA, in *Geography*, a town of Ruſſia, in the government of Irkutſk, on the Angara; 56 miles N.W. of Balaganſkai.

RAZBOINOI, a fort of Ruſſia, on the Ural; 92 miles E. of Orenburg.

RAZE,

RAZE. See TUMB.

RAZE, in the *Manege*. A horſe is ſaid to have *razed*, whoſe corner teeth ceaſe to be hollow; ſo that the cavity, where the black mark was, is filled up; that is, wholly diſappears, and the age of the animal cannot be known with any degree of certainty. See MARK.

RAZI, in *Biography*, one of the ſurnames of the famous Muſſulman Mohammed Ben Omar Ben Khatid Rei, Al Temini Al Bekri, a native of the city of Reï, in the Perſian Irak, of which the word Razi is the appellative. He was born in the year of the Hegira 543, correſponding with 1148 of the Chriſtian era, and became one of the moſt celebrated doctors. His knowledge was not confined to the learning uſually taught in the Mohammedan ſchools, but it comprehended likewiſe the ſciences imported into the Eaſt with the writings of the Grecian ſages. He was, moreover, a very eloquent preacher both in the Arabic and Perſian languages. By theſe qualifications he acquired the favour of ſeveral princes, particularly of a ſultan of the Gaurid dynaſty, who erected a college for him in the city of Herat in Choraſan. He was driven from this ſituation by the intrigues of Cadi Abdalmegid, of the ſect of Keramians, who contended that the deity was corporeal, and of human ſhape. Having challenged Razi one day to a public diſputation on the attributes of God, he was ſo confounded by the ſuperior reaſoning of the latter in defence of the divine ſpirituality, that he became his bitter enemy, and ſeized every opportunity of calumniating him to the ſultan, as a man who, under the cloak of philoſophy, concealed irreligious and impious notions. By his perſuaſions, the prince baniſhed Razi from the city, but he ſoon repented of his raſh decree, and recalled him. This happened in the year 606 of the Hegira. He was author of an "Introduction to the moſt ſubtile Myſteries for the Uſe of Men of Genius," in which he explains the principles of the Mohammedan philoſophy; and ſeveral other pieces. "Select Aſtronomical Reſearches" have been attributed to him, but perhaps on inſufficient authority.

RAZI is alſo the ſurname of a celebrated philoſopher, chemiſt, and aſtronomer, called Mohamed Ben Zakaria, a native of the ſame city as the preceding, who flouriſhed under the caliphate of Moctader of the dynaſty of the Abaſſides. He died about the year 922 of the Chriſtian era.

RAZIMIERZ, in *Geography*, a town of the duchy of Warſaw, ſituated between Slepezka and Poſen, where the unfortunate count Patkul was broken alive on the wheel, and impaled by order of Charles XII. of Sweden in 1708.

RAZNIPNAIA, a fort of Ruſſia, in the government of Upha, on the Ural; 56 miles S.W. of Orenburg.

RAZOIS, PORT, a port at the S.W. extremity of the coaſt of Nova Scotia, and N.E. of cape Negro.

RAZOR, a well-known edged inſtrument uſed in ſhaving. Heat appears to give a partial increaſe of tenacity to a razor's edge, probably becauſe the edge cools faſteſt, contracts, and is ſtretched.

RAZOR-*Bill*, in *Ornithology*, the common Engliſh name of the alca, a web-footed bird with no hinder toes, common on our ſea-ſhores. See ALCA *Torda*.

RAZOR-*Fiſh*, in *Ichthyology*, the *Coryphæna novacula* of Linnæus, having the head and fins barred with blueiſh lines. See NOVACULA.

RAZOR *Iſland*, in *Geography*, a ſmall iſland on the coaſt of Braſil; 12 miles S. of Rio Janeiro.

RAZUDA, a town of Hindooſtan, in Guzerat; 40 miles E.S.E. of Chitpour.

RE', an iſland in the Atlantic, near the weſt coaſt of France, about 16 miles long, and 3 broad; ſeparated from the coaſt of Vendée by the ſtraits of Breton, which are about 7 miles wide. The principal town is St. Martin de Ré. N. lat. 46° 13'. W. long. 1° 20'.

RE, in *Commerce*. See REE.

RE, in *Grammar*, &c. an inſeparable particle, or prepoſition, prefixed to the beginning of words, to vary, double, or otherwiſe modify their meaning.

The modificative *re* was firſt introduced by the Latins, from whom it is borrowed into moſt of the modern tongues. Priſcian derives it from *retro*, backwards; others rather derive *retro* from *re*; others derive *re* from the Greek ῥεα, *eaſy*; or from ῥεω, *I flow*.

The effect of the *re* is various: uſually it ſignifies *again*, *rurſum*, ανα; as in *re*-join, *re*-ſign, *re*-ſume, *re*-courſe, *re*-bound, *re*-cite, *re*-hear, *re*-cognize, *re*-compare, *re*-double, *re*-linquiſh, &c.

Sometimes it ſtands for *contra*, αντι, *againſt*; as in *re*-luctance, *re*-cumbent, *re*-cline, &c.

Sometimes for υπερ, *ſuper*, *over*, as in *re*-dundant; ſometimes for πορρω, *longe*, *far*, as in *re*-moving, &c.

RE, in *Muſic*, the name of the ſecond of the keys in the three hexachords of Guido, G, C, and F. See SOLMISATION, GAMMUT, HEXACHORDS, and MUTATIONS.

RE *Alla Caccia*, *Il*, the Italian title of a comic opera, taken from our "Miller of Mansfield." It was ſet to muſic for our opera-houſe in 1768, by Aleſſandri, a young compoſer of promiſing abilities. He was huſband of La Guadagni, the original "Buona Figliuola" in Italy, and ſiſter to Gaetano Guadagni, the celebrated ſinger. But the Miller of Mansfield was firſt formed into a comic opera for Paris, by Sedaine, and ſet by Monſigni, under the title of "Le Roi et le Fermier," in 1762.

RE *Teodoro*, *Il*, a comic opera, founded on the adventures and viciſſitudes of the unfortunate Theodore, king of Corſica. The muſic of this drama is one of the innumerable inſtances of the fertility of Paeſiello's pen. It had been performed all over Italy and Germany with the greateſt applauſe, previous to its being brought on our ſtage. The muſic, that was not changed, is extremely original and pleaſing, particularly the *finales*. There was a mixture of airs by Corri, Mazzinghi, and Storace; but beſides deſtroying the unity of ſtyle, the certainty of there being merit of ſome kind or other in every compoſition of Paeſiello, inclines lovers of muſic to lament that any of his airs ſhould be changed or omitted.

REA, in *Geography*, a river of England, which runs into the Tame, 3 miles N.E. of Birmingham.

REA, *Lough*, a lake of Ireland, in the county of Galway, on the border of which is the town of Loughrea. See LOUGHREA.

REACH, in *Sea Language*, the diſtance between any two points on the banks of a river, in which the current flows in a ſtraight uninterrupted courſe.

RE-ACTION, in *Phyſics*, the action by which a body acted upon, returns the action by a reciprocal one upon the agent.

The Peripatetics define re-action to be that which a paſſive body returns upon the agent, by means of ſome quality contrary to that received from it, in the ſame part with which the agent acted, and at the ſame time; as if water, while it is heated by the fire, does at the ſame time cool the fire.

It was known, even in the ſchools, that there is no action in nature without re-action; and it was a maxim among them, *omne agens*, *agendo repatitur*.

But the equality of the actions was not known. Sir Iſaac Newton eſtabliſhed it as one of the laws of nature, that

action

action and re-action are equal and contrary; or that the mutual actions of two bodies, ſtriking one againſt another, are exactly equal, but in contrary directions; or, in other words, that by the action and re-action of bodies one on another, there are produced equal changes in each: and thoſe changes are impreſſed towards directly contrary parts or ways. See *Laws of* NATURE.

Some of the ſchool-philoſophers deny any ſuch thing as re-action, properly ſo called, at all; urging, that action ariſes only from the ratio of the greater inequality; that is, we are only to account for action the exceſs of action, or what the agent does more than is returned by the patient. But the equality between action and re-action ſets aſide this exception.

READ, in *Geography*, a river of England, in the county of Northumberland, which runs into the Tyne, 10 miles N. of Hexham.

READ *Head*, a cape on the E. coaſt of Scotland. N. lat. 56° 35′. W. long. 2° 28′.

READFIELD, a poſt-town of America, in Kennebec county, and diſtrict of Maine, bounded on the E. by Hallowell, and ſeparated from Sterling on the W. by the eaſtern branch of the Androſcoggin river; 8 miles W. of Hallowell, and 190 N.E. of Boſton. It contains 1396 inhabitants.

READING, JOHN, in *Biography*, organiſt, firſt at Lincoln, then at Hackney, and finally of St. Dunſtan's church in Fleet-ſtreet, London. He was a ſcholar of Dr. Blow, and Stanley's firſt maſter. He publiſhed Hymns early in life, for pſalmodiſts in parochial congregations; and, laſtly, a work engraved on copper, which he called "A Book of my Anthems, with a Thorough-baſe, for the Organ or Harpſichord." He died in 1766, far advanced in years.

READING, in *Geography*, a borough and market-town in the hundred of Reading, and county of Berks, England, is 38 miles W. by S. from the metropolis. It is a town of conſiderable extent and importance, and contains, according to the parliamentary returns of 1811, 2032 houſes, and 10,788 inhabitants.

Hiſtorical Events.—Reading is unqueſtionably of very great antiquity; but whether it is indebted for its origin to the Britons, the Romans, or the Saxons, is unknown. Conjectures, however, have been hazarded on the ſubject by various writers. Camden thinks its foundation ought to be referred to the Britons; Leland calls it the Pontes of Antoninus; and Dr. Beeke, the learned profeſſor of modern hiſtory at Oxford, conſiders it the Calleva of Richard of Cirenceſter. But the circumſtances which are alleged in favour of theſe opinions, by their reſpective authors, are far from being ſatisfactory. This place is firſt mentioned in hiſtory, under its preſent appellation, in the year 871; at which time it is deſcribed by Aſſer as being a fortified town, belonging to the Saxon kings, but then occupied by the Daniſh invaders, who had retreated hither after their defeat at Engleſield. The victorious Saxons immediately inveſted the town; but their enemies, having received reinforcements, attacked the beſiegers with ſuch impetuoſity, that, after an obſtinate conteſt, they deemed it prudent to retire to Aſhdown. Hither they were followed by the Daniſh forces, which were again overthrown, and driven back to Reading. Here the latter remained unmoleſted till the following year, when they marched to London. In the reign of Alfred, who mounted the throne of Weſſex ſoon after this event, the Danes once more ſeized upon Reading, and they doubtleſs poſſeſſed it occaſionally during their incurſions in the tenth century. Throughout that long period of inceſſant hoſtility and depredation, however, this town ſeems to have eſcaped any very ſerious diſaſter; but in 1006 it was reduced to aſhes by Sweyn, king of Denmark, along with its famous nunnery, ſaid to have been founded by Elfrida, widow of king Edgar, as an atonement for the murder of Edward the Martyr. Reading ſoon recovered from this diſaſter, and in the courſe of a century afterwards became a place of conſiderable importance. In 1121 king Henry I. laid the foundation of its magnificent abbey, in which his remains were ſubſequently interred, according to his own deſire. Stephen, who uſurped the throne after Henry's death, built a caſtle here, which was ſurrendered to his antagoniſt Henry Fitz-Empreſs, who no ſooner obtained the crown, than he ordered it to be demoliſhed; ſo that even the ſcite of it is now uncertain. That monarch, however, otherwiſe evinced much partiality for Reading. Here he paſſed much of his time, and convened a parliament, as alſo an eccleſiaſtical convocation, in which Baldwin was elected archbiſhop of Canterbury. The abbey church was finiſhed in this reign, and dedicated in preſence of the king. In 1185 he came hither from London, to receive Heraclius, patriarch of Jeruſalem, who preſented him with the keys of the holy ſepulchre, and the royal banners of Jeruſalem, which Henry returned. In the reign of his ſucceſſor, Richard I., a convention for the trial of Longchamp, chancellor and biſhop of Ely, who had been appointed regent of the kingdom during the king's abſence, was held here. King John alſo held a convention in this town, in 1206; and in 1212 a council was convened here by the pope's legate, for the purpoſe of effecting a reconciliation between that infatuated prince and the exiled biſhops. In 1213 the king met the legate and barons at the abbey, and held a parliament. King Henry III. ſpent his Chriſtmas at Reading in 1226; and twice during his reign ſummoned the eſtates of the realm hither, for the tranſaction of national buſineſs. He was the firſt monarch who granted a charter of incorporation to the town. In 1346, Edward III. held a great tournament here; and in 1359, the marriage of his ſon, John of Gaunt, with Blanche, daughter of Henry, duke of Lancaſter, was ſolemnized in the abbey church. In 1384, Richard II. and his court, together with the mayor and aldermen of London, being aſſembled at Reading, John Northampton, the preceding mayor of that city, was convicted before them of ſeditious practices, and ſentenced to perpetual impriſonment. In 1389 a great council was held at Reading, at which the king and his barons were reconciled by John of Gaunt. Parliaments were held here alſo in 1440 and 1451; in the former of which the order of nobles called viſcounts was firſt eſtabliſhed; and in the year following, the parliament adjourned hither from Weſtminſter, on account of the plague. King Edward IV.'s marriage with Elizabeth, lady Grey, was firſt acknowledged at Reading, in 1464; on which occaſion ſhe made her public appearance at the abbey, conducted by the duke of Glouceſter and the earl of Warwick. In 1466 parliament was a ſecond time adjourned to Reading, to avoid the plague. King Henry VIII. frequently reſided here, having converted the diſſolved abbey into a palace. His ſon, king Edward VI., viſited this town in 1552, when he was met by the mayor and aldermen at Coley-Croſs, and preſented with two yokes of oxen; the mayor riding before him, uncovered, to the palace. The ſame ceremony was repeated, when Reading was viſited by the bigotted Mary, and her huſband, king Philip of Spain. Queen Elizabeth was a frequent viſitant here, and had a ſeat in the church of St. Lawrence.

Early in the reign of Charles I., when the plague raged with

with great violence at London, the courts of chancery, king's bench, and common pleas, were held here, as were likewiſe the court of exchequer, the court of wards and liveries, and the court of requeſts. In 1642, Reading was a parliamentary poſt, but the garriſon, being defective as to ordnance and ammunition, quitted the town, without reſiſtance, on the approach of a party of the king's horſe. In conſequence of this event it became a royal garriſon, and continued to be ſo till taken by the earl of Eſſex in April 1643, after a ſiege of eight days. The king, however, again recovered it in September the ſame year, and held it till May following, when he ordered the works to be demoliſhed, and evacuated the town. After this event Reading was frequently occupied as the head-quarters of the parliamentary army, and was conſequently much impoveriſhed by the contributions levied upon its inhabitants for the ſupport of the military. In 1688 the army of king James II. was quartered in this town, but quitted it on the approach of the prince of Orange. On this occaſion a ſkirmiſh took place in the market-place between two detachments of horſe, which terminated in favour of the Proteſtant intereſt, and is ſtill commemorated, by bell-ringing, on the anniverſary of its occurrence. Queen Anne viſited Reading in 1700, when ſhe was received by the corporation in ſtate, and preſented with forty broad pieces of gold in an elegant purſe made for the occaſion.

Municipal Government.—Reading claims the honour of having been originally conſtituted a guild, by charter from Edward the Confeſſor. This claim, however, is extremely queſtionable; and at all events we feel convinced that the ancient guild was nothing more than an aſſociation of mechanics and tradeſmen for their individual benefit. The firſt monarch who conferred upon Reading the privilege of ſeparate juriſdiction was Henry III., in the 37th year of his reign. His charter was ſubſequently confirmed by all his ſucceſſors, but without any material alterations, till the reign of Henry VI., when the corporation is firſt mentioned by the title of the mayor and burgeſſes. Thus it continued to be deſignated till queen Elizabeth divided the burgeſſes into capital and ſecondary, and declared the mayor and them to be a common council for the borough. That princeſs further conferred upon the corporation conſiderable eſtates. Charles I. authorized aldermen to be elected, and inveſted the mayor and them with ample powers for the government of the town. This charter was confirmed, after the reſtoration, by his ſon Charles II., and is the one under which the corporation now acts. By it the officers are declared to be a mayor, twelve aldermen, and the ſame number of capital burgeſſes; the mayor, and his deputy, (the preceding mayor,) the ſenior alderman, the biſhop of Saliſbury, and his chancellor, being juſtices of the peace for the borough, and empowered to hold ſeſſions, and a court of record. The recorder is an officer added by Charles II., who likewiſe firſt acknowledged the town-clerk. Reading ſent members to parliament from the time of the earlieſt records. Before 1716 the right of election was veſted in the freemen not receiving alms, and in the inhabitants paying ſcot and lot; but in that year it was limited, by a deciſion of the houſe of commons, to the inhabitants paying ſcot and lot only. The number of voters is eſtimated at 560, and the mayor is the returning officer. The ſpring aſſizes for the county are held at this town, as are likewiſe the Epiphany ſeſſions, but the ſummer aſſizes are held at Abingdon, and the Michaelmas, either there or at Reading, as the magiſtrates may judge moſt convenient.

Reading is a town of conſiderable extent, ſituated on both banks of the river Kennet, which ſeparates itſelf into ſeveral branches in paſſing through the town. It contains three pariſhes, St. Giles, St. Mary, and St. Lawrence, and is divided into five wards, called the High-ward, New-ward, Minſter-ward, Old-ward, and London-ward, for each of which a conſtable is appointed. Formerly it was a place of great trade in woollens, but that manufacture fell to decay during the ſeventeenth century, and has never ſince revived. At preſent the chief manufactured products are, coarſe linens, (ſuch as ſheeting, ſail-cloth, floor-cloth, and ſacking goods,) gauze, crapes, muſlinets, ribbons, hat-bands, ſhoe-ſtrings, and other ſimilar articles. Theſe afford employment to a great portion of the inhabitants among the lower orders; but the principal ſupport of the town ariſes from its water communications with London, Bath, and Briſtol. The articles exported are, flour, of which 20,000 ſacks are ſent annually to the metropolis, timber, bark, ſtraight hoops, linen, wool, cheeſe, beer, and a variety of minor articles: in exchange are received groceries of every kind, iron, ſpirits, fir timber, deals, ſtaves, Portland ſtone, bricks, hemp, flax, hides, leather, coals, Bath free-ſtone, Birmingham goods, &c. For the convenience of trade, ſeveral wharfs are formed at Reading, and many improvements have been lately made in the internal navigation of the diſtrict at large.

This town, from time immemorial, has been noted for its markets, which are held weekly, on Wedneſday and Saturday. The Wedneſday's market is chiefly for fruit; but that of Saturday embraces corn and every article of proviſion. The ſpot on which the corn market is held, is a ſpacious piece of ground, of a triangular form, environed by commodious ſhops for the accommodation of people attending the market, who may be ſupplied here with colonial or manufactured goods cheaper than in any other town in the county. This market-place is kept in repair by the corporation, for which they are entitled to take one pint out of each ſack of corn ſold in the market, amounting to about 54,600 quarters annually. The proviſion market buildings adjoin to the corn market-place, and form a long ſquare, conſiſting, one-half of two ranges of butchers' ſhops, and the other half of apartments for the market-women, who bring butter, eggs, poultry, &c. for ſale. At the ſouthern end of this building is a ſquare open area for fiſhmongers' and huckſters' ſtalls, and next to this, and fronting a ſtreet called Fiſher-ſtreet, is a large ſquare gate-way, over which is the houſe occupied by the clerk of the market. Beſides theſe market-places, there is another for the ſale of ſtore pigs, conveniently ſituated between Friar-ſtreet and Broad-ſtreet. This is private property, but the corporation receive the toll. At Reading are four annual fairs, one on the 2d of February, another on the 1ſt of May, a third on the 25th of July, and a fourth on the 21ſt of September. The three firſt are chiefly for the ſale of horſes and cows; but the laſt is alſo a ſtatute fair for the hiring of ſervants, and is further remarkable for the quantity of cheeſe brought hither from the counties of Glouceſter and Wilts. Hops are alſo plentiful at this fair.

The houſes of Reading are moſtly conſtructed of brick, and are generally diſpoſed in regular ſtreets, ſome of them very narrow, which have been paved under the authority of an act of parliament, paſſed in the year 1785.

The principal public buildings and inſtitutions in the town are the three churches of St. Lawrence, St. Mary, and St. Giles, and ſeveral diſſenting meeting-houſes, the town-hall and free-ſchool, the blue-coat ſchool, the green ſchool, the foundation ſchool, the ſchool of induſtry, the Lancaſtrian ſchool, the ſchool for national education, the theatre, and the county gaol.

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The church of St. Lawrence was chiefly erected towards the close of the 16th century, and is partly constructed of materials taken from the buildings of the abbey. Among the parts of it, so pilfered from the monastery, is a large door-way, which is composed of a circular arch, ornamented with rich mouldings, from which were suspended on each side the arms of the abbey; but these are now nearly obliterated. This door-way is likewise ornamented with niches, in which statues formerly stood. The advowson of the church belongs to St. John's college, Oxford. St. Mary's church is somewhat more ancient than that of St. Lawrence, having been constructed about the year 1547, in the stead of a previous one, which had gone to decay. Some portions of this building have evidently belonged to an older edifice, particularly a window over the west door, which is in the early pointed style of architecture. St. Giles's church was probably constructed at the commencement of the 12th century. The tower only is modern, the ancient one having been demolished during the civil war. The livings of both the churches last mentioned are in the gift of the lord chancellor. The principal meeting-houses for dissenters are the Calvinistic or Independent meeting-house in Broad-street, a Baptist meeting-house and a Quaker's meeting-house in Church-street, a Methodist chapel in Castle-street, and another in Minster-street, a Cudworthian and an Unitarian meeting-house in London-street, and a Catholic chapel in Vastern-lane. Another meeting-house for Baptists has also been lately erected in Sievier-street.

The town-hall and free-school form one building; the free-school occupying the ground story, and the hall, court-room, and offices, the floor above. The free-school was established in the reign of Henry VII., by John Thorne, abbot of Reading, with the funds of a suppressed almshouse. This school has two scholarships in St. John's college, Oxford, the gift of sir Thomas White, in 1557. Julius Palmer, one of the masters of this school, fell a martyr to his Protestant tenets in 1556. The blue-coat school, which is so named from the dress of the scholars, was founded in 1656, by Mr. Richard Aldworth, who bequeathed 4000*l.* for the support of a master, lecturer, and twenty boys. The present school-house is of late erection, and consists of a centre and two wings. Several donations and bequests having been made to this establishment by various persons, it now usually supports about 48 boys. The green school is situated in Broad-street, and is appropriated for the education of the daughters of decayed tradesmen, residents in the town, and of orphans, who have been left unprovided for by their parents. The inhabitants of Reading are indebted for the institution of this school to the Rev. Charles Sturges, the Rev. Dr. Nicholls, and the Hon. and Rev. W. B. Cadogan, former vicars of the three parish churches belonging to the town. It is supported by annual subscription, and the proceeds of different donations and bequests. In the foundation school, founded in 1766, eight male and eighteen female children are taught to read. It was instituted with a legacy left for that purpose by Mr. Joseph Neale. The school of industry originated under the patronage of Mrs. Cadogan, for female children, and is supported by the voluntary contributions of ladies in the town. The Lancastrian school, established in 1810, is situated in Southampton-street, and is attended by about 320 boys, who are nominated by the subscribers individually. The school for national education was opened in September, 1813. It is founded on the plan of instruction recommended by Dr. Bell, and is chiefly supported by the clergy of the town and county. Both these institutions are calculated to be highly beneficial to the rising generation. Besides these seminaries of education, there are in Reading several Sunday schools, all the children attending which receive a suit of clothes annually, from a fund provided by the bequest of Mr. Edward Simeon, who clothed them in the same manner during his life-time. The theatre of Reading is a neat and convenient building, lately erected, under the act for regulating provincial theatres. The gaol was built in 1793, on the site of some of the abbey ruins. It is a large edifice, and contains commodious apartments for the keeper, a neat chapel, an infirmary, and a room for the reception of the magistrates, in the centre; and two wings, one for male, and the other for female prisoners, with yards, cells for refractory individuals, &c.

Besides the above public buildings and establishments, there is a public library lately established at Reading, under the name of the "Reading Institution;" also a dispensary, which is attended by some of the medical gentlemen of the town. The house is the property of the corporation, and the general expences are defrayed by subscription. The Oracle may likewise be reckoned among the public buildings of Reading. This structure was erected by the mayor and burgesses, in conformity to the will of John Kendrick, who left 7500*l.* "to build a strong house of brick, fit and commodious to set the poor to work therein." The funds of this charity having been at different periods greatly abused and misapplied, the subject has been several times before the supreme courts of justice. The testator's object, in bequeathing his large legacy, was the improvement of the woollen trade; but instead of this, it was perhaps the first occasion of the decay of that manufacture, by enabling such as could obtain its advantages to undersell those who were not so fortunate. The same complaints are made against it, with respect to the manufactures now carried on in it, and, as we suspect, not without some show of reason.

Monastic Establishments.—As already mentioned, the earliest religious institution at Reading was a monastery for nuns, founded by Elfrida, the mother-in-law of Edward the Martyr. This nunnery was founded in 979, and was destroyed, in 1009, by the Danes. The precise site on which it stood is uncertain, but there can be no doubt of its existence. It appears from the Domesday-book, and also from Tanner's Notitia, that another nunnery was established here at a later period, but nothing of its history is known. The abbey, the ruins of which are still sufficient to attest its extent and importance, was founded by Henry I. in 1121. It occupied a spot of ground, equal, if not superior, to any in Berkshire for fertility of soil and beauty of situation. This spot comprehended about thirty acres, and was environed on three sides by a massive and lofty wall, and on the fourth by the river Kennet. Exterior to this wall was a piece of ground, about fifty yards wide, (like the pomœrium that surrounded the Roman cities,) which it was not allowable either to cultivate or build upon. It had four entrances to it, defended by arched gateways, and having battlements on their tops similar to those on the walls. Within these was the outer court, whence another gate-way led into the inner court. Part of this building remains, and is composed of bricks, chalk, and stone; and, from the dissimilarity of styles which it exhibits, has evidently undergone many alterations and repairs. Some of it is probably as late as the reign of Henry VII., though other portions of it are, undoubtedly, of much higher antiquity. The inner court conducted to the principal entrance to the abbey, the situation of which, owing to the ground having been since built upon, and the confusion occasioned by throwing up the ramparts in the civil war, cannot now be accurately determined. The only entrance on this side at present is through an arched passage, opening into the south-east corner of the cloisters, which is

certainly too mean to be ſuppoſed to have been the grand entrance to this ſuperb monaſtery. On the right-hand of the paſſage is a door-way, leading to a range of apartments, and within is a circular ſtaircaſe, which conducts to the upper part of the building. This diviſion of the abbey is conjectured to have been appropriated as offices for ſervants and others, as, underneath it, is a ſeries of arched cellars, and at its ſouthern extremity was the kitchen. The great hall, or conſiſtory, was entered from the cloiſters by three large entrance doors. It meaſured 80 feet in length, 40 in width, and the ſame in height, to the centre of the ceiling, which was conſtructed of ſtone, and ſupported by arches ſpringing from four pilaſters, 20 feet high, placed againſt each of the ſide walls. Theſe walls, and probably alſo the outer ones in every part of the building, meaſure twelve feet thick from the foundation to the ſet-off, and ſix feet thick from thence to the top, and are compoſed of flints and rubbiſh of various kinds, bedded in mortar, and indurated in the higheſt degree. The abbey-church appears to have extended 260 feet in length, and to have been built in the form of a croſs, with a tower and ſpire in the centre. The nave was 40 feet wide, and was divided from the ſide-aiſles by alternate piers and arches. From the maſſive character of this ſtructure, in general, and from the circular form of the windows in the dormitory, it is conjectured that its windows alſo had circular arches. In the ground to the eaſt of the church, many ſkeletons have been diſcovered, a circumſtance which points it out as the probable burial-place of the monks. The above-mentioned buildings conſtituted the body of the abbey, but there were likewiſe many others, both connected with and detached from them. Among theſe were the infirmary, the ſtables, and the mill. This laſt is yet ſtanding, and appropriated to its original purpoſe. It is a ſubſtantial edifice, built of flint and ſtone, and is probably coeval with the abbey-church.

Reading monaſtery was indubitably among the moſt diſtinguiſhed in England. The monks were of the Benedictine order, and were endowed with many privileges and immunities, not only by the founder, but by ſeveral of his ſucceſſors, and by ſome of the popes. They had the right of coining granted to them by king Edward III., alſo the right of holding three annual fairs, and a market every Sunday at Thatcham. The abbot was among thoſe entitled mitred, and took precedency in the houſe of peers, next after the abbots of Glaſtonbury and St. Alban's. He was lord of the manor of Reading, and poſſeſſed otherwiſe much influence in the government of the borough. Many of the monks were diſtinguiſhed for their talents and their acquirements in the learning of their reſpective ages. Robert of Reading, one of the firſt monks, was particularly famous, as being, with Adelard of Bath, the only Engliſhmen of their time who were maſters of the Arabic language. The abbey-church was the place of ſepulture of many royal and noble perſons, among whom were Henry I., and his ſecond queen, Adeliza, and probably alſo his firſt queen, Matilda; the empreſs Maud, and William, eldeſt ſon of Henry II.; Conſtance, grand-daughter to Edward III.; Ann, counteſs of Warwick; Richard, earl of Cornwall, and king of the Romans; and Richard de Curtenea, natural ſon of Henry II. At the diſſolution, the revenues of this monaſtery were eſtimated at 2116*l.* 3*s.* 9*d.* annually, above 20,000*l.* according to the preſent value of money. The lands, of courſe, were ſeized upon by king Henry, who parcelled them off, either in gifts or in leaſe, to different individuals; but the monaſtery itſelf was converted into a royal palace, and continued to be occaſionally occupied by our kings till its deſtruction during the grand rebellion, in the reigns of Charles I. and II.

The other monaſtic inſtitutions in Reading, beſides thoſe already noticed, were two convents for Franciſcan or Grey friars, St. Edmond's chapel, and Colney chantry. One of the convents was founded about the middle of the thirteenth century, ſoon after the firſt appearance of the Franciſcan order in this country. Its original ſituation was on a marſhy ground adjoining the Caverſham road, and ſtill called the Friery Mead; but in 1285 the friars removed to their ſubſequent reſidence, at the weſtern extremity of Frier-ſtreet. After the diſſolution this houſe was appropriated as a work-houſe for the poor; and part of the church now forms the borough priſon. This building is in the early pointed ſtyle, and has at its weſtern end a very beautiful lancet window. The other convent ſtood in Caſtle-ſtreet, probably on the ſpot now occupied by the Methodiſt chapel. This inſtitution ſeems to have been on a very ſmall ſcale, though it is mentioned by Leland as "a fayre houſe of Grey freres." St. Edmond's chapel ſtood on the riſing ground, called Chapel Hill, near the borough priſon. It was founded, in 1284, by Lawrence Burgeſs, then bailiff of the town. In the civil war it was converted into a fort; and afterwards, about the year 1750, was demoliſhed, and another chapel erected in its ſtead on Battle-Farm. Colney chantry was inſtituted by one of that family in the reign of Richard II., for the ſouls of king Edward III., of Thomas Colney, John Colney, and William Catour. It had diſtinct incumbents of its own, and was under the patronage of the corporation.

Reading has given birth to ſeveral perſons of eminence. Sir Thomas White, founder of St. John's college, Oxford, is ſaid to have been born here; but Fuller affirms that he was a native of Rickmanſworth. Archbiſhop Laud was born in this town in 1573, having been the ſon of William Laud, then a clothier in Broad-ſtreet, who, as the archbiſhop himſelf told lord Say, had borne all offices in the corporation, ſave the mayoralty. John Blagrave, the mathematician, is alſo commonly reputed to have been a native of Reading; as was Joſeph Blagrave, a celebrated aſtrological writer, who does not ſeem to have been related to the mathematician. The other diſtinguiſhed natives of Reading were, ſir Thomas Holt; ſir John Barnard, a noted alderman of London; James Merrick, the tranſlator of the Pſalms; William Baker, a learned printer; ſir Conſtantine Phipps, lord chancellor of Ireland; and Dr. Phanuel Bacon, author of ſeveral dramas, &c.

The vicinity of Reading preſents ſeveral objects worthy of notice. At a ſhort diſtance to the ſouthward, cloſe to a place called Catſgrove-lane, may be ſeen a remarkable ſtratum of oyſter-ſhells, imbedded in a vein of ſea-ſand, at leaſt twenty fathoms beneath the ſurface of a hill. This ſtratum is from one to two feet in thickneſs, and extends through a circumference of five or ſix acres of ground. Mixed with the ſhells is a conſiderable quantity of ſmall teeth, apparently of fiſh. Caverſham, formerly a ſeat of the Craven family, and afterwards of the Cadogans, is ſituated nearly oppoſite the town, on the north bank of the river Thames. The houſe was built by the earl of Cadogan, in the reign of George I., but has ſince undergone material alterations. In the old manſion, Anne of Denmark, queen to James I., was ſplendidly entertained by lord Knowles, when on her journey to Bath, in 1613. At the time Charles I. was a priſoner at Windſor, the parliament, through the mediation of general Fairfax, permitted him to viſit Caverſham Lodge, where all his children who were in England then reſided, in the cuſtody of the earl of Northumberland. In the hamlet of Woodley is a very pleaſing ſeat, belonging to lord Sidmouth; and two miles to the weſtward

weſtward is another, the property of the Blagrave family. The park is very extenſive, and is noted for fine veniſon. South-eaſt, about the ſame diſtance, is White-Knights, the ſeat of the marquis of Blandford. Sunning, celebrated in hiſtory as having been for ſome time the ſeat of the ſee of Wiltſhire, and ſubſequently the ſcite of one of the palaces of the biſhops of Saliſbury, is a village three miles to the eaſtward, on the road to Maidenhead. Leland mentions the biſhop's palace as ſtanding in his time. It was given by biſhop Gheaſt, along with the manor, to queen Elizabeth, in exchange for eſtates in Dorſetſhire. The antiquity of this place is ſtrongly marked by the ſepulchral monuments in the church. Cloſe to Sunning is an elegant manſion, the ſeat of Charles Fyſh Palmer, eſq. Lyſons's Magna Britannia, 4to. Berkſhire. Beauties of England and Wales, vol. i. by John Britton and E. W. Brayley, 1801. The Hiſtory and Antiquities of Reading, by John Mann, 4to. 1814. From the latter work, the chief and moſt eſſential parts of this account have been obtained: and thoſe who wiſh to poſſeſs the moſt copious and authentic hiſtory of Reading will procure this volume.

Reading, a townſhip of America, in Fairfield county, Connecticut, S. of Danbury adjoining. It contains 1717 inhabitants.—Alſo, a large townſhip of Middleſex county, in the ſtate of Maſſachuſetts, incorporated in 1644, and containing 2228 inhabitants, many of whom are employed in the manufacture of ſhoes, from 2 to 300,000 pair being annually exported; 12 miles N. of Boſton.—Alſo, a townſhip of Vermont, in Windſor county, W. of Windſor, adjoining. It contains 1565 inhabitants.—Alſo, a beautiful poſt-town, and the capital of Berks county, Pennſylvania, ſituated on the N.E. ſide of Schuylkill river; 54 miles N.W. of Philadelphia. This town is regularly laid out, and flouriſhes: its inhabitants are chiefly German: the borough and townſhip contain 3462. The public buildings are, a ſtone gaol, a court-houſe, an elegant church for German Lutherans, erected in 1793, a church for Calviniſts, one for Roman Catholics, a meeting-houſe for Friends, and a large edifice for the public offices. In the neighbourhood are 10 fulling mills, and ſeveral iron-works: and at the diſtance of 10 miles, on the road to Harriſburgh, is a ſpring, about 15 feet deep and 30 feet wide, from which iſſues a copious ſtream, containing ſome fine trout. In 1795 the ſum of 12,000*l.* was voted by the county for building a ſtone arched bridge over the Schuylkill, at this town, on the high road to Harriſburgh. N. lat. 40° 21′. W. long. 75° 55′.—Alſo, a townſhip of Adams' county, in Pennſylvania, containing 732 inhabitants.

Reading. See Lectio.

Reading *of a Deed.* See Deed.

READINGS, in *Criticiſm. Various readings, variæ lectiones*, are the different manners of reading the text of authors in ancient manuſcripts; where a diverſity has ariſen from the corruption of time, or the ignorance of copyiſts.

A great part of the buſineſs of the critics lies in ſettling the readings, by confronting the various readings of the ſeveral manuſcripts, and conſidering the agreement of the words and ſenſe. The various readings in the bible, (ſee *Hebrew* Bibles,) and in the claſſic authors, are almoſt innumerable.

Readings are alſo uſed for a ſort of commentary or gloſs on a law, text, paſſage, or the like; to ſhew the ſenſe an author takes it in, and the application he conceives to be made of it.

READINGTON, or Riddenton, in *Geography*, a town of New Jerſey, in Hunterdon county; 17 miles N.W. by W. of New Brunſwick. It contains 1797 inhabitants.

READ'S Bay, a road for ſhips on the W. coaſt of the iſland of Barbadoes, between Holetown and Speight's-town; half a mile broad. Ships may anchor here in ſafety, in ſix to twelve fathoms water, the ground being ſoft ooze, defended from all winds, except the weſt, which blows right into the bay. N. lat. 13° 7′. W. long. 59° 47′.

READSBOROUGH, or Reedsborough, a poſt-town of America, in Bennington county and ſtate of Vermont; 435 miles from Waſhington. It contains 410 inhabitants.

RE-AFFORESTED, is where a foreſt, having been diſafforeſted, is again made a foreſt. As the foreſt of Dean was, by an act of parliament in the 20th of king Charles II. See Forest.

RE-AGGRAVATION, in the Romiſh *Eccleſiaſtical Law*, the laſt monitory, publiſhed after three admonitions, and before the laſt excommunication.

Before they proceed to fulminate the laſt excommunication, they publiſh an aggravation, and a re-aggravation. Fevret obſerves, that in France the miniſter is not allowed to come to re-aggravation, without the permiſſion of the biſhop or official, as well as that of the lay judge. See Excommunication.

REAH, in *Geography*, a town of Syria, in the pachalic of Aleppo, ſituated in a country that abounds with olives, of which conſiderable quantities are prepared, and ſent to Perſia and other parts. This is the reſidence of an Aga; 36 miles S.S.W. of Aleppo.

REAL, Reale, is applied to a being that actually exiſts; in which ſenſe it coincides with *actual.*

Real, in *Law*, is oppoſed to *perſonal.*

Real *Action*, that by which the plaintiff lays title to land, &c. See Action.

Cuſtoms are ſaid to be real; that is, they determine all inheritances within their extent; and none may diſpoſe of them, but according to the conditions allowed by the cuſtoms where they are ſituated.

Real *altitude, affets, character, chattels, covenant, diſtinction, diſtreſs, eſtate, horizon, optic place, patronage, privilege, qualities, root, ſervices, ſuit*, and *writs*. See the ſeveral ſubſtantives.

Real, in *Commerce*, a Spaniſh money of account, of which there are four different ſorts. The real *vellon* is that which is moſt general; it conſiſts of $8\frac{1}{2}$ quartos, 17 ochavos, or 34 Maravedis vellon. Madrid, and the whole of Caſtile, with moſt of the adjacent provinces, and alſo Bilboa, Malaga, and Gallicia, keep accounts in reals and Maravedis vellon. The real of *new plate* (real de plata nuevo, or provincial) is double the real vellon: it is worth 17 quartos, or 34 ochavos: and it is alſo reckoned at 34 Maravedis of new plate. This real is repreſented by an effective coin of baſe ſilver, but books are not kept in any part of Spain in this money.

The real of *old plate* (real de plata antigua), moſtly called the real of plate, is chiefly uſed in foreign commerce and exchanges: it is worth 16 quartos, or 32 ochavos: and it is alſo reckoned at 34 Maravedis of old plate. Cadiz and Seville keep accounts in reals and Maravedis of old plate.

The real of *Mexican plate* (real de plata Mexicano) is uſed in tranſactions with Spaniſh America, where accounts are moſtly kept in hard dollars, reals, and quarters, and ſometimes in ſixteenths: 8 Mexican reals make 1 hard dollar (peſo duro): this coin is worth 10 reals of new plate, $10\frac{2}{3}$ reals of old plate, or 20 reals vellon. Thus, 1 real of new plate = 2 reals vellon: and 4 reals Mexican

can = 5 reals of new plate: 64 Mexican reals = 85 reals of old plate: 2 Mexican reals = 5 reals vellon: 16 reals of new plate = 17 reals of old plate: 17 reals of old plate = 32 reals vellon. The piſtole of exchange (dobloon de plata) is worth 32 reals of old plate, or 60 reals 8 Maravedis vellon. The dollar of exchange (peſo de plata) is worth 8 reals of old plate, or 15 reals 2 Maravedis vellon. The ducat of exchange (ducado de plata) is worth 11 reals 1 Maravedi of old plate, or 25$\frac{15}{17}$ Maravedis vellon. But, in commercial tranſactions within the country, the dobloon is reckoned only at 60, the peſo at 15, and the ducat at 11 reals vellon.

The coins now current in Spain are as follow:

	Reals Vellon.	Maravedis Vellon.
In gold.—The dobloon of 8 eſcudos, or quadruple piſtole, paſſing for	320	
The dobloon of 4 eſcudos, or double piſtole	160	
The dobloon de Oro, or piſtole	80	
The eſcudo	40	
The coronilla, or veinten de Oro	20	
In ſilver.—The dollar, or peſo duro	20	
The half dollar, or eſcudo vellon	10	
The peceta Mexicana	5	
The real of Mexican plate	2	17
In baſe ſilver.—The peceta provincial	4	
The real of provincial plate	2	
The real vellon	1	
In copper.—The piece of two quartos		8
The quarto		4
The ochavo		2

From 1730 to 1772, the gold was 22 carats, and the ſilver 11 dineros fine (the dinero = 24 grains): but in 1772 the gold was reduced to 21$\frac{1}{2}$ carats, and the ſilver to 10$\frac{3}{4}$ dineros fine, the pecetas and reals being reduced to 9$\frac{3}{4}$ dineros fine. In 1786 the ſtandard of the gold was again reduced to 21 carats for the different dobloons and their diviſions; and to 20$\frac{5}{8}$ carats for the coronilla or veinten de Oro. For the value of the piſtole, ſee PISTOLE.

The dollar (coined ſince 1772) contains 374$\frac{7}{8}$ troy grains of fine ſilver, or 405$\frac{3}{4}$ grains of Engliſh ſtandard ſilver: its value therefore in Engliſh ſilver coin is 4*s.* 4$\frac{1}{2}$*d.*; and the half dollar in proportion. The value of the peſo of plate, or dollar of exchange, in Engliſh ſilver coin, is 39$\frac{1}{2}$*d.*; of the dobloon of plate, or piſtole of exchange, 13*s.* 2*d.*: and of the ducat of plate, 4*s.* 6$\frac{1}{2}$*d.* The real of old plate is worth about 5*d.*; and the real vellon 2$\frac{3}{8}$*d.* nearly; or more accurately, 1*l.* ſterling = 48 reals, 20$\frac{3}{8}$ Maravedis of old plate, or 91 reals 17 Maravedis vellon.

By the reports of average aſſays lately made on the quadruple and dollar at the London mint by order of the bank of England, the quadruple weighs 17 dwt. 8 gr.; its fineneſs 4$\frac{1}{2}$ gr. worſe than Engliſh ſtandard: hence its value in Engliſh gold coin is 3*l.* 4*s.* 0$\frac{1}{2}$*d.* The dollar weighs 17 dwt. 8 gr.; its finenefs 8 dwt. worſe than Engliſh ſtandard: hence its value in Engliſh ſilver coin is 4*s.* 3$\frac{3}{4}$*d.* See PISTOLE.

The value of reals of Spain, and monies of account, expreſſed in pence and decimals of pence, according to the mint price both of gold and ſilver in England, *i.e.* 3*l.* 17*s.* 10$\frac{1}{2}$*d.* *per* ounce for gold, and 5*s.* 2*d.* *per* ounce for ſilver, is as follows:

	Value in Silver. D.	Value in Gold. D.
Real of old plate	4.93	4.57
Real of new plate	5.24	4.86
Real of Mexican plate	6.55	6.07
Real vellon	2.62	2.43
The dollar of old plate, or of exchange	39.45	36.59

The aſſay, weight, &c. of Spaniſh ſilver coins compared with the Engliſh ſtandard of 11 oz. 2 dwt., and according to the mint price of ſilver in England, *i. e.* 5*s.* 2*d.* *per* ounce ſtandard, are as follow, W. denoting worſe than Engliſh ſtandard.

	Aſſay. oz.	dwt.	Weight. oz.	dwt.	gr.	Contents in Pure Silver. grains.	Value in Sterling. *s.*	*d.*
Dollar, old Mexican ſquare (1747)	W. 0	4$\frac{1}{2}$	0	17	7	376.1	4	4$\frac{1}{2}$
Half ditto	W. 0	4$\frac{1}{2}$	0	8	15$\frac{1}{2}$	188.	2	2$\frac{1}{4}$
Dollar, old, called Sevillan (1731)	W. 0	4$\frac{1}{2}$	0	17	7	376.1	4	4$\frac{1}{2}$
Old Mexican peceta, of two Mexican reals (1734)	W. 0	4$\frac{1}{2}$	0	4	7$\frac{1}{4}$	93.6	1	1
Real of Mexican plate (1746)	W. 0	4$\frac{1}{2}$	0	2	3$\frac{1}{2}$	46.8	0	6$\frac{1}{2}$
Dollar, Mexican, with globes and pillars (1765)	W. 0	4$\frac{1}{2}$	0	17	8$\frac{1}{2}$	377.	4	4$\frac{3}{4}$
Peceta, of two reals of plate (1721)	W. 1	7	0	3	16$\frac{1}{2}$	71.9	0	10
Real of plate (1721)	W. 1	7	0	1	20$\frac{1}{4}$	35.9	0	5
Dollar, of late coinage, univerſally circulated under the name of the Spaniſh dollar	W. 0	8	0	17	8	370.9	4	3$\frac{3}{4}$
Half dollar, ditto	W. 0	8	0	8	16	185.2	2	1$\frac{3}{4}$
Mexican peceta (1774)	W. 0	8	0	4	7$\frac{1}{2}$	92.3	1	0$\frac{3}{4}$
Real of Mexican plate (1775)	W. 0	8	0	2	3$\frac{3}{4}$	46.1	0	6$\frac{1}{4}$
Peceta provincial, of two reals of new plate (1775)	W. 1	9$\frac{1}{2}$	0	3	18	72.2	0	10
Real of new plate (1795)	W. 1	9$\frac{1}{2}$	0	1	21	36.1	0	5

For the aſſay, weight, value, &c. of gold coins, ſee PISTOLE.

REAL, or *Reali*, is alſo a money of account at Leghorn. At Zante, and alſo Cefalonia and Corfu, accounts are kept in reali, of 10 lire, or 100 ſoldi, alſo called aſpri.

REAL is the name of a kind of boat in ſome places.

REAL *el Novita*, in *Geography*. See NOVITA.

REAL *Nuevo*, a town of Mexico, in the province of New Biſcay; 120 miles N.W. of Parral. N. lat. 29° 10′. W. long. 107° 20′.

REAL

Real *del Rofario*, a town of Mexico, in the province of Chiametlan, on the Spiritu Santo; 24 miles N. of Chiametlan.

Real *de Frayles*, a town of New Mexico, in the province of Mayo; 60 miles from Santa Cruz. N. lat. 27° 44′. W. long. 110° 22′.

Real *de Minas*, a town of New Navarre; 180 miles S.S.E. of Cafa Grande.

Real *de St. Juan*, a town of New Navarre; 195 miles S.S.E. of Cafa Grande.

Real *de la Jura, El*, a town of Spain, in the province of Seville; 25 miles N.W. of Carmona.

REALE, *Knights of the*, or *Knights of the Lioneſs*, owed their inſtitution to the following event. Ladiſlaus, ſon of Charles Duras, having been proclaimed and crowned king of Naples at Gæta, the Neapolitans ſet up Lewis II. duke of Anjou, and laid the foundation of the bloody wars that followed. Theſe troubles divided the Neapolitan nobles into two factions; and of thoſe who declared for the houſe of Anjou, ſome wore on their left arm a golden *reale* embroidered or on a red ground, by way of contempt to queen Margaret, widow of Charles III. who wanted to hold the reins of government during the minority of Ladiſlaus, and called themſelves "knights of the Reale;" whilſt others wore on their breaſt the figure of a "lioneſs, with her feet tied," pendant to a ribbon which paſſed round their necks, indicating by it, that they looked upon queen Margaret as tied by the leg; and then ſtyled themſelves "knights of the Lioneſs."

REALEJO, in *Geography*, a town of Mexico, in the province of Nicaragua, ſituated on a bay of the Pacific ocean, at the mouth of a river, both of the ſame name. The river is ſo deep and capacious as to be capable of receiving 200 ſail of ſhips. The town is defended by large intrenchments, and very fine docks for building and repairing ſhips; but the place ſuffered conſiderably from the Buccaneers. The town is large, has three churches, and an hoſpital; but the place is unhealthy, on account of the creeks and ſtinking ſwamps in its vicinity. Its chief trade conſiſts in pitch, tar, and cordage. At the mouth of the harbour is an iſland, which intercepts the ſea, and renders it ſafe and commodious: it forms two channels, but that on the N.W. ſide is much the beſt; 18 miles N.W. of Leon. N. lat. 12° 45′. W. long. 87° 30′.

REALGAR, in *Mineralogy*, ſometimes called red orpiment, an ore of arſenic, conſiſting, according to Thenard, of

75 parts arſenic,
25 ſulphur.

The colour of realgar is a bright deep red, paſſing into ſcarlet and orange: it occurs both maſſive, and cryſtallized in priſms, which have either 4, 6, 8, 10, or 12 ſides, terminated by four-ſided ſummits. The primitive form of the cryſtal is an octahedron, with ſcalene triangles. The luſtre of realgar is between vitreous and waxy: it is ſemi-pellucid, ſoft, fragile, and eaſily fuſible, burning in the air with a blue flame, and giving out arſenical and ſulphureous vapours. By friction it becomes negatively electrical. Realgar is found in the vicinity of volcanos, and accompanying other metallic ores, both in primitive and ſecondary mountains. This ſubſtance is uſed as a pigment; and is formed by the Chineſe into toys. See *Sulphurated Arſenic* under Arsenic.

In the hiſtory of the French Academy, we have an account of a cup brought to Paris by the ambaſſadors of Siam, and preſented there, as a remedy uſed by that people againſt all diſeaſes.

Upon an examination, which had like to have coſt M. Homberg dear, he found it to be a kind of realgar, or red arſenic, much more cauſtic than our's.

Its uſe among the Siameſe, he takes to have been the ſame with that of regulus of antimony; *viz.* to give an emetic quality to the wine drank out of it.

As the doſe of medicines is much ſtronger in the torrid zone than among us (the quantity of ipecacuanha, *e. gr.* ordinarily taken by the Indians, being twenty times as great as that among us), it is very poſſible a cup of realgar, though enough to poiſon an European, may prove a gentle medicine to a Siameſe.

REALIJO, in *Geography*, a ſmall iſland in the Pacific ocean, near the coaſt of Popayan. N. lat. 4° 16′.

REALIZE, in *Commerce*, a term little known in trade before the year 1719, when thoſe immenſe fortunes began to be made in France and England, by the buſineſs of actions or ſtock.

By *realizing* is meant the precaution many of thoſe who had gained moſt, took, to convert their paper into real effects: as lands, houſes, rich moveables, jewels, plate; but, above all, into current ſpecies. A precaution capable of ruining the ſtate; but the French regency had the wiſdom to fruſtrate it, by taking proper meaſures to have the money, thus ready to be hoarded up, returned to the public.

REALISTS, Realistæ, a ſect of ſchool-philoſophers who followed the doctrine of Ariſtotle with reſpect to univerſal ideas, formed in oppoſition to the Nominalists, (ſee that article,) who embraced the hypotheſis of Zeno and the Stoics upon that perplexed and intricate ſubject.

Ariſtotle held, againſt Plato, that, previous to, and independent on, matter, there were no univerſal ideas or eſſences, and that the ideas or exemplars which the latter ſuppoſed to have exiſted in the divine Mind, and to have been the models of all created things, had been eternally impreſſed upon matter, and were coeval with, and inherent in, their objects. Zeno and his followers, departing both from the Platonic and Ariſtotelian ſyſtems, maintained, that theſe pretended univerſals had neither form nor eſſence, and were no more than mere terms and nominal repreſentations of their particular objects.

Under the Realiſts are included the Scotiſts, Thomiſts, and all excepting the followers of Occam.

Their diſtinguiſhing tenet is, that univerſals are realities, and have an actual exiſtence, out of an idea and an imagination; or, as they expreſs it in the ſchool-language, *a parte rei*; whereas the Nominaliſts contend, that they exiſt only in the mind, and are only ideas, or manners of conceiving things.

Doctor Odo, or Oudard, a native of Orleans, afterwards abbot of St. Martin de Tournay, was the chief of the ſect of the Realiſts. He wrote three books of dialectics; where, on the principles of Boethius and the ancients, he maintained that the object of that art is things, not words; whence the ſect took its riſe and name.

REALITY, Realitas, in the *Schools*, a diminutive of *res*, *thing*, firſt uſed by the Scotiſts to denote a thing which may exiſt of itſelf, or which has a full and abſolute being of itſelf, and is not conſidered as a part of any other.

Yet a reality is conceived as ſomething leſs than *res*; and accordingly every *res* is ſuppoſed to contain a number of realities, which they otherwiſe call *formalities*.

Thus, *e. gr.* in a man, according to the doctrine of the Scotiſts, are a number of realities; *viz.* a ſubſtance, life, animal, and reaſon.

Some

Some diſtinguiſh reality into ſubjective and objective.

REALM, Regnum, *Kingdom*, a country which gives its head or governor the denomination of king.

The word is formed of the French *royaume*, which denotes the ſame.

REALMONT, in *Geography*, a town of France, in the department of the Tarn, and chief place of a canton, in the diſtrict of Alby; 9 miles S. of Alby. The place contains 2247, and the canton 8949 inhabitants, on a territory of 247½ kiliometres, in 19 communes.

REALVILLE, a town of France, in the department of the Lot; 8 miles N.E. of Montauban. N. lat. 44° 6′. E. long. 1° 34′.

REAMLA, a town of the Arabian Irak; 10 miles W. of Baſſora.

REAMO, a town of Naples, in Abruzzo Ultra; 6 miles W.N.W. of Teramo.

REAMUR, a town of France, in the department of the Vendée; 18 miles N. of Fontenay le Comte.

REANG, a town of Bengal; 45 miles S. of Silhet.

REAPER, a perſon whoſe buſineſs it is to reap or cut grain.

REAPING, the operation of cutting crops by means of the ſickle. It is a very laborious ſort of field-work, and one which requires conſiderable attention and care to perform it in a neat and exact manner. Reaping is performed with ſome other ſorts of crops, beſides thoſe of the grain kinds; as occaſionally for peas, beans, flax, and others of a ſimilar nature. Work of this nature is executed in many different ways, according to the differences in the cuſtoms of different diſtricts; as by ſets of men hired by the month, for this particular purpoſe, called harveſt-men; by perſons taking it by the piece, or by the acre, and by the ſheaf or ſtouk of eight ſheaves.

In ſome methods, by the piece or the quantity is unqueſtionably the beſt, in moſt caſes, on account of the very high prices which are exacted at this very buſy ſeaſon, and the very ſmall extent of labour which is performed in working by the day, which cannot be controlled by the farmer at ſuch hurrying times. Beſides, the work is, for the moſt part, the beſt and moſt expeditiouſly performed in theſe ways; which are objects of very great importance, and deſerving of much conſideration in this ſort of buſineſs. The eye of the farmer is, however, conſtantly neceſſary to ſee that all goes on in a right manner.

In the northern parts of Lancaſhire, this ſort of labour is moſtly performed by the day, or the hattock of ten ſheaves, or the ſtouk of twelve ſheaves; three-pence being often paid for the former, and four-pence or five-pence for the latter, in theſe places.

In ſome diſtricts, the reaping of the crops commences before they are quite ripe; but in others, not until this has fully taken place.

Reaping *of Corn*, the practice of cutting it with the ſickle, or otherwiſe, by perſons employed for the purpoſe. It may be obſerved, that the buſineſs of reaping or cutting grain crops differs much in the manner of performing the work, in different diſtricts of the kingdom, and kinds of crops. In the more ſouthern parts of the iſland, the crops of this ſort are moſtly cut by means of ſhort ſtiff ſcythes, made for the purpoſe, having bows formed of bent ſticks, or what in ſome places are termed *cradles*, fixed upon the lower parts of the handles, for the more readily depoſiting the ears or heads of the corn in one uniform direction, as much as poſſible, in order that it may be afterwards bound up into ſheaves. But in other caſes, the naked ſcythe is made uſe of; the corn being ſeldom bound up, being ſimply raked together into ſmall heaps, in a ſimilar manner to hay.

In the more northern parts of England, and in Scotland, the reaping of grain crops is, however, in general performed by the ſickle, or reaping hook; the different handfuls, as ſoon as cut, being depoſited upon bands, formed by twiſting together a few ſtalks of the corn at the ends next the ears, and afterwards bound up into ſheaves, in order to their being ſet up into *ſhocks* or *hattocks*. This method is, in moſt inſtances, adopted with the wheat and rye crops, in every part of the iſland; as in cutting them with the ſcythe, it is difficult to be performed without much loſs being ſuſtained by the ſhedding of the grain. And, in addition, it is of great advantage to have theſe ſorts of crops bound up regularly into ſheaves, the ſtraw being much better.

Beſides theſe, there is another mode ſometimes practiſed, which is by means of a hook with a ſharp edge, without any teeth; the labourer, in executing the work, hooking up the corn towards him. It is moſtly made uſe of in the ſouthern diſtricts, where it is known by the name of *bagging*, the grain in this way being cut very low.

In this way the reaper collects enough for one ſheaf at a time, binds it, and ſets it up in tens, called a ſhock in Middleſex. This bagging (or fagging) practice is, to all intents and purpoſes, mowing with one hand againſt the ſtanding corn. The toothleſs hook, employed in doing it, is of nearly twice the weight of the common ſickle. It is ſharpened occaſionally, when neceſſary, in the manner of the ſcythe; and the operation of cutting the crop down is by a ſucceſſion of blows made upon the ſtraw of the ſtanding grain, very nearly in the direction down towards the ſurface of the ground. Reaping in Middleſex is moſtly all done in this way, as the proper uſe of the ſcythe is but little known.

This method has the advantage of being done cloſer, and with equal or more expedition than the hand-reaping mode, beſides the ſaving in ſtraw, which is here ſuppoſed worth 7*s*. the acre.

In Eſſex wheat crops are generally reaped or cut with the ſickle, though in the vicinity of the metropolis it is not uncommon to have it mown with the ſcythe, as cloſe to the ground as other ſorts of grain crops, in the view of increaſing the quantity of ſtraw, which is there very valuable. It is thrown, in theſe caſes, with great ſkill and dexterity into ſwaths. When perfectly ripe, it is ſoon bound up into ſheaves of ſix or eight inches diameter, with bands of wheat-ſtraw of ſingle or double lengths; but when not in this ripe or dry ſtate, it is allowed to remain in the ſwaths two or three days, as neceſſary. However, in more than three quarters of the county, it is reaped or cut with the ſickle; and indeed in almoſt all places, when beaten down by the wind and rain.

In regard to the time of reaping the grain, there is conſiderable difference in different diſtricts; ſome not reaping it until it is quite ripe, while others cut it when ſomething ſhort of this ſtate. This, however, ſhould probably be regulated by the nature of the ſeaſon, and the kind ſtate or quality of the crop, as well as the uſes to which the grain is to be put.

In reſpect to the manner of reaping grain crops, whether the ſickle or ſcythe be employed for the purpoſe, there is much difference in the height at which the crops are cut in different places. In ſome it is the practice to have the buſineſs performed in as cloſe a manner as poſſible; while in others a ſtubble of eight, ten, and fifteen inches, or more,

is left. Theſe different practices have their advocates; one party ſuppoſing that the work proceeds more ſlowly, where it is executed in ſo cloſe a manner; while the other contend that the contrary is the caſe. But as the ſtubble which is left is not only uſeleſs to the land, but in many caſes very troubleſome in its ſucceeding culture, being frequently under the neceſſity of being removed, it would ſeem to be the beſt as well as cheapeſt practice, to have the buſineſs conſtantly executed in a cloſe manner. It has been obſerved by a late practical writer, that by this means the agricultor will not only have more litter at command, for the bedding of his yards, ſtalls, and other places, and conſequently an increaſe of manure, but have the buſineſs more expeditiouſly performed, with much leſs waſte of grain, and at the ſame time be freed from the trouble and expence of removing the ſtubble. It has indeed been fully ſhewn, by a careful trial, made with the view of aſcertaining the difference between high and low reaping, that the advantage is conſiderably in favour of the cloſe method.

And the reſult of the trial is thus ſtated by the writer of the Agricultural Survey of the Weſt Riding of Yorkſhire, who obſerves that the experiment was made upon part of a field of wheat, two ridges of which were cut cloſe by the ground, and the other two conſiderably higher, though not ſo high as the general run of the Yorkſhire ſtubbles. Each of the diviſions was apparently of equal quality, and meaſured a trifle more than a quarter of a Scotch acre, which is about one-fifth larger than the Engliſh ſtatute acre. The crop was ſtacked ſeparately, and the time taken to the part cut low was one hour and twenty-four minutes, of eight ſhearers; while the high cutting was performed by the ſame number of hands in forty-eight minutes. The wages paid that week were 18*d.* *per* day, and the ſuppoſed expence of maintenance 6*d.* or 2*s.* *per* day altogether. When threſhed, the grain and ſtraw were carefully meaſured and weighed, and the reſult of the experiment was as follows:

	£	s.	d.
Reſult—8 ſhearers, 1 hour 24 minutes, at 2*s.* *per* day, or 22½*d.* *per* hour - - -	0	2	4
The ſame hands in 48 minutes - - -	0	1	4
Difference of expence	0	1	0

In favour of high cutting one ſhilling, or four ſhillings *per* acre.

	£	s.	d.
1¼ peck of wheat more upon the low cut ridges than thoſe cut high, at 1*s.* 4*d.* *per* peck - - - - - - - -	0	1	8
14 ſtones (22 avoirdupois pounds) of more ſtraw, at 2*d.* *per* ſtone - - - -	0	2	4
	0	4	0

Or ſixteen ſhillings *per* Scotch acre.

From which deduct the increaſed expence of cutting, there remains a benefit of twelve ſhillings *per* acre in favour of low cutting.

It is noticed farther, that the above trial, according to the beſt of the reporter's judgment, was fairly made; and the reaſon which urged him to make it, was to ſilence the objections of ſome neighbours, who alleged low ſhearing was not profitable. It is alſo proper to obſerve, that the field of wheat, on which the trial was made, was not broke down nor ſtraggled, ſo was in a favourable condition for high cutting. We have ſeen wheat-fields, where three times the quantity might have been left, unleſs great pains were uſed.

But the methods of reaping grain crops, both with the ſickle and the ſcythe, have each their advantages and diſadvantages. In the firſt manner, the crops are depoſited with more regularity and exactneſs, and conſequently bound into ſheaves with greater facility and diſpatch. Beſides, in many caſes leſs loſs is incurred by ſhedding, in the time the work is in performing; but the labour is executed with greater difficulty and trouble. The latter poſſeſſes the ſuperiority of being more expeditious, and of being performed to any degree of cloſeneſs that may be required; while it has the evident diſadvantage of leaving the cut grain in a more irregular and uneven ſituation, by which it is rendered leſs fit for being bound up into ſheaves, which in many caſes is an inconvenience of great conſequence. When the grain has attained a high degree of ripeneſs, there may likewiſe be great loſs ſuſtained, by its being ſhed during the operation, in this way of reaping and cutting the crop. Where this method is practiſed, it is, however, not unfrequently the caſe to have it bound into ſheaves; though the moſt common cuſtom is to let it remain in the rows or ſwaths, till fit for being put into the ſtack. When bound, it is generally the practice to cut it inwards againſt the crop on which it reſts: in the other caſe, it is cut in the manner of graſs for hay. It is obvious, therefore, that when labourers are procured with difficulty, this mode of reaping is the moſt adviſeable; while, under the contrary circumſtances, the former may be had recourſe to with more advantage, as the work may be executed in a neater and more exact way. See HARVESTING and SICKLE.

It may be remarked, that this is a ſort of work that is often let by the acre to perſons that go about for harveſt work; and it may, in many caſes, be the beſt performed in this manner. But great attention ſhould be paid by the farmer, to ſee that the grain is cut and bound up in a proper method, and that the work be not performed in improper weather. The prices vary according to the nature of the crops, the ſeaſon, and other circumſtances, ſometimes riſing as high as eleven or twelve ſhillings the acre, and ſometimes much higher.

REAPING *Fork*, a tool of the fork kind, invented for the purpoſe of raiſing and collecting the mown grain into ſheaves, ſo that it may be bound up. It is conſtructed with two, rather long, prongs below, ſlightly curving upward, ſomewhat in the manner of the common large hay fork, to which are attached, at the upper part, near the inſertion into the handle, two other upright prongs, which bend a little forward towards their tops or ends; by means of which, with the under prongs running along the ground, the tool being puſhed forward by the labourer, the grain in the ſtraw is raiſed up, brought together, held in a firm manner, and removed from the ſwathe ſo as to be bound into ſheaves. In this way, the lower prongs perform the work of picking the ſtrawy material from the land, while the higher upright ones prevent it from falling backwards, and determine the quantity which is neceſſary for a ſheaf. In this manner, by this ſimple contrivance, the mown grain can be brought together and bound up with much greater regularity, and in a much more expeditious method than is poſſible to be done by mere hand labour.

REAPING *Hook*, an implement of the ſickle kind, with which the buſineſs of reaping is performed in ſome diſtricts.

Theſe hooks are ſometimes formed with teeth, or in a toothed manner, and ſometimes with a cutting edge. In Devonſhire, and ſome other counties, thoſe with ſmooth edges are generally preferred to ſickles with ſawed ones:

theſe ſorts of hooks are uſed occaſionally with either hand, the operator ſhifting hands, chopping the ſtraw low down, and gathering about half a ſheaf at a time, which, when put together, is bound with reed, combed from former wheat-ſtraw, or with a double length of the wheat which is reaping. See SICKLE.

REAPING *Machine*, a contrivance for the purpoſe of reaping grain by means of animal labour. With this view, and to facilitate an operation of ſuch importance to the farmer, different attempts have been made to conſtruct machines, ſo as to diſpatch the work in a rapid manner by the aſſiſtance of horſe labour, but the ſucceſs with which they have been attended, has hitherto been far from complete. An implement of this ſort has lately been made by Mr. Plunknett; it is upon a ſomewhat new principle, the horſe drawing the machine inſtead of puſhing it forward, as was the old mode of applying the power.

In this machine, the horſe tracks from the front ſide of it, which is ſeen at once by the appearance of the implement, ſo as to be clear of the crop, and the two large wheels, by means of the axle, drive another wheel, which communicates with the two other wheels, the latter of which is found in the axis of the cutter: a man at the handles regulates the direction, &c. This machine may be ſeen fully repreſented in the ſecond volume of the Farmer's Dictionary; and a reaping machine for clover may be ſeen in the ſame work in the ſame plate.

Other machines of this kind have ſtill more lately been invented by other perſons, but without anſwering the purpoſe in that full and complete manner which is neceſſary in this ſort of work.

What appears to be chiefly wanting in theſe ſorts of machines, to render them complete and effective, as tools for the purpoſe of reaping, is that of their having more power or velocity in the cutting parts, ſo that the work may be performed in a perfectly clean neat manner, without the ſtraw being drove or forced down in an improper manner before the inſtruments which are to cut it; their cutting it out fully in the whole of its breadth; their being capable of being regulated to cut at different heights, and to different breadths; their being made capable of directing the cut ſtrawy grain all in one even regular direction, ſo that it may be bound up with facility; the horſes, or other animals, being ſo attached to them as to permit of their walking along on the ſide of the ſtanding grain, where the former cut was made, or where they puſh the implements before them, the having them ſo conveniently fixed in them as to admit of no ſort of interruption to the labour in any way; their being made light and of ready application, as well as at a cheap rate; and their keeping the ſcythes or cutting parts in a perfectly ſharp ſtate, without their being taken out, and undergoing the operation of whetting. There are, beſides theſe, ſome other points, which ſhould be attended to, but theſe are, probably, the moſt material.

REAPS, ſmall parcels of corn, laid along on the ſtubble, in reaping, to be afterwards gathered into ſheaves by the binder. This is moſt commonly the caſe, when the weather is moiſt, as in dry times the reaps of corn are uſually laid in the bands, and tied up, as ſoon as they are in ſufficient quantity, into ſheaves.

REAR, a term frequently uſed in compoſition, to denote ſomething behind or backward in reſpect of another; in oppoſition to *van*, or *avant*, *before*.

It is formed by corruption of the French *arriere*, ſignifying the ſame.

REAR, in a *Military Senſe*, is uſed for the hind-part of an army, &c. in oppoſition to the *front*, or face of it.

REAR, in *Naval Language*, is a name given to the laſt diviſion of a ſquadron, or the laſt ſquadron of a fleet, and which is accordingly commanded by a rear-admiral, or the third officer of the ſaid fleet or ſquadron.

REAR-*admiral*. See ADMIRAL.

REAR-*guard*. See GUARD.

REAR-*half-files*, are the three hindmoſt ranks of a battalion, when it is drawn up ſix deep. See FILE-*leaders*.

REAR-*line* of an army encamped, is always twelve hundred feet at leaſt from the centre line, both of which run parallel to the front line, and alſo to the reſerve.

REAR-*rank*, is the laſt rank of a battalion, or ſquadron, when drawn up, and generally ſixteen or eighteen feet from the centre line, when drawn up in open order.

REAR-*up*, in the *Manege*, called in French *cabrer*, is the action of a horſe, when he raiſes himſelf upon his houghs or hinder legs, as if he would fall quite over in a backward direction, to the great danger of his rider. This is often cauſed by his having too much of the curb.

REAR, in *Rural Economy*, to raiſe the roof part of any ſort of ſhed or other building for containing ſome kind of live-ſtock.

REARED, or *Wale*-REARED. See WALE-*reared*.

REARING ANIMALS, in *Agriculture* and *Rural Economy*, the buſineſs of breeding and bringing them up to the moſt ſuitable ſtates for the purpoſes of the farmer. The principles of this art depend upon a variety of different circumſtances and kinds of knowledge, as has been already explained. See BREEDING, and LIVE-*Stock*.

Animals of the horſe kind ſhould invariably be brought up in the beſt manner, without any ſort of ſtinting in their food, according to the uſes they are deſigned to ſerve, in order that they may have their full growth and power. In the labouring cattle kinds of animals, attention ſhould, in ſome degree, be paid to hardineſs, both in their food and their expoſure, by having recourſe to the more coarſe ſorts of feeding in the leſs ſheltered ſituations, but nothing of ſtinting ſhould ever be allowed, as by theſe means they become large, and capable of ſuſtaining a greater degree of exertion. There is, likewiſe, much utility in good training, in rearing all ſorts of animals in this intention; and it requires careful, ſteady, mild perſons to be employed in it, as they, for the moſt part, acquire the habits and diſpoſitions of thoſe about them, in ſome meaſure; and the more early they are obtained the better. This point deſerves much more attention from farmers and others than it has hitherto met with, as moſt of the bad habits of working animals ariſe from the neglect of it. Beſides, good training and mild diſpoſitions are highly favourable to fattening animals. See HORSE.

In rearing poultry, pigeons, rabbits, and fiſh, much care, management, and circumſpection, are conſtantly neceſſary, in order to their perfect ſucceſs. Too little attention is for the moſt part beſtowed on the nature of the birds, in ſome ſorts of the more wild poultry kinds, as thoſe which are of the game deſcription, for inſtance, the galena, the pheaſant, the ſwan, and ſome others. Theſe cannot be ſo readily reared, or with ſo much facility, under hens of the domeſtic kind, as other ſorts are, ſuch as the turkey, peacock, &c. This circumſtance ſhould therefore be always kept in mind in rearing ſuch birds. See POULTRY, PIGEONS, RABBIT, &c.

A very nice attention and management is alſo requiſite in the rearing and perfecting of fiſh. See FISH, POND-*Fiſheries*, and *Salmon* FISHERY.

In rearing birds of the game kind, ſuch as the above, in the way of ornament about a reſidence, Mr. Loudon has remarked, much depends upon encouraging them, when allowed

lowed to go wild, by giving them proper and abundant cover, and ſowing among it ſuch herbs and plants as they are particularly fond of, as thoſe of the creſs, chervil, parſley, thyme, and ſome other kinds. They have likewiſe a tendency to encourage and domeſticate hares. Abundance of fearleſs game about a reſidence, he thinks, give a peculiar nobleneſs, and appearance of freedom, which few things elſe can communicate or afford.

REASON, Ratio, a faculty or power of the ſoul, by which it diſtinguiſhes good from evil, and truth from falſhood. Or, reaſon is that principle, by which, comparing ſeveral ideas together, we draw conſequences from the relations they are found to have.

Some of the later ſchool-philoſophers define reaſon to be the comprehenſion of many principles which the mind ſucceſſively can conceive and from which concluſions may be drawn.

Others conceive reaſon as no other than the underſtanding itſelf, conſidered as it diſcourſes.

Reaſon, Mr. Locke obſerves, comprehends two diſtinct faculties of the mind; *viz. ſagacity*, by which it finds intermediate ideas; and *illation*, by which it ſo orders and diſpoſes of them, as to diſcover what connection there is in each link of the chain, by which the extremes are held together; and by them, as it were, draws into view the truth ſought for.

Illation, or inference, conſiſts in nothing but the perception of the connection there is between the ideas in each ſtep of the deduction, by which the mind comes to ſee either the certain agreement or diſagreement of any two ideas; as in demonſtration, in which it arrives at knowledge; or their probable connection, on which it gives or withholds its aſſent; as in opinion.

Senſe and intuition reach but a little way; the greateſt part of our knowledge depends upon deductions, and intermediate ideas. In thoſe caſes, where we muſt take propoſitions for true, without being certain of their being ſo, we have need to find out, examine, and compare, the grounds of their probability; in both caſes, the faculty which finds out the means, and rightly applies them to diſcover certainty in the one, and probability in the other, is that which we call *reaſon*.

In reaſon, therefore, we may conſider four degrees; firſt, the diſcovering and finding out of proofs. See Invention.

Secondly, the regular and methodical diſpoſition of them, and laying them in ſuch order, as that their connection may be plainly perceived. See Method.

Thirdly, the perceiving of their connection (ſee Judgment.) And,

Fourthly, the making a right concluſion.

Reaſon fails us in ſeveral inſtances; as, firſt, where our ideas fail.

Secondly, it is often at a loſs, becauſe of the obſcurity, confuſion, or imperfection, of the ideas it is employed about. Thus, having no perfect idea of the leaſt extenſion of matter, nor of infinity, we are at a loſs about the diviſibility of matter.

Thirdly, our reaſon is often at a ſtand, becauſe it perceives not thoſe ideas which would ſerve to ſhew the certain or probable agreement or diſagreement of any two other ideas.

Fourthly, our reaſon is often engaged in abſurdities and difficulties, by proceeding upon falſe principles, which, being followed, lead men into contradictions to themſelves, and inconſiſtency in their own thoughts.

Fifthly, dubious words, and uncertain ſigns, often puzzle men's reaſon, and bring them to a nonplus.

Though the deducing one propoſition from another be a great part of the office of reaſon, and that about which it is uſually employed; yet the principal act of ratiocination is the finding the agreement or diſagreement of two ideas one with another, by the intervention of a third. As a man, by a yard, finds two houſes to be of the ſame length, which could not be brought together to meaſure their equality by juxta-poſition. Words have their conſequences as the ſigns of ſuch ideas and things agree or diſagree with what they really are; but we obſerve it only by our ideas.

Hence we may be able to form an idea of that ordinary diſtinction of things, into ſuch as are *according to*, thoſe that are *above*, and thoſe *contrary to reaſon*.

Thoſe *according to reaſon* are ſuch propoſitions, whoſe truth we can diſcover by examining and tracing thoſe ideas we have from ſenſation and reflection, and by natural deduction find to be true or probable.

Thoſe *above reaſon* are ſuch propoſitions, whoſe truth or probability we cannot by reaſon derive from thoſe principles.

Thoſe *contrary to reaſon* are ſuch propoſitions as are inconſiſtent with, or irreconcileable to, our clear and diſtinct ideas.

Thus the exiſtence of one God, is according to reaſon; the exiſtence of more than one God, is contrary to reaſon; and the reſurrection of the body after death, above reaſon.

Above reaſon may be alſo taken in a double ſenſe; *viz.* above probability or above certainty.

They who diſpute moſt againſt the power and privileges of human reaſon, do it becauſe their own reaſon perſuades them to that belief; and ſo, whether the victory be on their or our ſide, they are equally defeated.

They ſeek to terrify us with the example of many great wits, who, by following this *ignis fatuus* (ſo they call the only pole-ſtar God has given us to direct our courſe by), have fallen into wild and ridiculous opinions, and increaſed the catalogue of hereſies to ſo great a number; but theſe men either followed not their reaſon, but made it follow their will; or elſe they firſt hoodwinked it by intereſt and prejudice, and then bade it ſhew them the way; or were wanting in thoſe neceſſary diligences required for ſo doubtful a paſſage: or if, without any of theſe, the weakneſs of their underſtanding had deceived them, the error is neither hurtful to themſelves, nor would be to others, if this doctrine of governing ourſelves by our own reaſon, and not by authority and example, were generally eſtabliſhed. Diſ. Concern. Hum. Reaſ.

It is not the uſe of ſuch liberty, but the appropriating it to ourſelves, that is the cauſe of all the diſorders charged upon it; for thoſe who lay a reſtraint on other men's reaſon, have firſt made uſe of their own to ſettle them, and to make uſe of it in this very reſtraining of others. Ibid.

Reason, in *Matters of Religion*, is uſed in oppoſition to *faith*.

This uſe of the word, Mr. Locke takes to be in itſelf very improper; for faith is nothing but a firm aſſent of the mind; which, if it be regulated, as it is our duty, cannot be afforded to any thing but upon good reaſon, and ſo cannot be oppoſite to it.

He that believes without having any reaſon for believing, may be in love with his own fancies; but he neither ſeeks truth as he ought, nor pays the proper obedience due to his Maker, who would have him uſe thoſe diſcerning faculties he has given him, to keep him out of miſtake and error.

But ſince reaſon and faith are by ſome men oppoſed to one another, it may be neceſſary to conſider them together.

Reaſon, as contradiſtinguiſhed to faith, is the diſcovery of the certainty or probability of ſuch propoſitions, or truths, which it has got by the uſe of its natural faculties; *viz.* by ſenſation, or reflection.

Faith, on the other hand, is the aſſent to any propoſition upon the credit of the propoſer, as coming immediately from God; which we call *revelation*, which ſee.

Reason, in *Logic* and *Rhetoric*, denotes a neceſſary or probable argument; or an anſwer to the queſtion, *cur eſt? why is it?*

As if it be inquired, why do the ſubject and predicate agree? and it is anſwered, becauſe they are ſpoken of the ſame thing: this laſt enunciation is a reaſon. Hence, ſay the ſchoolmen, becauſe *quia* is the ſign or character of a reaſon, as *non*, *no*, of a negation, and *eſt*, *is*, of an affirmation.

They make three kinds of reaſons, *rationes*; viz. *ratio ut*, *that*; *ne*, *leſt*; and *quia*, *becauſe*. For, anſwering to a queſtion, *cur*, *why*, we begin with becauſe, *quia*; as, why do you ſtudy? that I may become learned; which is the *ratio ut*. Again, why do you ſtudy? leſt I ſhould be ignorant; which is the *ratio ne*. Laſtly, why is a body tangible? becauſe matter is impenetrable; which is the *ratio quia*.

The *reaſon ut* properly denotes the end, or final cauſe; and *reaſon ne* the beginning: accordingly the one is called the beginning, the other end; ſo that the *reaſon quia* is left the only reaſon, properly ſo called.

Reason, among *Metaphyſicians*, is uſed in the ſame ſenſe with eſſence; or that by which any thing is what it is.

This is ſometimes alſo called formal reaſon, as repreſenting the thing under that form or nature under which it is conceived.

Reason, in *Mathematics*. See Ratio.

Reason *of State*, *Ratio Status*, in *Matters of Policy*, denotes a rule or maxim, whether it be good or evil, which may be of ſervice to the ſtate.

The phraſe is borrowed from the Italians, who firſt uſed *ragione di ſtato* in this ſenſe.

Reaſon of ſtate is properly underſtood of ſomething that is neceſſary and expedient for the intereſt of the government, but contrary to moral honeſty, or juſtice.

Politicians have a long time diſputed about the *ratio ſtatus*; whether ſtates and governments are tied down to the ſame laws of morality with individual perſons; or whether things, otherwiſe immoral and unlawful, may not be practiſed on urgent occaſions, by way of reaſon of ſtate?

The queſtion is, whether any thing be unlawful, or prohibited a ſtate, that is neceſſary to the preſervation of that ſtate, or whether it be allowed to preſerve itſelf on any terms?

Reason, *Challenge upon*. See Challenge.

Reason *ſufficient of Leibnitz*. See Leibnitzian *Philoſophy*.

REASONABLE Aid, a duty which the lord of the fee anciently claimed of his tenants, holding in knight's ſervice, or on ſocage, towards the marrying his daughter, or the making his eldeſt ſon knight.

This is taken away by ſtat. 2 Car. II. See Aid.

REASONING, Ratiocination, the exerciſe of that faculty of the mind called *reaſon*: or, it is reaſon deduced into *diſcourſe*; which ſee.

The agreement or diſagreement of two ideas does not appear from the bare conſideration of the ideas themſelves, unleſs ſome third be called in, and compared, either ſeparately, or conjointly with it: the act, then, by which, from ideas thus diſpoſed and compared, we judge this or that to be ſo, or not ſo, is called *reaſoning*. Or, it is that operation of the mind, by which we infer one thing, *i. e.* one propoſition from two or more propoſitions premiſed. Or, again, it is the drawing of a concluſion, which before was either unknown, or dark, or doubtful, from ſome propoſitions which are more known and evident. It is the narrowneſs of the human mind which introduces the neceſſity of reaſoning; for if the mere perception and compariſon of two ideas would always ſhew us whether they agree or diſagree, then all rational propoſitions would be matters of intelligence, or firſt principles, and there would be no uſe of reaſoning, or drawing any conſequences. But when we are unable to judge of the truth or falſehood of a propoſition in an immediate manner, by the mere contemplation of its ſubject and predicate, we are then conſtrained to uſe a medium, and to compare each of them with ſome third idea, that by ſeeing how far they agree or diſagree with it, we may be able to judge how far they agree or diſagree among themſelves. Watt's Logic, part iii. chap. 1.

Rohault defines reaſoning to be a judgment depending on ſome antecedent judgment: thus, having judged that no even number can be compoſed of five uneven numbers, and that ten is an even number; to conclude, that ten cannot be divided into five uneven parts, is a ratiocination, or reaſoning.

This agrees with father Malebranche's doctrine, one of the great points of which is, that reaſoning, on the part of the underſtanding, is only a mere perceiving.

That ingenious author endeavours to ſhew, that, as to the underſtanding, there is no difference between a ſimple *perception*, a *judgment*, and a *reaſoning*, except in this, that the underſtanding perceives a ſimple thing without any relation to any thing elſe, by a ſimple *perception*; that it perceives the relations between two or more things in a *judgment*; and, laſtly, that it perceives the relations that are between the relations of things, in a *reaſoning*. So that all the operations of the underſtanding are no more than mere perceptions.

Thus, *e. gr.* when we conclude, that 4 being leſs than 6, twice 2 being equal to 4, are of conſequence leſs than 6, we do no more than perceive the relation of the inequality between the relation of twice 2 and 4, and the relation of 4 and 6.

The manner of proceeding juſtly in reaſoning; ſo as to arrive with the greater ſafety at the knowledge of truth, makes what we call *method*.

For the real benefit of logic to reaſoning, ſee Logic and Syllogism.

RE-ATTACHMENT, in *Law*, a ſecond attachment of him who was formerly attached, and diſmiſſed the court without day, by not coming of the juſtices, or the like caſualty.

Brook makes re-attachment either *general* or *ſpecial*. *General* is where a man is re-attached for his appearance on all writs of aſſize lying againſt him: *ſpecial*, for one or more certain writs.

REAU, in *Geography*, a town of Germany, in the principality of Culmbach; 9 miles S.E. of Hof.

REAVE, in *Rural Economy*, a provincial term, uſed to ſignify the unroofing or diſturbing the thatch or other covering of a building by winds, &c.

REAUMUR, Renè-Antoine Ferchault, *Sieur de*, in *Biography*, was born in 1683 at Rochelle. He was brought up to the ſtudy of the law, which he quitted for that

that of the mathematics, natural hiſtory, and natural philoſophy. In 1703 he went to Paris, and ſo diſtinguiſhed himſelf in a few years, that in 1708 he was admitted into the Academy of Sciences. From that time he entirely gave himſelf up to the purſuits of natural hiſtory in all its branches, and few men have paſſed a life more actively and uſefully employed. Utility was the conſtant aim in all his enquiries, even into the moſt minute parts of nature; and experiment and obſervation were his perpetual guides. No one ſurpaſſed him in the patient induſtry with which he obſerved natural phenomena, or followed the proceſſes of art. The Memoirs of the Academy of Sciences, from 1709 to 1756, are enriched with his communications. The improvement of manufactures was a great object of his attention. In 1722 he publiſhed a work, entitled "L'Art de convertir le Fer forgè en Acier, et l'Art d'adoucir le Fer fondu," which contained a minute and ſcientific account of the proceſſes employed in that branch of manufacture, with hints for their improvement. He introduced into France the manufacture of tinned iron, which article had before been imported from abroad; and he made a great many experiments in the manufacture of porcelain, which contributed to its perfection in France. He alſo performed numerous experiments relative to the art of hatching chickens by artificial heat, as practiſed in Egypt, an account of which he publiſhed in two vols. 1752. M. Reaumur rendered his name celebrated by his peculiar method of graduation on the thermometer, which is ſtill the only one uſed in France and many parts of the continent. In this thermometer the freezing point is marked zero, and the boiling point at 80°. (See THERMOMETER.) Some of the moſt valuable of Reaumur's phyſiological experiments were thoſe relating to the concoctive powers of the ſtomach in granivorous and carnivorous birds, in which he clearly eſtabliſhes the different modes of action in theſe two claſſes, *viz.* by trituration, and by ſolution. In natural hiſtory, he acquired the greateſt fame as an entomologiſt. Beſides a number of curious papers on this ſubject in the Memoirs of the Academy, he publiſhed a very elaborate work, entitled "Memoires pour ſervir à Hiſtoire Naturelle des Inſectes," in ſix vols. 4to. 1734—1742. This work was the labour of many years, and the reſult of innumerable obſervations made in his garden, in which he kept inſects of all kinds, that he might examine their generation, changes, and mode of life. Reaumur was a man of much private worth, of mild and amiable manners, and correct morals. He died in 1757, at the age of 75. He bequeathed his manuſcripts, and cabinet of natural philoſophy, to the Academy of Sciences.

REAUMURIA, in *Botany*, ſo called in honour of the great French naturaliſt, Renè Antoine Ferchault de Reaumur, principally known, as a botaniſt, by his examination of the fructification of *Fuci*, but chiefly celebrated as a philoſophical inquirer into the hiſtory of inſects, and their tranſformations, to which the ſpecific name of the original ſpecies, *vermiculata*, evidently alludes. Linnæus mentions Haſſelquiſt as the author of the name *Reaumuria;* of which we can find no traces in his book, though the ſpecimen of the plant in the Linnæan herbarium, has ſome appearance of having been gathered by this diſtinguiſhed Oriental traveller. Is it poſſible, that the *Anonyma dubia*, n. 15, of his Iter Palæſtinum, 465, which his editor Linnæus could not make out, can be the *Reaumuria*? The deſcription is not inapplicable, except what concerns the ſtamens and ſtyle. Yet this does not make him the author of the name, though it may poſſibly account for Linnæus's mention of him in conjunction therewith. The latter appears, by his manuſcripts, to have once deſtined *Vermicularis* for the generic appellation.—Linn. Gen. 276. Schreb. 371. Willd. Sp. Pl. v. 2. 1249. Mart. Mill. Dict. v. 4. Ait. Hort. Kew. v. 3. 327. Juſſ. 316. Lamarck Illuſtr. t. 489. Dict. v. 6. 84.—Claſs and order, *Polyandria Pentagynia*. Nat. Ord. *Succulentæ*, Linn. *Ficoideæ*, Juſſ.

Gen. Ch. *Cal.* Perianth inferior, of five prominent, ovate, pointed, permanent leaves. *Cor.* Petals five, oblong, equal, ſeſſile, rather longer than the calyx, oblique, or lobed, at the extremity. Nectary of five double, fringed ſcales, at the meeting of the petals, attached to their lower part. *Stam.* Filaments numerous, capillary, the length of the calyx, inſerted into the receptacle; *Desfont.;* anthers roundiſh, incumbent. *Piſt.* Germen ſuperior, roundiſh; ſtyles five, thread-ſhaped, erect, approaching each other, on a level with the ſtamens; ſtigmas ſimple. *Peric.* Capſule ovate, of five cells, with five flat, at length reflexed, valves; the partitions membranous, unconnected, deciduous. *Seeds* ſeveral, erect, oblong, entirely clothed with numerous, ſilky, ſimple hairs, twice their own length.

Eſſ. Ch. Calyx of five leaves. Petals five, with ten fringed ſcales at their baſe. Capſule of five cells, with five valves, and five deciduous partitions. Seeds ſeveral, oblong, hairy.

Obſ. Specimens in ſeed, from profeſſor Desfontaines, have enabled us to reconcile his account, and that of Linnæus, with the obſervation of Forſkall, that "the capſule has only one cell," the partitions being deciduous, and concealed among the hairy ſeeds. Not having examined the nectariferous ſcales, we have, in adverting to Labillardiere's and Hooker's plates of the ſecond ſpecies, made the deſcription ſo general as to accord with both.

1. R. *vermiculata.* Saltwort-leaved Reaumuria. Linn. Sp. Pl. 754. Willd. n. 1. Forſk. Ægypt. Arab. 101. Desfont. Atlant. v. 1. 431. Lamarck Illuſtr. t. 489. f. 1. (Sedum ſiculum maritimum vermiculatum, flore Saxifragæ albæ, ſemine villoſo; Bocc. Sic. 6. t. 4. f. C, G. S. minimum arboreſcens vermiculatum; Lob. Ic. 380. Kali vermiculatum albo et amplo ſedi roſei flore; Barrel. Ic. t. 888. Vermicularis frutex minor; Ger. Em. 523; at leaſt the figure, which is that of Lobel. The deſcription accords rather with *Salſola fruticoſa*, as cited by Hudſon.)—Leaves linear-awlſhaped, convex beneath. Calyx entire.—Native of barren ſandy ground towards the ſea, in Sicily, Barbary, Egypt, and Syria, flowering in ſummer. The habit of the plant is like a *Tamarix*, or *Salſola*. *Stem* ſhrubby, buſhy, much branched, round, ſmooth, whitiſh, leafy. *Leaves* numerous, ſcattered, ſeſſile, from a quarter to three quarters of an inch long, ſpreading, linear-awlſhaped, acute, fleſhy, ſmooth, glaucous; convex beneath; flat above; dotted on both ſides with minute depreſſions. Desfontaines compares the *leaves* to thoſe of *Sedum reflexum*. *Flowers* terminal, ſolitary, white, not unlike thoſe of *Saxifraga Cotyledon*, each encompaſſed with a number of imbricated floral leaves, like thoſe of the ſtem or branch, but longer. *Calyx-leaves* ovate, with a narrow, entire, membranous edge, and awlſhaped leaf-like point. *Petals* terminating in three ſlight lobes, well repreſented by Barrelier. *Capſule* brown, very ſmooth, and ſomewhat ſhining; its valves rigid, reflexed after the ſeeds are diſcharged, and permanent. *Seeds* clothed with long, tawny, ſhining hairs. Forſkall ſays this plant is uſed at Alexandria as a cure for the itch, being applied bruiſed externally, and taken internally in the form of a decoction. It is an elegant little ſhrub, well worthy of a place in our gardens, or green-houſes, to which it is as yet a ſtranger.

2. R. *hypericoides.* Elliptic-leaved Reaumuria. Willd. n. 2. Ait. n. 1. Lamarck f. 2. (R. linifolia; Salif. Parad.

Parad. t. 18. Hypericum alternifolium; Labillard. Syr. faſc. 2. 17. t. 10.)—Leaves elliptic-lanceolate, flat. Calyx minutely crenate.—Gathered in barren dry ground, near the deſert of Syria, by M. Labillardiere, to whom we are obliged for a wild ſpecimen. The plant is ſaid to have been introduced into England, by the late Mr. John Bell, about 1800, and is marked by Mr. Aiton as a hardy perennial. Its true genus is well aſcertained by Lamarck, Poiret, and Saliſbury. The *ſtem* is herbaceous, about a foot high, ſimple, or branched, ſmooth, pale or reddiſh. *Leaves* alternate, glaucous, from half an inch to an inch in length, elliptic-oblong, or ſomewhat lanceolate, varying greatly in breadth, dotted all over. *Flowers* terminal, ſolitary, pale roſe-coloured, with oblique petals. *Calyx-leaves* broader than in the former, their membranous edges finely crenate, their points very ſmall. We know nothing of the *capſule* or *ſeeds*.

REAY, in *Geography*, a town of Scotland, in the county of Caithneſs; 6 miles W. of Thurſo.

REBACH, a river of France, which runs into the Rhine, nearly oppoſite to Manheim.

REBAIS, a town of France, in the department of the Seine and Marne, and chief place of a canton, in the diſtrict of Coulommiers; ſix miles E.N.E. of it. The place contains 1256, and the canton 11,284 inhabitants, on a territory of 190 kiliometres, in 18 communes.

RE-BAPTISANTS, a religious ſect, who maintain, that perſons irregularly baptiſed are to be baptiſed afreſh.

The Anabaptiſts are re-baptiſants, inaſmuch as they baptiſe thoſe at maturity, who had been before baptiſed in childhood.

St. Cyprian and pope Stephen had mighty differences about the re-baptization of converted heretics.

Donatus was condemned at Rome in a council, for having re-baptized ſome perſons, who had fallen into idolatry after their firſt baptiſm.

REBAT, in *Geography*. See RABAT.

REBATE, in *Architecture*. See JOINERY and PLANE.

REBATE, or *Rabat*, *Rebatement*, in *Commerce*, a term much uſed at Amſterdam for a diſcount or abatement in the price of certain commodities, when the buyer advances the ſum in hand, for which he might have taken time. See DISCOUNT.

Rebate (among us uſually called *prompt payment*) is eſtimated by months, and is only allowed for certain kinds of merchandizes, which, according to the cuſtom of Amſterdam, are

15 months, or 10 *per cent.* on German, Pruſſian, and Poliſh wools.

18 months, or 12 *per cent.* on brown Muſcovado ſugar, pot-aſhes, ſoda, Italian Armoiſines, ſatin, damaſk, and ſilk ſtuffs.

21 months, or 14 *per cent.* on Spaniſh wool and lamb's wool.

33 months, or 22 *per cent.* on Italian ſilk and raw ſilk from the Levant, which ſilks are ſold by the Antwerp weight, about 5 *per* 100 lighter than that of Amſterdam.

Dutch cloths, camlets, &c. are ſold with 4 *per cent.* rabat, for ready money, or without any rabat at 9 months' credit.

Dutch ſilk ſtuffs are ſold with 2 *per cent.* rabat at 6 months' credit: with 4 *per cent.* at 3 months; or with 6 *per cent.* for ready money.

In all ſales of goods, except thoſe laſt mentioned, a further abatement is made of 1 or 2 *per cent.* for prompt payment.

At Hamburgh, ſome ſorts of merchandiſe, when ſold in large quantities, have an allowance made of 7, 13, or 19 months rabat, reckoned at 8 *per cent. per annum*; which the buyer, when he pays ready money, or pays within four weeks of the day of ſale, deducts from the nominal price.

Refined ſugars, Engliſh and Dutch cloths, Engliſh baize, ſhalloons, flannels, kerſeymeres, ratteens, and ſerges, are ſold with 7 months' rabat, or $4\frac{2}{3}$ *per cent.*; that is, $4\frac{2}{3}$ are deducted from $104\frac{2}{3}$, or 7 from 157.

Cotton, cinnamon, cochineal, indigo, ginger, nutmegs, cloves, mace, rice, raw ſugars, capers, currants, cumine, gall-nuts, Ruſſian leather, linen, crape, Italian ſilks, table-linen, Sileſia cloth, Marſeilles ſoap, almonds, ſumac, moloſſes, Turkiſh yarn, Italian tartar, are ſold with 13 months' rabat, or $8\frac{2}{3}$ *per cent.*; that is, 13 is deducted from 163. Silks from the Levant, as Ardaſſette, Barutine, and Cerbaffi, are ſold with 16 months' rabat, or $10\frac{2}{3}$ *per cent.*; that is, 8 is deducted from 83. Kelly's Un. Camb. vol. i.

This intereſt, called *rebate*, or *rabat*, is uſually regulated on the footing of 8 *per cent. per annum*.

The reaſon of this expedient is, that the merchants having not always wherewithal to pay for their goods in hand, by means of the rebatement, ſuch as have, will find their account in it; and ſuch as have not will be engaged to diſcharge themſelves as ſoon as poſſible, for the ſake of the diſcount.

REBATEMENT, in *Heraldry*, a diminution or abatement of the dignity of the figures or bearing in a coat of arms. See ABATEMENT.

REBEBE, in *Commerce*, a meaſure of corn in Egypt, particularly at Alexandria, equal to about $4\frac{1}{2}$ buſhels; as *kiſloz*, another meaſure, is equal to $4\frac{7}{8}$ buſhels, Engliſh meaſure: 17.94 rebebes are equal to 10 Engliſh quarters, and each of them contains 9587 cubic inches; and 16.51 kiſlos are equal to 10 Engliſh quarters, and each contains 10418 cubic inches.

REBEC, a muſical inſtrument reſembling a fiddle, with a neck, finger-board, three ſtrings tuned 5ths, and played with a bow.

Etymologiſts have tortured themſelves to find a derivation for the name of a vulgar inſtrument, no longer in uſe. Some trace it from the Arabic, ſome from the Celtic, the Welſh, the Spaniſh, Italian, and old French. Indeed, ſo numerous, diſcordant, and unſatisfactory are their opinions, as neither to be worth writing, nor peruſal, if we could give them a place.

Rebec and ribible ſeem to be the ſame inſtrument, and are often indiſcriminately uſed by Gower, Chaucer, and the ſtill more ancient bards of Normandy, and our own country.

As the head, or ſcroll-work, of old viols and violins uſed to be curiouſly carved, ſo ſeems to have been that of the rebec. Chaucer compares the face of an old woman, an old trot, to the head of a rebec. Rabelais does the ſame.

——" A tel mineſtrier tel rebec
Tenant toujours le verre au bec
Car elle avoit viſage de rebec."

REBECCO, in *Geography*, a town of Italy, in the department of the Panaro; 29 miles S.W. of Modena.

REBEL, JEAN-FERRY, ſen. in *Biography*, one of the 24 violins of the king of France's band, and chamber compoſer to his majeſty. He beat time for many years at the opera, and, in his day, paſſed for a great compoſer. His muſic for dances is ſtill heard with pleaſure. His capriccios, freaks, and dancing characters, have enjoyed great reputation. In 1703 he ſet the opera of Ulyſſes, written by Guichard.

Rebel left two children: Francis, who died in 1775, and Anne, the wife of the celebrated Lalande, maſter of the king's band.

Rebel, François, knight of St. Michael, maſter, like his father, of the king's band, and director of the opera, born 1702, and died in 1775. He was the ſon of Jean-Ferry Rebel, director of the orcheſtra at the opera, and one of the twenty-four violins of the king's band. His ſon had obtained the reverſion, in 1717, of chamber muſician to the king, and in 1703, that of compoſer; having given proofs of his abilities by many different works, but, above all, by his "Pyramus and Thiſbe," compoſed in partnerſhip with Francœur.

He was ſucceſſively appointed to all the muſical poſts of honour and profit under the royal patronage and that of the public. The cloſe and uninterrupted friendſhip between this muſician and Francœur, does honour to the memory of both; having compoſed jointly, for 50 years, ſucceſsful pieces, without diſcovering to which of them the greateſt honour was due. Laborde. See Francœur.

REBELLION originally ſignified a ſecond reſiſtance or riſing of ſuch as had been formerly overcome in battle by the Romans, and had yielded themſelves to their ſubjection.

It is now generally uſed for a traiterous taking up of arms againſt the king, either by his own natural ſubjects, or by thoſe formerly ſubdued; whether their view be to deprive him of the ſupreme authority, or whether they intend to reſiſt his commands in ſome particular affairs, in order to impoſe conditions on him. Popular commotion is a concourſe of people, tumultuouſly aſſembled, and reſiſting the voice of their ſuperiors, whether their deſigns be againſt thoſe ſuperiors themſelves, or only ſome private perſons. Such violent commotions are common when the people think themſelves aggrieved, and are occaſioned by no order of men ſo frequently as the tax-gatherers. (See the next article.) If the rage of the malcontents be particularly levelled at the magiſtrates, or others veſted with the public authority, and they proceed to a formal diſobedience or violent proceedings, it is called a "ſedition." When the evil ſpreads, infecting great numbers in the city or provinces, and ſubſiſts in ſuch a manner, that the ſovereign is no longer obeyed, ſuch a diſorder cuſtom has more eſpecially diſtinguiſhed by the name of "inſurrection." All theſe violences diſturb the public order, and are crimes of ſtate, even when ariſing from juſt cauſes of complaint. For violent meaſures are interdicted in civil ſociety; the injured party ſhould have recourſe to the magiſtrates, to whom they may apply for redreſs; and if juſtice be not obtained from them, their complaints may then be laid at the foot of the throne. Every citizen ſhould even patiently ſuffer ſupportable evils, rather than diſturb the public peace. Nothing leſs than a denial of juſtice from the ſovereign, or affected delays, can excuſe the furious commotions of a provoked people; they in ſome meaſure juſtify themſelves, if the evils be intolerable, and the oppreſſions great and manifeſt. But, it may be aſked, what conduct ſhall the ſovereign obſerve towards the inſurgents? The reply in general is, that which ſhall at the ſame time be moſt conſonant to juſtice, and moſt ſalutary to the ſtate. If he is to repreſs thoſe who unneceſſarily diſturb the public peace; he is, by the ſame reaſoning, to ſhew clemency towards unfortunate perſons, to whom juſt cauſe of complaint has been given, and who are guilty only in having undertaken to do themſelves juſtice; ſo that they have been wanting in patience rather than fidelity. The ſovereign ſhould conſider that his rights are derived from thoſe of civil ſociety, from the truſt repoſed in him, from the obligation devolved upon him of watching over the welfare of the nation, of procuring its greateſt happineſs, and of maintaining in it order, juſtice, and peace. He will alſo duly diſtinguiſh the nature and degree of the different diſorders which may diſturb the ſtate, oblige him to take arms, or ſubſtitute the means of force inſtead of thoſe of authority. By conſiderations of this kind he will regulate his behaviour towards revolted ſubjects. It cannot be queſtioned, that ſubjects riſing againſt their prince without cauſe deſerve ſevere puniſhments; yet in this caſe the number of delinquents calls for the ſovereign's clemency; ſhall he depopulate a city, or deſolate a province, in puniſhing their rebellion? Such a chaſtiſement, however juſt in itſelf, becomes a cruelty when extended to ſo great a number of perſons. Had the inſurrection of the Netherlands againſt Spain been totally unwarrantable, every man of virtue would ſtill execrate the memory of the duke of Alva, who made it his boaſt that he had cauſed above 20,000 heads to be ſtruck off by the hands of the common executioner. Let not his ſanguinary imitators (ſays the excellent Vattel) expect to juſtify their enormities by neceſſity. Who was ever more undeſervedly inſulted by his ſubjects than Henry the Great of France? His conqueſts were ever accompanied by an uniform clemency, and at length that excellent prince obtained the ſucceſs he deſerved: he thereby gained over faithful ſubjects; whereas the duke of Alva loſt his maſter the United Provinces. Tyrants alone will treat, as ſeditious, thoſe brave and reſolute citizens, who exhort the people to preſerve themſelves from oppreſſion in the vindication of their rights and privileges; a good prince will commend ſuch virtuous patriots, provided their zeal be tempered with moderation and prudence. If he has juſtice and his duty at heart; if he aſpires to that immortal and unſullied glory of being the father of his people; let him miſtruſt the ſelfiſh ſuggeſtions of a miniſter, who repreſents to him as rebels all thoſe citizens who do not hold out their hands to chains, who refuſe tamely to ſuffer the ſtrokes of arbitrary power.

The ſafeſt, and the moſt juſt way thoroughly to appeaſe ſedition, is to give the people ſatisfaction; and if the inſurrection has been without cauſe, which perhaps has never been the caſe, ſtill an amneſty is to be granted where the offenders are numerous. When this amneſty is once publiſhed and accepted, whatever has paſt muſt be buried in oblivion. A prince who makes any conſcience of his word, is faithfully to keep what he has promiſed to rebels themſelves; *i. e.* to thoſe ſubjects who have revolted without reaſon or neceſſity. If his promiſes are not inviolable, what ſecurity have the rebels in treating with him? When they have once drawn the ſword, they have nothing to do but, as one of the ancients expreſſes it, to throw away the ſcabbard. The prince will then want the mild and ſalutary means of appeaſing a revolt: to exterminate the rebels will be the only expedient remaining. Theſe will become formidable through deſpair: compaſſion will beſtow ſuccours on them; their party will increaſe, and the ſtate will be in danger. Vattel's Law of Nations, b. iii. See *Civil* War.

Rebel is ſometimes alſo uſed, in our ancient ſtatutes, for a perſon who wilfully breaks a law; and ſometimes for a villain diſobeying his lord.

Rebellion, *Commiſſion of.* See Commission.

REBELLIOUS Assembly, a gathering of twelve perſons, or more, intending, going about, or practiſing, unlawfully, and of their own authority, to change any laws of the realm, or to deſtroy the incloſure of any park or ground incloſed, banks of fiſh-ponds, pools, conduits, &c. to the intent the ſame ſhall remain void, or that they ſhall have way in any of the ſaid grounds; or to deſtroy the deer in any park, fiſh in ponds, coneys in any warren, dove-houſes,

houſes, &c. or to burn ſtacks of corn, or to abate rents, or prices of victuals. See RIOT, ROUT, and UNLAWFUL *Aſſembly*.

REBENSOE, in *Geography*, a ſmall iſland in the North ſea, near the coaſt of Norway. N. lat. 70°.

REBHIANG, one of the Hebrew accents, anſwering to our comma, and enumerated among their kings and pauſes. It is marked by a dot over the middle of a letter. See ATHNACH, SYLLUK, &c. See alſo ACCENTS.

REBINARE, was to give a ſecond ſtirring or ploughing to arable land that lay fallow, to prepare it for ſowing wheat, &c. or to plough the ground a third time for that purpoſe. "Tempus rebinandi erit poſt feſtum Nativitatis ſancti Johannis Baptiſte cum terra pullulaverit poſt carucam." Fleta, lib. ii. cap. 73.

REBNITZ, in *Geography*. See RIBNITZ.

REBORDAOS, a town of Portugal, in the province of Tras los Montes; two miles S. of Bragança.

REBOUND. See RECOIL.

REBOUX, in *Geography*, a town of France, in the department of Mont Blanc; 9 miles N.W. of Chambery.

REBTORF, a town of Bavaria, in the principality of Aichſtatt; 3 miles W. of Aichſtatt.

REBUS, a name-device, as Camden engliſhes it; or an enigmatical repreſentation of ſome name, &c. by uſing figures or pictures, inſtead of words, or parts of words. Such is that of the gallant mentioned by Camden, who expreſſed his love to Roſe Hill, by painting in the border of his gown a roſe, a hill, an eye, a loaf, and a well; which, in the rebus ſtyle, is read, *Roſe Hill I love well.*

The Picards have the honour of the invention of this notable kind of wit; whence the French, to this day, call it *rebus de Picardie.* Camden adds, that the Engliſh firſt learnt it of them in the reign of our Henry III. by means of the garriſons we then had in Calais, Guienne, and other places bordering on Picardy.

Its origin is by Menage, &c. aſcribed to the prieſts of Picardy, who, it ſeems, anciently, in carnival time, uſed every year to make certain libels, entitled *de rebus quæ geruntur*, being railleries on the intrigues and tranſactions that had paſſed about the city; in which they made great uſe of ſuch ſort of equivoques and alluſions, breaking and joining words, and ſupplying them with paintings.

Camden tells us, the rebus was in wonderful eſteem among our forefathers; and that he was nobody who could not hammer out of his name an invention by this wit-craft, and picture it accordingly.

The Sieur des Accords has made an ample collection of the moſt famous rebuſes de Picardie. And Mr. Camden has done ſomething of the ſame kind in his Remains.

Abel Drugger's device in Ben Johnſon's Alchemiſt, and Jack of Newbury, in the Spectator, are known to every body. But the rebus, being once raiſed to ſign-poſts, grew out of faſhion at court.

Yet has rebus antiquity on its ſide, as having been in uſe in the pure Auguſtan age: Cicero, in a dedication to the gods, inſcribed Marcus Tullius, with a little pea, called by the Latins *cicer*, by us a *chich pea.* And Julius Cæſar, in ſome of his coins, uſed an elephant, called *Cæſar* in the Mauritanian tongue. Add to theſe, that the two mint-maſters in that age, L. Aquilius Florus, and Voconius Vitulus, uſed, the firſt a flower, the ſecond a calf, on the reverſe of their coins.

REBUS, in *Heraldry*, a coat of arms which bears an alluſion to the name of the perſon: as three caſtles, for Caſtleton; three cups, for Butler; three conies, for Coniſby; a kind of bearings which are of great antiquity.

Rebus is alſo uſed by the chemical writers, ſometimes to ſignify ſour milk, and ſometimes for what they call the ultimate matter of which all bodies are compoſed.

REBUTTER, from *re*, and the French *bouter*, to *repel*, or *bar*, in *Law*, the anſwer of the defendant in a cauſe to the plaintiff's ſur-rejoinder.

The plaintiff's anſwer to the defendant's rebutter, is called a *ſur-rebutter.*

REBUTTER is alſo when a man warrants any land or hereditament to another, and the perſon making the warranty, or his heir, ſues him to whom the warranty is made, or his heir or aſſignee, for the ſame thing: if he, who is ſo ſued, plead the deed or fine with warranty, and pray judgment, if the plaintiff ſhall be received to demand the thing which he ought to warrant to the party, againſt the warranty in the deed, &c. this is called a rebutter.

Again, if I grant to the tenant to hold *ſine impetitione vaſti*, and afterwards implead him for waſte, he may debar me of the action, by ſhewing my grant; which is likewiſe a rebutter.

REC, in *Geography*, a river of France, which runs into the Sarre, at Sarre Alb.

RECANATI, a town of the marquiſate of Ancona; near which towards Macerata are ſeen the ruins of Helvia Ricina; a town built by the emperor Sept. Severus, and deſtroyed by the Goths; 8 miles N.N.E. of Macerata. N. lat. 43° 25'. E. long. 13° 39'.

RECANGED, in *Rural Economy*, a term provincially uſed to ſignify lifted or diſcoloured in ſtripes.

RECANTATION. See PALINODY, or RETRACTATION.

RECAPITULATION, in *Oratory*, &c. a part of the peroration, or concluſion; called alſo *anacephalæoſis.*

Recapitulation is a ſummary of the preceding diſcourſe; or a conciſe, tranſient enumeration of the principal things inſiſted on at large in it; by which the memory of the hearer is refreſhed, and the force of the whole collected into one view.

An inſtance of this may be given in the peroration of Cicero's Manilian: "Quare, cum bellum ita neceſſarium ſit, ut negligi non poſſit: ita magnum, ut accuratiſſime ſit adminiſtrandum; & cum ei imperatorem præficere poſſitis, in quo ſit eximia belli ſcientia, ſingularis virtus, clariſſima auctoritas, egregia fortuna; dubitabitis, Quirites, quin, &c."

In order to conſtitute a good repetition or recapitulation, it muſt be ſhort and conciſe: it is alſo convenient to recite things in the ſame order in which they were at firſt laid down; but ſometimes a repetition is made, by running a compariſon between the ſpeaker's own argument, and thoſe of the adverſe party, and placing them in oppoſition to each other; and this method Cicero takes in the concluſion of his third oration upon the Agrarian law. In ſome caſes, when the diſcourſe is very long, and the arguments inſiſted on have been many, the orator only mentions ſuch things which he thinks of leaſt conſequence, by ſaying that he omits or paſſes over them, till he comes to what is of greater moment, which he repreſents more fully. Ward's Orat. vol. i. ſect. 18. See PRETERITION.

RECAPTION, RECAPTIO, or *Repriſal*, in *Law*, is a remedy given to the party himſelf for an injury to his perſonal property. This happens, when any one hath deprived another of his property in goods or chattels perſonal, or wrongfully detains one's wife, child, or ſervant; in which caſe the owner of the goods, and the huſband, parent, or maſter, may lawfully claim and retake them, wherever he happens to find them, ſo it be not in a riotous manner, or

or attended with a breach of the peace. Thus, *e. gr.* if my horſe is taken away, and I find him in a common, a fair, or a public inn, I may lawfully ſeize him to my own uſe; but I cannot juſtify breaking open a private ſtable, or entering on the grounds of a third perſon to take him, except he be felonioufly ſtolen, but muſt have recourſe to an action at law. Reception is unlawful, if it be done with intention to ſmother or compound a larciny. See RESTITUTION *of Stolen Goods.*

RECAPTION alſo is the taking a ſecond diſtreſs of one formerly diſtrained for the ſame cauſe, and alſo during the plea grounded on the former diſtreſs.

Reception is alſo the name of a writ lying for the party thus diſtrained to recover damages. See REPLEVIN.

RECAPTURE, in *Naval Inſurance*, denotes the recovery of a ſhip, or its cargo wholly or in part, after having been taken by an enemy. For every loſs occaſioned by capture, whether lawful, *i. e.* when made by a declared enemy, according to the laws of war, or unlawful, *i. e.* when it is againſt the rules eſtabliſhed by the law of nations, whether by friends or enemies, the inſurer is liable, agreeably to the comprehenſive and expreſs words of the policy: and in every caſe of capture the inſurer is anſwerable, to the extent of the ſum inſured, for the loſs actually ſuſtained. This may be either *total*, as where the ſhip and goods inſured are not recovered; or *partial*, as where the ſhip is recaptured or reſtored before abandonment; in which caſe the inſurer is bound to pay the ſalvage, and any other neceſſary expence the inſured may have incurred by the recovery of his property. The inſurer is liable for a loſs by capture, whether the property in the thing inſured be changed by the capture or not. As to the length of poſſeſſion by an enemy, which is deemed ſufficient to diveſt the property out of the original owner, or the effect of a recapture in reveſting it; theſe are matters which can never now come directly in queſtion between the inſurer and inſured, in any caſe of inſurance upon real intereſt. In gaming inſurances, or inſurances without intereſt, indeed, when there was a recapture, the claim, as for a total loſs, ſeems formerly to have involved the queſtion, whether the property in the thing inſured had, by the capture, or any proceeding founded on it, been diveſted out of the original owner, or not, before the recapture. Nevertheleſs, when a ſhip is inſured "intereſt or no intereſt," it has been repeatedly determined, that if the ſhip be taken, it is a total loſs, however illegal the capture may be, and though the ſhip may be retaken and reſtored to the owner. But though no queſtion can now ariſe between the inſured and the inſurer, as to the effect of a capture or recapture, in diveſting or reveſting the property; it may not be deemed unimportant to inquire when a capture ſhall be deemed to transfer the property to an enemy, and what ſhall be the effect of a recapture in reveſting it in the original owner. The general opinion ſeems to be, that by the law of nations, the property of things captured in war is changed when all reaſonable hope of recovering them is gone; and, with reſpect to things moveable, all reaſonable hope of recovering them is preſumed to be gone when they are brought within the protection of the enemy's fortreſs. Grotius ſays, that ſhips or goods, taken at ſea, become the property of the captors, when they are brought into the enemy's harbours, or to the place where his whole fleet is ſtationed; for then all hopes of recovering them may be ſaid to vaniſh. But, he adds, that by the law of nations, as introduced among European ſtates in more modern times, things are conſidered as captured, when they have been 24 hours in the power of the enemy. Others deny this rule of the law of nations, and inſiſt on the rule of the Roman law, that the prize muſt be carried "infra præſidia" before it can become the property of the captors; and by "præſidia" Bynkerſhoeck underſtands the camps, the ports, the towns, and the fleets, of the enemy. In our courts of admiralty, however, it has always been holden, by the marine law of England, independent of the ſtatute which commands reſtitution, and fixes the rate of ſalvage, the property is not changed in favour of a vendee or recaptor, ſo as to bar the orignal owner, till there has been a regular ſentence of condemnation: and in the reign of king Charles II., a ſolemn judgment was given upon this point; and reſtitution of a ſhip taken by a privateer was decreed, after ſhe had been fourteen weeks in the enemy's poſſeſſion, *becauſe ſhe had not been condemned.* The ſame doctrine has, in ſeveral inſtances, prevailed in our courts of common law. In one caſe it was holden that nine days' poſſeſſion by the captor, and in another, that four years' poſſeſſion, and ſeveral voyages performed, will not change the property, without a ſentence of condemnation.

In general, whenever a ſhip is taken by the enemy, the inſured may abandon, and demand as for a total loſs; and he is not bound to make any claim or appeal in the enemy's courts of admiralty, or to litigate there the validity of the capture.

But the inſured is in no caſe *bound* to abandon; and, as the law now ſtands, no capture by the enemy can be ſo total a loſs as to leave no poſſibility of recovery, for the *jus poſtliminii* continues for ever, except in the caſe of a captured ſhip converted into a ſhip of war. (Stat. 33 G. III. c. 66. § 42.) If the owner himſelf ſhould retake his ſhip or goods, he will be fully intitled to them; and if they be retaken at any time, whether before or after condemnation, he will be intitled to reſtitution, upon payment of a ſettled ſalvage. Stat. 29 G. II. c. 34. § 24; and 33 G. III. c. 66. § 42.

The chance of the owner's recovering his property, does not, however, ſuſpend the demand of the inſured, as for a total loſs: but in the caſe of a recapture, juſtice is done to the inſurer by putting him in the place of the inſured. In queſtions upon policies of inſurance, the nature of the contract as an *indemnity*, and nothing elſe, is always liberally conſidered.

When there has been a capture, whether legal or not, and the ſhip has been recaptured or reſtored, the inſurer is bound to defray all neceſſary expences which the inſured has been put to for the recovery of his property. He is therefore liable for a ſum of money paid by the inſured to the captors, as a *compromiſe* made *bonâ fide*, to prevent the ſhip being condemned as prize. See RANSOM.

It often happens that a recaptured ſhip is in a ſtate to proſecute her original voyage; and, in that caſe, it is the intereſt of the recaptors, as well as of the other parties concerned, that ſhe ſhould be permitted to do ſo. The laſt prize act (ſtat. 33 Geo. III. c. 66. § 44.) has therefore very properly provided, "That if a ſhip be retaken before ſhe has been carried into an enemy's port, it ſhall be lawful for her, if the recaptors conſent thereto, to proſecute her voyage; and it ſhall not be neceſſary for the recaptors to proceed to adjudication till ſix months after the recapture, or till the return of the ſhip to the port from whence ſhe ſailed; and the maſter, owners, or agents, with the conſent of the recaptor, may diſpoſe of their cargoes before adjudication: and in caſe the veſſel ſhall not return to the port from whence ſhe ſailed, or the recaptors ſhall have had no opportunity of proceeding regularly to adjudication within the ſix months, on account of the abſence of the ſaid veſſel, the court of admiralty ſhall, at the inſtance of the recaptors, decree reſtitution to the former owners, they paying ſalvage, upon ſuch evidence as to the court ſhall, under all the cir-

cumſtances of the caſe, appear reaſonable; the expence of ſuch proceeding not to exceed *fourteen pounds.*"

We ſhall here obſerve, that there is an obvious difference between capture and arreſt of princes; the object of the one is prize, that of the other detention, with a deſign to reſtore the ſhip or goods detained, or to pay the value to the owner. When a ſhip is detained in a port after a declaration of war, or the iſſuing of letters of repriſal, this more reſembles a capture than a detention, and gives the injured an immediate right to abandon, as for a loſs by capture, even though no condemnation be pronounced, and though the ſhip be afterwards reſtored. The moſt frequent cauſe of detention is an embargo, which is a proclamation or order of ſtate, uſually iſſued in time of war or threatened hoſtilities, prohibiting the departure of ſhips or goods from ſome or all of the ports of ſuch ſtate until further order. An embargo laid on ſhips and merchandize in the ports of this kingdom by virtue of the king's proclamation, is ſtrictly legal, when the proclamation does not contravene the ancient laws, or tend to eſtabliſh new ones; but only to enforce the execution of ſuch laws as are already in being, in ſuch manner as the king ſhall judge neceſſary. But whether an embargo be legally or illegally laid, the injury to the owner, by the detention of his ſhip or goods, is the ſame; and the inſurer is equally liable for the loſs occaſioned by it. If a ſhip be ſeized after a ceſſation of arms and preliminary articles of peace are ſigned, this ſhall not be deemed a capture, but only an arreſt of princes. For the regulation of ſalvage upon a recapture, we refer to the article SALVAGE.

Capture by an enemy or a pirate, or an arreſt of princes, or even an embargo, is *primâ facie* a total loſs; and immediately upon the capture, or upon a mere arreſt, or at any time while the ſhip continues under detention, the inſured may elect to abandon, and give notice to the inſurer of his intention ſo to do; and thus entitle himſelf to claim as for a total loſs from the inſurer. For, from the moment of the capture, the owners loſe their power over the ſhip and cargo, and are deprived of the free diſpoſal of them; and, in the opinion of the merchant, his right of diſpoſal being ſuſpended or rendered uncertain, is equivalent to a total deprivation. It would therefore be unreaſonable to oblige the inſured to wait the event of capture, detention, or embargo.

There is this difference between a policy *upon intereſt*, and a *wager policy*, that in the one caſe the inſured may, if he thinks proper, abandon the moment he has notice of a capture or detention, and this will bind the underwriters, whatever may be the ultimate fate of the ſhip; but in the caſe of a wager policy there can be no abandonment, becauſe the inſured has nothing to abandon.

But a capture or arreſt does not neceſſarily, and at all events, terminate in a total loſs, ſo as to entitle the inſured to abandon; for as he cannot abandon till he has received advice of the loſs; if, at the time he receives ſuch advice, or before he has elected to abandon, he receive advice that the ſhip or goods inſured are recovered, or are in ſafety, he cannot then abandon; becauſe he can only abandon *while* it is a total loſs, and he knows it to be ſo; not after he knows of the recovery. Therefore, if a captured ſhip be retaken and permitted to proceed on her voyage, ſo that ſhe ſuffers but a ſmall temporary inconvenience; this would only be a partial, and not a total, loſs.

On the other hand, a title to reſtitution upon a recapture does not neceſſarily, and at all events, deprive the inſured of the right to abandon; for if, in conſequence of the capture, the voyage be loſt, or not worth purſuing; if the ſalvage be very high; if farther expence be neceſſary, and the inſurer will not undertake at all events to pay it, he may abandon. The rule is, that, if the thing inſured be recovered before any loſs is paid, the inſured is entitled to claim as for a total, or a partial loſs, according to the final event; that is, according to the ſtate of the caſe at the time he makes his claim. There is no veſted right to a total loſs, till the inſured, having a right to abandon, elects to do ſo; for he is only entitled to an indemnity for his loſs as it ſtands at the time of the action brought, or offer to abandon.

But if, after a total loſs has been actually paid, the thing inſured be recovered, the inſurer cannot oblige the inſured to refund the money he has received; but he ſhall ſtand in the place of the inſured, and ſo no injuſtice is done.

Caſes are mentioned by Mr. Serjeant Marſhall, which ſerve as examples to ſhew, that though a captured ſhip be recaptured, yet if the voyage be loſt, the loſs will be total, and the inſured will have a right to abandon.

By the marine law, the property was not changed by the capture, till after condemnation: and ſince the 29 Geo. II. c. 34, the "jus poſtliminii" continues for ever. A recapture does not in all caſes prevent the loſs being total. If the voyage be abſolutely loſt, or be not worth purſuing; if the ſalvage be very high; if further expence be neceſſary; if the inſurer will not engage, at all events, to bear that expence, though it ſhould exceed the value, or fail of ſucceſs: under theſe, and many other ſimilar circumſtances, the inſured may diſentangle himſelf and abandon, notwithſtanding there was a recapture. Upon a recapture the property returns to the original owner, pledged to the recaptors for the amount of the ſalvage: upon the payment of which he is intitled to reſtitution. If upon a recapture the captain, finding that the voyage cannot be purſued, and, acting fairly for the benefit of all concerned, ſell the ſhip and cargo to pay the ſalvage, and thereby put an end to the voyage, the inſured may abandon and recover as for a total loſs. However, a capture does not neceſſarily amount to a total loſs, nor does a recapture prevent its being total. If the captain purchaſe the ſhip from the captors for account of his owners, the money paid, being in the nature of ſalvage, is only partial loſs.

To this article we ſhall ſubjoin two or three remarks on the ſubject of abandonment, which do not elſewhere occur. A time ſhould be fixed when the degree of the inſurer's reſponſibility ſhould be aſcertained. In ſeveral maritime ſtates on the continent, poſitive regulations have been eſtabliſhed, limiting the time, after a loſs has happened, within which the inſured may abandon. In England we have no ſuch poſitive regulation, nor any time limited by law for abandoning. But the courts have laid down a rule, better adapted to the purpoſe; and the rule is, that as ſoon as the inſured receives advice of a total loſs, he muſt make his election whether he will abandon or not. If he determines to abandon, he muſt give the underwriters notice of this within a reaſonable time after the intelligence arrives; and any unneceſſary delay in giving this notice will amount to a waver of his right to abandon; for unleſs the owner does ſome act, ſignifying his intention to abandon, it will be only a partial loſs, whatever may be the nature of the loſs, or the extent of the damage. If the inſurers in any manner prevent the abandonment, they ſhall pay the whole loſs, to the amount of the ſum inſured. If no intelligence be received of a ſhip within a reaſonable time, it ſhall be preſumed that ſhe foundered at ſea: when the time has elapſed which affords that preſumption, the inſured may abandon, and claim as for a total loſs. Marſhall on Inſurance, vol. ii.

RECAR-

RECARDAINS, in *Geography*, a town of Portugal, in the province of Beira; 6 miles E. of Bragança Nova.

RECCAN. See ARRACAN.

RECCO, a town of the Ligurian republic, near the ſea-coaſt; 11 miles S.E of Genoa.

RECEIF, a fort and harbour on the coaſt of Brazil. S. lat. 8° 10'.

RECEIPT, or RECEIT, in *Commerce*, an acquittance or diſcharge; or a written acknowledgment of having received a ſum of money.

Where the receipt is on the back of a bill, &c. it is uſually called an *endorſement*.

Among tradeſmen the receipt uſually makes the ſecond of the three articles of an account; the receipt contains the monies received; the two others the expence, and the return or balance.

By the 44 Geo. III. c. 98, the former ſtamp duties were repealed, and others impoſed; by the 48 Geo. III. c. 149, theſe laſt were repealed, and the following were impoſed; *viz.*

Receipt or diſcharge given for or upon the payment of money	Duty. £	*s.*	*d.*
Amounting to 2*l.* and not amounting to 10*l.*	0	0	2
ditto 10*l.* - ditto - 20*l.*	0	0	4
ditto 20*l.* - ditto - 50*l.*	0	0	8
ditto 50*l.* - ditto - 100*l.*	0	1	0
ditto 100*l.* - ditto - 200*l.*	0	2	0
ditto 200*l.* - ditto - 500*l.*	0	3	0
ditto 500*l.* or upwards - - -	0	5	0
And where any ſum of money whatever ſhall be therein expreſſed, or acknowledged to be received in full of all demands - - -	0	5	0

And any note, memorandum, or writing whatſoever, given to any perſon for or upon the payment of money whereby any ſum of money, debt, or demand, or any part of any debt or demand therein ſpecified, and amounting to 2*l.* or upwards, ſhall be expreſſed or acknowledged to have been paid, ſettled, balanced, or otherwiſe diſcharged or ſatisfied, or which ſhall import or ſignify any ſuch acknowledgment, and whether the ſame ſhall or ſhall not be ſigned with the name of any perſon, ſhall be deemed and taken to be a receipt for a ſum of money of equal amount with the ſum, debt, or demand ſo expreſſed or acknowledged to have been paid, ſettled, balanced, or otherwiſe diſcharged, or ſatisfied, within the intent and meaning of this ſchedule, and of the foregoing act, and ſhall be charged with a duty accordingly.

And any receipt or diſcharge, note, memorandum, or writing whatever, given to any perſon for or upon the payment of money, which ſhall contain, import, or ſignify any general acknowledgment of any debt, account, claim, or demand, debts, accounts, claims, or demands, whereof the amount ſhall not be therein ſpecified, having been paid, ſettled, balanced, or otherwiſe diſcharged or ſatisfied, or whereby any ſum of money therein mentioned ſhall be acknowledged to be received in full, or in diſcharge or ſatisfaction of ſuch debt, account, claim, or demand, debts, accounts, claims, or demands, and whether the ſame ſhall or ſhall not be ſigned with the name of any perſon, ſhall be deemed and taken to be a receipt for the ſum of 500*l.* or upwards, within the intent and meaning of this ſchedule, and of the foregoing act, and ſhall be charged with the duty of 5*s.* accordingly.

By 43 Geo. III. c. 126, ſuch receipt ſhall not be available in law or equity as ſuch acknowledgment, or be given in evidence, unleſs duly ſtamped as aforeſaid.

And all receipts, diſcharges, and acknowledgments of the deſcription aforeſaid, which ſhall be given for or upon payments made by or with any bills of exchange, drafts, promiſſory notes, or other ſecurities for money, ſhall be deemed and taken to be receipts given upon the payment of money within the intent and meaning of this ſchedule and of the foregoing act.

Exemptions from the preceding Duties on Receipts.

Receipts exempted from ſtamp duty by any act or acts of the preſent ſeſſion, relating to the aſſeſſed taxes.

Receipts or diſcharges given by the treaſurer of the navy for any money impreſted to or received by him for the ſervice of the navy.

Receipts or diſcharges given by any agent for money impreſted to him on account of the pay of the army or ordnance.

Receipts or diſcharges given by any officer, ſeaman, marine or ſoldier, or their repreſentatives reſpectively, for or on account of any wages, pay, or penſion due from the navy-office, army pay-office, or ordnance-office.

Receipts or diſcharges given for the conſideration money, for the purchaſe of any ſhare in any of the government or parliamentary ſtocks or funds, or in the ſtocks and funds of the governor and company of the bank of England, or of the Eaſt India company, or South Sea company, and for any dividend paid on any ſhare of the ſaid ſtocks or funds reſpectively.

Receipts given for money depoſited in the bank of England, or in the bank of Scotland, or royal bank of Scotland, or in the bank of the Britiſh linen company in Scotland, or in the hands of any banker or bankers, to be accounted for on demand, provided the ſame be not expreſſed to be received of or by the hands of any other than the perſon or perſons to whom the ſame is to be accounted for; but if with intereſt, ſee PROMISSORY *Notes*.

Receipts or diſcharges written upon promiſſory notes, bills of exchange, drafts or orders for the payment of money duly ſtamped according to the laws in force at the date thereof, or upon bills of exchange drawn out of, but payable in Great Britain.

Receipts or diſcharges given upon bills or notes of the governor and company of the bank of England; letters by the general poſt acknowledging the ſafe arrival of any bills of exchange, promiſſory notes, or other ſecurities for money.

Receipts or diſcharges indorſed or otherwiſe written upon, or contained in any bond, mortgage, or other ſecurity, in any conveyance, deed, or inſtrument whatever, duly ſtamped according to the laws in force at the date thereof, acknowledging the receipt of the conſideration money therein expreſſed, or the receipt of any principal money, intereſt, or annuity thereby ſecured.

Releaſes or diſcharges for money by deeds duly ſtampt according to the laws in force at the date thereof.

Receipts or diſcharges given for drawbacks or bounties upon the exportation of any goods or merchandiſe from Great Britain.

Receipts or diſcharges for the return of any duties of cuſtoms upon certificates of over entry.

Receipts or acknowledgments of payments indorſed upon any bills, orders, remittance bills, or remittance certificates, drawn by commiſſioneed officers, maſters, and ſurgeons in the navy, or by any commiſſioner or commiſſioners of the navy, under the authority of the act paſſed in the 35th year of his majeſty's reign, for the more expeditious payment of the wages and pay of certain officers belonging to the navy.

Receipts or acknowledgments of payments indorſed upon any bills drawn purſuant to any former act or acts of parliament, by the commiſſioners of the navy, or by the commiſſioners for victualling the navy, or by the commiſſioners for managing the tranſport ſervice, and taking care of ſick and wounded ſeamen, upon and payable by the treaſurer of the navy.

If any perſon ſhall write or ſign any receipt liable to any ſtamp duty, without being firſt duly ſtamped as aforeſaid; or with a ſtamp of a lower value than is herein directed: he ſhall forfeit 10*l.* if the ſum paid or expreſſed therein ſhall not amount to 100*l.*; and 20*l.* if the ſum amount to 100*l.* or upwards. 31 Geo. III. c. 27. ſ. 17. 35 Geo. III. c. 55. ſ. 8.

Every perſon who ſhall give any receipt or writing acknowledging the payment of money, in which a leſs ſum ſhall be expreſſed than the ſum actually paid or received, or who ſhall ſeparate or divide the ſum actually paid or received into divers ſums, or ſhall write off any part of any debt, or demand, or be guilty of or concerned in any contrivance with intent to defraud his majeſty, ſhall forfeit 50*l.* 35 Geo. III. c. 55. ſ. 9.

And the perſons, or their agent, from whom any ſum ſhall be due or payable, and who ſhall have paid ſuch ſum, may provide a ſtamp with the proper duty, or of ſome higher rate of duty than required, and demand of the perſon entitled to ſuch ſum, or any agent to whom the ſame ſhall have been paid, a receipt for ſuch ſum, and alſo the amount of the duty thereon as aforeſaid; and if ſuch perſon refuſe to give ſuch receipt upon demand thereof, or to pay the amount thereof, every ſuch perſon ſhall forfeit for each offence 10*l.* 43 Geo. III. c. 126. ſ. 5.

Stamps denoting the duties under former acts may be uſed, provided they be applied to receipts of the like amount as required by this act. ſ. 8.

And all vellum, parchment, and paper liable to any ſtamp duty as aforeſaid, ſhall be ſtamped before the ſame be written or printed upon; or may be brought to the ſaid commiſſioners or their officers to be ſtamped within 14 days after ſuch receipts ſhall be given or bear date, and ſhall be ſtamped on payment of 5*l.* over and above the duty; and if brought after 14 days within one calendar month, on payment of 10*l.* over and above the duty. 31 Geo. III. c. 25. ſ. 19, 20. 35 Geo. III. c. 55. ſ. 10, 11.

All penalties by this act incurred may be ſued for in the courts at Weſtminſter; or any neighbouring juſtice may hear and determine any offence which ſubjects the offender to any pecuniary penalty; who may, on complaint made within three calendar months, ſummon the party accuſed, and the witneſſes, and examine into the matter of fact; and on confeſſion, or the oath of one witneſs, may give judgment therein, and levy ſuch penalty by diſtreſs on the goods of the offender, which, if not redeemed within ſix days, may be ſold; and ſuch penalty ſhall be diſtributed half to the king, and half to the informer; and for want of ſufficient diſtreſs, the offender ſhall be committed to priſon for three calendar months, unleſs ſuch penalty ſhall be ſooner paid. 31 Geo. III. c. 25. ſ. 24, 25. 35 Geo. III. c. 55. ſ. 12, 13.

If any perſon ſhall find himſelf aggrieved by the judgment of ſuch juſtice, he may, upon giving ſecurity to the amount of ſuch penalty and coſts, appeal to the next ſeſſions, which ſhall happen 14 days next after ſuch conviction, on giving reaſonable notice; and in caſe ſuch judgment be affirmed, they may award the perſon appealing ſuch coſts as to them ſhall ſeem meet. Id.

Provided, nevertheleſs, that ſuch juſtice may, where he ſhall ſee cauſe, mitigate any ſuch penalty, ſo as not to reduce the ſame to leſs than one moiety thereof over and above the coſts. 31 Geo. III. c. 25. ſ. 26. 35 Geo. III. c. 55. ſ. 14.

Witneſſes not appearing, having been duly ſummoned, without reaſonable cauſe to be allowed by ſuch juſtice, or refuſing to give evidence, ſhall forfeit 40*s.* to be recovered in like manner. 31 Geo. III. c. 25. ſ. 27. 35 Geo. III. c. 55. ſ. 15.

Perſons counterfeiting or forging any ſtamp hereby directed to be made uſe of ſhall be guilty of felony without benefit of clergy. 31 Geo. III. c. 25. ſ. 29. 35 Geo. III. c. 55. ſ. 17. 43 Geo. III. c. 126. ſ. 11.

All powers given by any former act relating to the ſtamp duties ſhall extend to this act. 31 Geo. III. c. 25. ſ. 30. 35 Geo. III. c. 55. ſ. 18. 43 Geo. III. c. 126. ſ. 12.

Perſons ſued or proſecuted on account of any thing done in purſuance of this act may plead the general iſſue and give the ſpecial matter in evidence; and if a verdict be for the defendant, or the plaintiff be nonſuited, treble damages ſhall be awarded againſt ſuch plaintiff. ſ. 15.

By the 44 Geo. III. c. 98, the former duties on legacies under the care of the commiſſioners for ſtamp duties were repealed, and new duties were impoſed. By the 45 Geo. III. c. 28, additional duties were impoſed, and by the 48 Geo. III. c. 149, the following were impoſed (being by ſ. 3. of this laſt act placed under the proviſions of former acts relating to ſuch duties,) and thoſe impoſed by former acts were repealed.

Schedule, Part III.

Legacies and ſucceſſion to perſonal or moveable eſtate upon inteſtacy.

I. *Where the teſtator, teſtatrix, or inteſtate, died before or upon the 5th of April* 1805.

For every legacy, ſpecific or pecuniary, or of any other deſcription, of the amount or value of 20*l.* or upwards, given by any will or teſtamentary inſtrument of any perſon who died before or upon the 5th day of April 1805, out of his or her perſonal or moveable eſtate, and which ſhall be paid, delivered, retained, ſatisfied, or diſcharged, after the 10th of October 1808.

Alſo for the clear reſidue (when devolving to one perſon), and for every ſhare of the clear reſidue (when devolving to two or more perſons), of the perſonal or moveable eſtate of any perſon who died before or upon the 5th of April 1805 (after deducting debts, funeral expences, legacies, and other charges firſt payable thereout), whether the title to ſuch reſidue, or any ſhare thereof, ſhall accrue by virtue of any teſtamentary diſpoſition, or upon a partial or total inteſtacy; where ſuch reſidue, or ſhare of ſuch reſidue, ſhall be of the amount or value of 20*l.* or upwards, and where the ſame ſhall be paid, delivered, retained, ſatisfied, or diſcharged, after the 10th of October 1808.

	£	s.	d.
Where any ſuch legacy, or reſidue, or ſhare of ſuch reſidue, ſhall have been given, or devolved, to or for the benefit of a brother or ſiſter of the deceaſed, or any deſcendant of a brother or ſiſter of the deceaſed; a duty at and after the rate of 2*l.* 10*s.* *per cent.* on the amount of the value thereof - - - - - - - - - -	2	10	0
Where to or for the benefit of a brother or ſiſter of the father or mother of the deceaſed; or any deſcendant of a brother or ſiſter of the father or mother of the deceaſed; a duty at and after the rate of 4*l.* *per cent.* on the amount or value thereof - - - - - - - - - -	4	0	0

Where

	£	s.	d.
Where to or for the benefit of a brother or ſiſter of a grandfather or grandmother of the deceaſed, or any deſcendant of a brother or ſiſter of a grandfather or grandmother of the deceaſed; a duty at and after the rate of 5*l. per cent.* on the amount or value thereof - - -	5	0	0
Where to or for the benefit of any perſon in any other degree of collateral conſanguinity to the deceaſed, than is above deſcribed, or to or for the benefit of any ſtranger in blood to the deceaſed; a duty at and after the rate of 8*l. per cent.* on the amount or value thereof - -	8	0	0

II. *Where the teſtator, teſtatrix, or inteſtate, ſhall have died after the 5th of April* 1805.

For every legacy, ſpecific or pecuniary, or of any other deſcription, of the amount or value of 20*l.* or upwards, given by any will or teſtamentary inſtrument, of any perſon who ſhall have died after the 5th of April 1805; either out of his or her perſonal or moveable eſtate, or out of or charged upon his or her real or heritable eſtate, or out of any monies to ariſe by the ſale, mortgage, or other diſpoſition of his or her real or heritable eſtate, or any part thereof, and which ſhall be paid, delivered, retained, ſatisfied, or diſcharged after the 10th of October 1808.

Alſo, for the clear reſidue, (when devolving to one perſon), and for every ſhare of the clear reſidue (when devolving to two or more perſons), of the perſonal or moveable eſtate of any perſon who ſhall have died after the 5th of April 1805, (after deducting debts, funeral expences, legacies, and other charges firſt payable thereout), whether the title to ſuch reſidue, or any ſhare thereof, ſhall accrue by virtue of any teſtamentary diſpoſition thereof, or upon a partial or total inteſtacy, where ſuch reſidue, or ſhare of reſidue, ſhall be of the amount or value of 20*l.* or upwards, and where the ſame ſhall be paid, delivered, retained, ſatisfied, or diſcharged after the 10th of October 1808.

And alſo for the clear reſidue (when given to one perſon), and for every ſhare of the clear reſidue (when given to two or more perſons), of the monies to ariſe from the ſale, mortgage, or other diſpoſition of any real or heritable eſtate, directed to be ſold, mortgaged, or otherwiſe diſpoſed of, by any will or teſtamentary inſtrument of any perſon who ſhall have died after the 5th of April 1805, (after deducting debts, funeral expences, legacies, and other charges, firſt made payable thereout, if any), where ſuch reſidue, or ſhare of reſidue, ſhall amount to 20*l.* or upwards, and where the ſame ſhall be paid, retained, or diſcharged, after the 10th of October 1808.

	£	s.	d.
Where any ſuch legacy or reſidue, or any ſhare of ſuch reſidue, ſhall have been given, or have devolved, to or for the benefit of a child of the deceaſed, or any deſcendant of a child of the deceaſed; a duty at and after the rate of 1*l. per cent.* on the amount or value thereof - -	1	0	0
Where to or for the benefit of a brother or ſiſter of the deceaſed, or any deſcendant of a brother or ſiſter of the deceaſed; a duty at and after the rate of 2*l.* 10*s. per cent.* on the amount or value thereof - - - - -	2	10	0
Where to or for the benefit of a brother or ſiſter of the father or mother of the deceaſed, or any deſcendant of a brother or ſiſter of the father or mother of the deceaſed; a duty at and after the rate of 4*l. per cent.* on the amount or value thereof - - - - - -	4	0	0
Where to or for the benefit of a brother or ſiſter of a grandfather or grandmother of the deceaſed, or any deſcendant of a brother or ſiſter of a grandfather or grandmother of the deceaſed; a duty at and after the rate of 5*l. per cent.* on the amount or value thereof - - - -	5	0	0
Where to or for the benefit of any perſon in any other degree of collateral conſanguinity to the deceaſed, than as above deſcribed, or to or for the benefit of any ſtranger in blood to the deceaſed; a duty at and after the rate of 10*l. per cent.* on the amount or value thereof - -	10	0	0

And all gifts of annuities, or by way of annuity, or of any other partial benefit, or intereſt, out of any ſuch eſtate or effects as aforeſaid, ſhall be deemed legacies within the intent and meaning of this ſchedule.

Exemptions.

Legacies and reſidues, or ſhares of reſidue, of any ſuch eſtate or effects as aforeſaid, given or devolving to or for the benefit of the huſband or wife of the deceaſed, or to or for the benefit of any of the royal family.

And all legacies which were exempted from duty by the 39 Geo. III. c. 73, for exempting certain ſpecific legacies, given to bodies corporate or other public bodies, from the payment of duty.

By ſ. 43. of 48 Geo. III. c. 149, the commiſſioners are authorized to remit penalties incurred before paſſing this act by non-payment of the duty on legacies, if the duty in arrear ſhall be paid on or before the 31ſt Jan. 1809.

By ſ. 44, in all caſes not provided for by ſ. 43, where any receipt for any of the above matters ſhall be brought to the head office to be ſtamped after the expiration of three calendar months from the date thereof, it may be ſtamped on payment of the duty, together with the penalty incurred for not ſtamping the ſame in due time: and if the receipt have been ſigned out of Great Britain, and be brought to be ſtamped within 21 days after being received in Great Britain, and no penalty to be incurred.

The ſaid duties to be under the management of the commiſſioners of the ſtamp duties. 35 Geo. III. c. 52. ſ. 3.

And in caſe of ſpecific legacies, where the reſidue of any perſonal eſtate ſhall conſiſt of property not reduced into money, the perſon taking adminiſtration of ſuch effects, or by whom the duty ought to be paid, may ſet a value thereon, and offer the duty accordingly; and may, at his own expence, require the ſtamp commiſſioners to appoint a perſon to ſet ſuch value, and ſuch commiſſioners may accept the duty ſet by ſuch perſon with an appraiſement, but if they ſhall not be ſatisfied with the value ſo ſet, they may appoint a perſon to appraiſe ſuch effects, and to ſet the value thereon, and require the duty to be paid accordingly; but if the perſon who ought to pay ſuch duty ſhall not be ſatisfied with ſuch valuation, he may cauſe the ſame to be reviewed by the commiſſioners of the land-tax of the diſtrict where ſuch effects ſhall be, at their next meeting, if fourteen days have elapſed before ſuch meeting, and if not, at the next ſucceeding meeting, of which appeal ſix days notice ſhall be given to the ſtamp commiſſioners; and the ſaid commiſſioners of the land-tax may appoint a perſon to appraiſe ſuch effects, and to ſet a value thereon, and may hear and determine ſuch appeal in like manner as appeals to them in other caſes, and their judgment ſhall be final; and if the valuation made under the authority of ſuch ſtamp commiſſioners ſhall not be appealed from within the time aforeſaid, or ſhall be affirmed upon appeal, the duty ſhall be paid accordingly; and if any variation ſhall be made on ſuch

appeal, the duty ſhall be paid according to ſuch variation; and if the duty aſſeſſed in manner aforeſaid ſhall exceed the duty offered to and refuſed by ſuch ſtamp officers, the expences ſhall be borne by the perſon liable to pay ſuch duty. If any diſpute ſhall ariſe between perſons entitled to any ſuch legacy, or reſidue, or taking adminiſtration as aforeſaid, reſpecting the value thereof, or duty to be paid thereon, the duty ſhall be aſſeſſed by ſuch ſtamp commiſſioners on reference to them by either party; and if the value of ſuch property ſhall be in diſpute, ſuch ſtamp commiſſioners ſhall cauſe an appraiſement to be made thereof, at the expence of the perſon liable to pay the duty, in manner aforeſaid; and if ſuch perſon ſhall be diſſatisfied with ſuch valuation, the ſame ſhall be reviewed and finally determined by the ſaid commiſſioners of the land-tax, upon appeal to them within the time and in the manner aforeſaid. And if the effects whereon ſuch duty is payable ſhall be ten miles from London, ſuch perſons as ſhall be deputed by the ſaid ſtamp commiſſioners ſhall act in their ſtead. ſ. 22. 36 Geo. III. c. 52.

And if it ſhall appear to the ſaid ſtamp commiſſioners, upon oath, to be adminiſtered by a juſtice, or maſter extraordinary in chancery, that leſs duty has been paid than ought to have been, by miſtake, without intention of fraud, ſuch miſtake may be rectified by ſuch commiſſioners, who may accept the duty really due within three calendar months, if no ſuit hath been inſtituted, and on payment of 10*l. per cent.* thereon by way of penalty. ſ. 30.

Every perſon paying or receiving money contrary to this act, who ſhall within twelve calendar months diſcover the other party offending, ſo as he be convicted thereof, ſhall be indemnified and diſcharged from all penalties againſt this act. ſ. 31.

And all powers of forming acts relating to the ſtamp duties, not hereby altered, ſhall be in force, in the execution of this act. ſ. 42.

Wherever any executor or adminiſtrator ſhall not have paid the ſaid duties within time, the court of exchequer may, on application from the ſtamp office on ſatisfactory affidavit, grant a rule for ſuch executor to ſhew cauſe why he ſhould not deliver to the commiſſioners an account on oath of all legacies, or of the perſonal property paid or payable by him, and why the duties thereon have not been, or ſhould not be forthwith paid, and may make ſuch rule abſolute where it appears proper. And regiſtrars of eccleſiaſtical courts ſhall, within a month of requiſition, deliver to the ſtamp office an account of wills and letters of adminiſtration in their cuſtody, with particulars relating thereto, and extracts from any wills deemed neceſſary by the commiſſioners, on payment of fees agreed on or allowed by the eccleſiaſtical court, on pain of 50*l.* recoverable by information by the attorney-general. 42 Geo. III. c. 99. ſ. 2, 3.

And by the 5 W. c. 21, the probate of the will or letters of adminiſtration of any common ſoldier or ſeaman, ſlain or dying in the ſervice, ſhall be exempt from the ſtamp duties. ſ. 6.

RECEIPT, or *Reſceit*, in *Law*. See RESCEIT.

RECEIPT *of Homage*. See RESCEIT.

RECEIPT *of the Exchequer*. See COURT *of Exchequer*.

RECEIPT, in *Medicine*. See RECIPE.

RECEIPTS, *Auditor of*. See AUDITOR.

RECEIVER, or RECIPIENT, in *Chemiſtry*, a globe-ſhaped veſſel, which is adapted to the neck or beak of an alembic, retort, or other diſtillatory veſſel, in order to collect, receive, and contain the products of diſtillations.

Receivers ſhould be made of glaſs, not only becauſe this matter reſiſts the action of the ſtrongeſt and moſt corroſive ſubſtances, but alſo becauſe being tranſparent, it allows the operator to ſee through it, and to judge by the frequency of the drops, if the diſtillation be too quick or too ſlow, and alſo if the quantity and nature of the ſubſtances that come over be ſuch as are required.

Almoſt all receivers are kinds of bottles of different ſizes, of a ſpherical form, the necks of which are cut ſhort, and each of which is pierced with a ſmall hole in its lateral or upper part, to give vent to the air or vapours, which are too expanſive. Receivers of this form are called *balloons*; which ſee. Some receivers are matraſſes with long necks. Theſe are generally adapted to the beaks of glaſs alembics. The long neck ſerves to keep the belly of the receiver, where the liquor is collected, at a proper diſtance from the fire.

Receivers have different forms for particular operations. Such are thoſe which have two or three beaks, either to be adapted to other receivers, or to admit at the ſame time the necks of ſeveral diſtillatory veſſels, when the intention of the operator is, that the vapours of different ſubſtances ſhould meet in the ſame receiver. Such alſo are receivers for eſſential oils, obtained from aromatic plants diſtilled with water, which are ſo made, that they are never full, but that the water runs out, and leaves the oil behind. Theſe are a kind of glaſs cucurbits, which contract as they riſe higher; ſo that their neck or upper opening is but nearly of a convenient ſize to receive the beak of the worm. Theſe receivers have another opening about the middle of the ſwelling or belly; and to this opening is joined a glaſs tube, which bends and riſes vertically along the outer part of the receiver, ſo as to be within two inches and a half as high as the upper opening. At this height the tube bends again towards the ſide oppoſite to the body of the receiver, to pour into another veſſel the liquor which ariſes there. It forms the figure of an S.

When this receiver is to be uſed, it is to be placed vertically under the beak of the worm. During the diſtillation, the liquor riſes to an equal height in the body of the receiver, and in the crooked tube: when, therefore, the height of the liquor in the receiver becomes greater than the height of the tube, it muſt begin to flow from the mouth of this tube into another veſſel placed on purpoſe to receive it; but as eſſential oils are either lighter or heavier than water, and as they are, therefore, always collected either above or under the water, and as the liquor which diſcharges itſelf through the tube is taken from the middle part of the receiver, nothing but water can be evacuated at the mouth of the pipe, while the oil always remains in the receiver. With ſuch a receiver diſtillation may be performed without the trouble of changing the veſſels. Macquer's Chem. Dict. See DISTILLATION and LABORATORY.

RECEIVER *of an Air-Pump*, is part of its apparatus; being a glaſs veſſel placed on the top of the plate, out of which the air is to be exhauſted. To an air-pump belong various receivers, of various forms and ſizes, and ſerving for various purpoſes. See AIR-*Pump*.

RECEIVER, *Exhauſted*, in *Pneumatics*. See EXHAUSTED. And for the method of repairing thoſe that are cracked, ſee CÆMENT.

RECEIVER, *Receptor*, or *Receptator*, in *Law*, is uſed commonly in the bad ſenſe, for ſuch as knowingly receive ſtolen goods from thieves, and conceal them.

This offence is only a miſdemeanor at common law: however, by the ſtatutes 3 & 4 W. & M. c. 9. and 5 Ann. c. 31. the offender is made acceſſory to the theft and felony. But becauſe the acceſſory cannot in general be tried, unleſs with the principal, or after the principal is convicted, the

receivers by that means frequently eluded juſtice; to remedy which it is enacted by ſtatute 1 Ann. c. 9. and 5 Ann. c. 31. that ſuch receivers may be ſtill proſecuted for a miſdemeanor, and puniſhed by fine and impriſonment, though the principal felon be not before taken, ſo as to be proſecuted and convicted. And in caſe of receiving ſtolen lead, iron, and certain other metals, ſuch offence is, by ſtatute 29 Geo. II. c. 30. puniſhable by tranſportation for fourteen years. So that now the proſecutor has two methods in his choice: either to puniſh the receivers for the miſdemeanor immediately, before the thief is taken (Foſter. 373.); or to wait till the felon is convicted, and then puniſh them as acceſſories to the felony. But it is provided by the ſame ſtatutes, that he ſhall only make uſe of one, and not of both theſe methods of puniſhment.

By the ſame ſtatute alſo (29 Geo. II. c. 30.) perſons having lead, iron, or other metals in their cuſtody, and not giving a ſatisfactory account how they came by the ſame, are guilty of a miſdemeanor, and puniſhable by fine and impriſonment. And by ſtatute 10 Geo. III. c. 48. all knowing receivers of ſtolen plate or jewels, taken by robbery on the highway, or when a burglary accompanies the ſtealing, may be tried as well before as after the conviction of the principal, and whether he be in or out of cuſtody; and, if convicted, ſhall be adjudged guilty of felony, and tranſported for fourteen years. By ſtat. 21 Geo. III. c. 68. the receiving of any ſtolen copper, braſs, bell-metal, or utenſil fixed to any building, or any iron-rails or fencing ſet up in any court or other place, is made tranſportation for ſeven years, or three years' impriſonment to be kept to hard labour. By ſtat. 21 Geo. III. c. 69. the receiving of ſtolen pewter of any kind is ſubjected to the like penalty, although the principal has not been convicted. By ſtat. 22 Geo. III. c. 58. the receiving of any ſtolen goods, (except lead, iron, copper, braſs, bell-metal, and ſolder,) is made a miſdemeanor, puniſhable by fine and impriſonment, or whipping, as the court ſhall appoint; which ſhall exempt the offender from being puniſhed as acceſſory, although the principal be afterwards convicted, and the offence ſhall appear to be grand larceny, or ſome greater offence. (See LARCENY.) For the puniſhment of receivers of goods ſtolen by bum-boats, &c. on the river Thames, ſee ſtat. 2 Geo. III. c. 28. § 12. Receivers of linen goods ſtolen from the bleaching-grounds are, by ſtat. 18 Geo. II. c. 27. declared felons without benefit of clergy. In France, receivers are puniſhed with death; and the Gothic conſtitutions diſtinguiſhed alſo three ſorts of thieves: "unum qui conſilium daret, alterum qui contrectaret, tertium qui receptaret et occultaret; pari pœna ſingulos obnoxios."

RECEIVER alſo denotes an officer, of which there are various kinds, denominated from the particular matters they receive, the places where, or the perſons for whom, &c.

As receiver of rents; receiver-general of the cuſtoms; receiver of the fines, upon original writs in chancery, &c.

RECEIVER-*General* of the duchy of Lancaſter, is he who gathers all the revenues and fines of the lands of the ſaid duchy, all forfeitures, aſſeſſments, &c.

RECEIVER-*General* of the public revenue is an officer appointed in every county, to receive the taxes granted by parliament, and remit the money to the treaſury.

RECEIVER'S *Office*. See *Greenwich* HOSPITAL.

RECENT FRUITS. See FRUIT.

RECEPTACLE *of Stall Manure*, in *Agriculture*, the place where the various matters from the ſtalls, and other places where animals are kept, are depoſited and laid up. Some ſuppoſe that theſe places ſhould be a little hollow or excavated; while others are of quite a different opinion, and think that they ſhould be even, or a little raiſed. A very ſlight hollowing is, however, probably the beſt. An experienced writer on this ſubject ſuggeſts, that it is not to be inferred that, becauſe they ſhould be hollow, they ſhould alſo be deep; as one principal uſe of them is to bring the rain waters, which fall within the yards or incloſed parts, into a ſtagnant ſtate, and to let them off ſuperficially, ſo as to prevent any thing of the ground current kind from carrying away the dung, either in a bodily manner, or in a thick fluid ſtate: they may, in this way, ſuffer the more watery particles only to paſs away into reſervoirs, prepared to preſerve and keep them for future uſe. It is believed that two feet on the lower ſide, or deepeſt parts, may be taken as a mean depth; but leſs may often be quite ſufficient: and the bottoms of the waſte-water channels being laid ſix or eight inches lower than the rim of the baſons, the depth of water which they can contain is, it is concluded, not more than ſixteen or eighteen inches, when empty of manure. But it is ſuggeſted, as neceſſary to good farm management, that, ſoon after the winter's manure has been removed and cleared away, floorings of marle, or ſome other earthy fertilizing material, mixed with lime, to the thickneſs of ten or twelve inches, ſhould be ſpread out over the bottoms of the baſons or hollowed parts; by which means a rich compoſt for graſs lands may be formed at ſmall expence, on which all the offal materials of manure which can be collected, free from ſeeds of weeds, during the ſummer and autumn, ſhould be depoſited. In this manner the receptacles ſhould be filled to the brims, even though no ſtable manure were put into them during the above two ſeaſons; ſo that the winter's ſtall manures may have firm platforms to reſt upon, out of the way of water, the great evil which antiquated prejudice ſo much fears in theſe manure receptacles, as the prevention of the due maturation of their different contents.

With theſe receptacles of manure there ſhould be connected drains from the cattle-houſes, ſtalls, and farm-offices, for receiving and conveying the urine, and other liquid matters, from them to theſe baſons or receptacles; and the mouths of their outlet channels ſhould be well guarded, in order to prevent their being choaked up by the manure, when piled up to conſiderable height above them. The reſervoirs, pits, or wells, which are made before them, are always to be kept free, for the ſuperfluous water, or other liquid matters of the receptacles, to drain or filtrate into; and thence to paſs away in moiſt weather; or to be pent up in them, in dry warm ſeaſons, for the purpoſe of being thrown over the piled-up manures, for the promotion of their decay and maturation.

Where there are graſs lands lying conveniently below theſe receptacles and reſervoirs for receiving their overflowings, all the different parts of the places, where they are ſituated, may be made to ſhelve gently towards them; but where land cannot be commanded for favouring this intention, the receptacles or baſons ſhould receive no other waters than what are ſupplied to them by the atmoſphere. This regulation may eaſily be accompliſhed, ſimply by raiſing their rims a few inches higher than the ſurrounding ſurfaces, which ſhould be frequently cleared from the manure and litter dropped upon them, depoſiting all ſuch ſubſtances within their rims. The rain-water which falls, in theſe caſes, is to be conveyed to the catch-pools, or the moſt contiguous common drains. In all caſes, that which falls upon the buildings ſhould be conveyed away, without being ſuffered to paſs through the receptacles or baſons, unleſs

unleſs where liquid manure is more in demand than that of the bulky kind.

From the ſlow progreſs made by manures of this ſort to maturation, in the winter ſeaſon, in the open air, even when piled up in the drieſt ſituations, on account of its being conſtantly ſoaked or ſaturated with moiſture, and expoſed to the effects of the cold atmoſphere, the plan of giving receptacles of this ſort a long oval ſquare form, and covering them with roofs, to free them wholly from rain, as well as to defend them from cold, has been hit upon, and recommended from authority. As by thus affording the articles of manure the means of paſſing into the ſtate of fermentation, in the winter months, their putrefaction and decay would be beneficially promoted, for the uſe of the more early crops of the ſpring. But how far the advantage, gained in this way, may equal or be ſuperior to the expence of building, and extra labour in the removals of the manure, is a point which is by no means yet fully decided. And the ſuperior benefits, which have lately been derived from the uſe of manure in its more raw or freſh ſtate, render all ſuch ſchemes perhaps of leſs importance than would otherwiſe be the caſe.

As it is a matter of great conſequence to prevent the exceſſive waſte of this ſort of manure, which at preſent frequently takes place in moſt parts of the country, it has been ſuggeſted by an experienced writer, who has attended much to the ſubject, and thought a great deal upon it, that piling it in ſhallow receptacles or baſons, and conducting the liquor, when not wanted for moiſtening the piles of manure, which overflows from them, to reſervoirs or catch-pools, in order to ſtop, depoſit, and arreſt the heavier and more groſs particles that may be conveyed in it, and to provide a valuable collection of liquid manure in particular ſituations, and of rich muddy matters in others, are the moſt appropriate practical means of accompliſhing the matter, in an eaſy and cheap way, that can be adopted or had recourſe to. See DUNG, FARM-*Yard*, HOMESTAL, MANURE, RESERVOIR, and YARD *Manure*.

RECEPTACULUM, RECEPTACLE, in *Botany* and *Vegetable Phyſiology*, is the ſeventh, or laſt, part of fructification diſtinguiſhed by Linnæus, being the common baſis, or point of connection, of the others. (See FRUCTIFICATION.) It is evident that ſuch a part muſt exiſt, under ſome ſhape or other; yet the receptacle is not always diſtinguiſhed by any particular figure. In ſimple flowers it is often little more than a mere point; in compound ones it is very remarkable and important, ſerving, by its differences of ſtructure, to afford very good generic diſtinctions. The receptacle of the Daiſy, *Bellis*, is conical; that of *Chryſanthemum* convex. In *Sphæranthus* this part is very nearly globular, while in ſome ſpecies of *Centaurea* and *Carlina* it is either flat, or ſlightly concave. In *Sonchus* it is naked, deſtitute of hairs or ſcales between the florets or ſeeds; while in *Carduus* it is hairy, and in *Anthemis* variouſly ſcaly. This laſt genus differs, by the character in queſtion alone, from *Chryſanthemum*, whoſe receptacle is naked; but the character is not quite ſo natural, in this caſe, as could be wiſhed. Mr. Brown has obſerved to us, that it affords not even a certain artificial diſtinction, in the *Chryſanthemum indicum* of the gardens, Curt. Mag. t. 327; which Willdenow, like M. de Ramatuelle and profeſſor Desfontaines, has referred to *Anthemis*, becauſe they found the receptacle to be ſcaly. We are convinced they are in the right, and yet this appears to be the very ſame plant with *Chryſanthemum indicum*, the ſcales of the receptacle being variable, and ſometimes almoſt, if not altogether, evaneſcent. Some genera of this claſs have a cellular, or honeycomb-like receptacle, as *Onopordum*, and *Tolpis* (*Crepis barbata* of Linnæus). In that caſe the edges of the cells are variouſly jagged, toothed, or fringed, and they now and then are ſcarcely diſtinguiſhable from the reticulations or rugoſities of ſome naked receptacles.

The *receptacle of the flower*, in Linnæan language, means the area or ſpace between the ſtamens and ſtyles, in certain genera whoſe germen is inferior; as the whole umbelliferous order, in which the part in queſtion is more or leſs tumid, often coloured, and aſſumes a glandular aſpect. The *receptacle of the ſeeds* is not unfrequently a diſtinct part from the capſule or its valves, ſerving to connect the ſeeds therewith. (See an example of it in REDUTEA.) The *rachis*, or common ſtalk of a ſpike, or ſpikelet, in *Graſſes*, is alſo termed a receptacle.

In ſome plants the receptacle undergoes great changes, acquiring a different texture in the fruit, from what it had in the flower. Thus, the whole fruit, as we call it, of the Fig, (ſee FICUS,) is a common receptacle, at firſt coriaceous, and, like the reſt of the plant, containing a milky, ſomewhat acrid, juice. It forms a bag, lined with flowers or florets, and having a ſmall aperture at the top. After the flowers are paſt, this bag becomes pulpy, coloured, and full of ſweet aromatic juice. So the fruit of the Strawberry, (ſee FRAGARIA,) is but an originally ſmall dry receptacle, ſubſequently enlarged, and become pulpy, whoſe outſide is ſtudded with naked ſeeds. In *Brouſſonetia*, deſcribed under our article PAPYRIUS, the ſeparate ſtalk of each germen becomes the enlarged and pulpy ſupporter of a naked ſeed. In POLLICHIA, (ſee that article,) the common receptacle of the flowers, minutely ſcaly, and hardly diſcernible, in its earlier ſtate, changes to a congeries of white, juicy, ſweet, tooth-like ſcales, elevating the ſeeds in their appropriate withered perianths, and altogether conſtituting one of the moſt extraordinary pulpy fruits that we have ever met with. A ſimilar change of ſubſtance is obſervable in the calyx of the Mulberry, as well as in *Commelina Zanonia*; a change common and natural in the germen of pulpy fruits, though rare in the particular parts of which we have been ſpeaking.

RECEPTACULUM *Chyli*, in *Anatomy*, that portion of the trunk of the abſorbing veſſels, into which the lacteal abſorbents pour the fluids which they have taken up in the alimentary canal: it is uſually rather larger than the neighbouring portions of the veſſel, and ſometimes very conſiderably ſo. See ABSORBENTS.

RECEPTARII, a term of reproach uſed for ſuch phyſicians as wrote pompous receipts for loads of medicines, more conſulting the good of the apothecary than the patient; as alſo for ſuch as gave receipts for general medicines, to be uſed at the diſcretion of people wholly unacquainted with the nature of diſeaſes.

RECEPTION, RECEPTIO, in *Philoſophy*, denotes the ſame with *paſſion*, conſidered as oppoſed to *action*.

RECEPTION is alſo properly uſed for the manner of treating or entertaining a perſon; and the ſolemnities and ceremonies practiſed on that occaſion. See ENTRY.

The reception of ambaſſadors is uſually performed with a great deal of pomp.

RECEPTION is ſometimes alſo uſed for the act of approving, accepting, and admitting a thing. See ACCEPTANCE.

The canon law only binds where it is *received*: the civil law is received in ſome countries, and not in others.

The French would never *receive* the council of Trent, the Spaniſh inquiſition, nor the dogmata of the ultramontane canoniſts.

RECEPTION, in *Aſtrology*, is a dignity befalling two planets when they exchange houſes; *e. gr.* when the ſun arrives in Cancer, the houſe of the moon; and the moon, in her return, arrives in the ſun's houſe.

The ſame term is alſo uſed, when two planets exchange exaltation.

RECEPTITIOUS GOODS. See GOODS.

RECESSION *of the Equinoxes*. See PRECESSION *of the Equinoxes*.

RECESSUS, a word uſed by ſome medical writers to expreſs an abſceſs, or apoſthumation.

RECESSUS *Imperii*, *Receſs of the Empire*, a phraſe uſed in ſpeaking of the affairs of Germany; ſignifying a collection of the votes or determinations of a diet.

At the end of each diet, before it breaks up, they gather together all their reſolutions, and reduce them into writing; the act which contains them they call the *receſſus imperii*, becauſe made when on the point of retiring.

RECEY *ſur Ouſce*, in *Geography*, a town of France, in the department of the Côte d'Or, and chief place of a canton, in the diſtrict of Chatillon; 15 miles S.E. of Chatillon. The place contains 880, and the canton 5913 inhabitants, on a territory of 260 kiliometres, in 17 communes.

RECHABITES, a kind of religious order among the ancient Jews, inſtituted by Jonadab the ſon of Rechab; and comprehending his family and poſterity.

Their founder preſcribed them three things: firſt, Not to drink any wine. Secondly, Not to build any houſes, but to dwell under tents. Thirdly, Not to ſow any corn, or plant any vines.

The Rechabites obſerved theſe rules with great ſtrictneſs, as appears from Jerem. xxxv. 6, &c. Whence St. Jerom, in his thirteenth epiſtle to Paulinus, calls them *monachi*, *monks*. Jonadab, their founder, lived under Jehoaſh, king of Judah, contemporary with Jehu, king of Iſrael; his father Rechab, from whom his poſterity were denominated, deſcended from Raguel or Jethro, father-in-law to Moſes, who was a Kenite, or of the race of Ken; whence Kenite and Rechabite are uſed as ſynonimous in ſcripture.

The Kenites entered the promiſed land with the Hebrews, and dwelt in the tribe of Judah, about the Dead ſea. They were diſtinguiſhed from the Iſraelites by their retired ſort of life, and by their contempt of cities and houſes. Serrurius diſtinguiſhes the ancient Rechabites deſcended from, and inſtituted by, Jethro, from the new Rechabites of Jonadab. The injunction of Jonadab laid no obligation on the other Kenites, nor on the other deſcendants of Jethro. This they continued to obſerve above 300 years. Jehu began to reign A.M. 3120, and Jehoiakim, king of Judah, was put to death A.M. 3405, B.C. 599; but in the laſt year of Jehoiakim, king of Judah, Nebuchadnezzar coming to beſiege Jeruſalem, the Rechabites were forced to take refuge in the city, ſtill, however, lodging in tents. During this ſiege, Jeremiah received orders from the Lord to converſe with the diſciples of Rechab, to invite them into the temple, and to offer them wine to drink. But the Rechabites would not accept the offer.

The Rechabites were, probably, led captive, after the taking of Jeruſalem by the Chaldæans. (See Pſalm lxx.) They returned from their captivity, and ſettled in the city of Jabez beyond Jordan. (See 1 Chron. ii. 55.) Some have ſuggeſted, that the Aſſidæans of the Maccabees, (1 Macc. ii. 42. vii. 13. and 2 Macc. xiv. 6.) were ſucceſſors and followers of the Rechabites. Others have confounded them with the Eſſenes. But it is certain, that the manner of life of the Eſſenes was very different from that of the Rechabites, as appears from Joſephus, Antiq. lib. xviii. cap. 2. who informs us, that the Eſſenes had fields, and inhabited houſes, but had neither wives nor children; and did not perform their religious ceremonies with the other Jews at Jeruſalem: all which was contrary to the practice of the Rechabites.

RECHACING, in *Hunting*, the driving back of the deer, or other beaſts, into the foreſts, chaces, &c. which had ſtraggled out into the copſes or thickets, &c.

Anciently there were offices of rechacers of the deers beſtowed by the king on gentlemen, or old hunters, with ſalaries for the keeping of running dogs to rechace the deer into the foreſts, and then to beat the dogs off, without purſuing any farther.

RECHANGE, in *Commerce*. See RE-EXCHANGE.

RECHANGE is alſo uſed at ſea for ſuch tackle as is kept in reſerve aboard the ſhip, to ſerve in caſe of failure of that already in uſe. See TACKLE.

The Levantines uſe the word *reſpect* or *reſpit* in the ſame ſenſe.

RECHARGE *of a Fire Arm*, is a ſecond loading, or charge. The recharge ſhould never be ſo deep as the firſt charge, leſt the piece, being over heated, ſhould burſt.

RECHBERG, in *Geography*, a town of Auſtria; eight miles N.W. of Grein.

RECHE, a river of France, which runs into the Amblave, near Malmedy.—Alſo, a town of England, in the county of Cambridge, on the river Cam, formerly a place of great trade, and before the draining of the fens, a port for veſſels of conſiderable burthen; five miles W. of Newmarket.

RECHEAT, in *Hunting*, a leſſon which the huntſman winds on the horn, when the hounds have loſt their game, to call them back from purſuing a counter-ſcent.

RECHENBURG, in *Geography*, a town of Saxony, in the circle of Erzgeberg; four miles S.E. of Frauenſtein.

RECHIA, a town of Servia; 100 miles W. of Niſſa. N. lat. 43° 12′. E. long. 19° 3′.

RECHICOURT, a town of France, in the department of the Meurthe, and chief place of a canton, in the diſtrict of Sarrebourg; five miles N. of Blamont. The place contains 992, and the canton 8516 inhabitants, on a territory of 217½ kiliometres, in 18 communes.

RECHNITZ, a town of Hungary; ſix miles S.S.W. of Guntz.

RECHPERG, a town of Auſtria; two miles N. of Stain.

RECIMUS, among the Romans, a kind of ſquare mantle, or veil, worn by women on the head. Salmaſius will have it to have been a ſort of gown uſed by the Roman ladies, and tucked up before with a ſquare pin, of a purple colour.

RECINA, in *Geography*, a town of the marquiſate of Ancona; three miles N.W. of Macerata.

RECIPE, in *Medicine*, a preſcription, or formula, of a remedy, appointed to be adminiſtered to a patient. See PRESCRIPTION.

It is thus called, becauſe always beginning with the word *recipe*, *take*; ordinarily expreſſed by the abbreviation ℞.

RECIPIANGLE, or RECIPIENT-ANGLE, a mathematical inſtrument, ſerving to take the quantity of angles; uſed eſpecially in the drawing plans of fortifications.

The recipiangle was formerly a popular inſtrument among the French, but little known among us; it is uſually very

ſimple, in form of a ſquare, or rather a *bevel* (which ſee); conſiſting of two arms, or branches, rivetted together, and yet moveable, like a ſector, on the centre or rivet.

To take an angle with it, they lay the centre of a protractor to the joint, and the degrees cut by the edge ſhew the quantity of the angle: otherwiſe the angle made by the two rulers is drawn on paper, and then meaſured with a protractor.

Sometimes there is a circle divided into degrees added over the centre or rivet, with an index to ſhew the degrees without a protractor. At other times the under branch is divided.

To meaſure a ſaliant angle with any of the recipiangles, apply the inſides to the lines that form the angle; for a re-entering angle, apply the outſides, &c.

RECIPIENDO EXCOMMUNICATO. See EXCOMMUNICATO.

RECIPIENDO *et faciendo attornato*. See ATTORNATO.

RECIPIENT, in *Chemiſtry*. See RECEIVER.

RECIPIENT, *Italian*, a veſſel like a tea-pot, intended for the ſeparation of eſſential oils from the watery liquor on which they float.

RECIPIENT *of an Air-pump*. See RECEIVER.

RECIPROCAL, RECIPROCUS, ſomething that is mutual, or which is returned equally on both ſides, or affects both parties alike.

The end of human ſociety is to afford each other reciprocal aid; there are reciprocal duties between the prince and his ſubjects, the huſband and wife, &c. There is a reciprocal action between the agent and patient.

The *lex talionis* eſtabliſhes a kind of reciprocation of juſtice.

If two ſimilar triangles be cut by parallel lines, the ſections of the ſides will be proportional; and reciprocally, if the ſides be cut proportionably, the triangles are ſimilar.

RECIPROCAL, in *Logic*, is applied to terms which have the ſame ſignification, or are convertible; as, *reaſonable animal* and *man*.

Schoolmen define *reciprocation* a converſion of the ſeveral terms in an enunciation. And terms are ſaid to be converted in an enunciation, when the predicate is put in the place of the ſubject, and, *reciprocally*, the ſubject in that of the predicate.

Thus, rationality and riſibility are ſaid to reciprocate; for we ſay equally, *a rational is riſible*, and *a riſible is rational*.

RECIPROCAL, in *Grammar*, is applied to certain verbs and pronouns in ſome of the modern languages; in regard of their turning or reflecting the noun, or perſon, upon himſelf.

Thus the pronoun relative, *himſelf*, refers Cato to Cato's ſelf.

The abbé de Dangeau defines reciprocal verbs to be thoſe whoſe nominative is plural, and denotes perſons acting mutually on one another: as, *Ces quatre hommes s'entrebattoient, theſe four men fought together; Pierre et toi vous vous louez, Peter and you praiſe one another*, &c.

Reciprocal verbs are a ſpecies of thoſe which that author calls *pronominals*, and which he diſtinguiſhes into reciprocal and identical.

RECIPROCAL, in *Poetry*, is applied to verſes which run the ſame both backwards and forwards; called alſo *recurrents*. See RETROGRADE.

RECIPROCAL, in *Arithmetic* and *Algebra*, is the quotient ariſing from the diviſion of unity by any number or quantity. Thus, the reciprocal of $a = \frac{1}{a}$, the reciprocal of $\frac{x}{y} = \frac{y}{x}$, and ſo on.

RECIPROCAL *Equations*, in *Algebra*, are thoſe equations which contain ſeveral pairs of roots which are the reciprocals of each other. Thus, an equation whoſe roots are $a, \frac{1}{a}$; $b, \frac{1}{b}$; &c. is called a reciprocal equation. Some authors define reciprocal equations, to be thoſe equations whoſe coefficients proceed in the ſame order from both extremes, and reſpectively equal to each other: thus, $x^5 + a x^4 + b x^3 + b x^2 + a x + 1 = 0$, is a reciprocal equation; but this form ought rather to be conſidered as a neceſſary property of theſe equations, by which they may be readily diſtinguiſhed, than to be employed in the definition of them; it being doubtleſs the reciprocity of the roots from which they have received their peculiar appellation.

The ſolution of theſe equations may always be made to depend upon others of half the original degree, when the equation is of even dimenſions; or upon half the dimenſion *minus* 1, when it is odd.

Thus far, in fact, this property is not excluſively due to reciprocal equations, as the ſame may be done in all caſes where any ſimilar relation is known to have place between the roots of an equation, whether by multiplication, diviſion, addition, or ſubtraction; but in theſe caſes there is nothing in the form of the equation by which ſuch relations may be known to have place, whereas in reciprocal equations their reciprocity becomes immediately obvious by the peculiar order of their co-efficient, theſe being the ſame from both extremes, both with regard to ſign and magnitude. Hence any equation of the form

$$x^m + a x^{m-1} + b x^{m-2} + \ldots . b x^2 + a x + 1 = 0$$

is immediately known to be reciprocal, and we may proceed in its ſolution as follows.

Firſt, if the equation be of odd dimenſions, as

$$x^{2n+1} + a x^{2n} + b x^{2n-1} + \ldots . b x^2 + a x + 1 = 0,$$

then it is obvious that either $+ 1$, or $- 1$, is one of its roots, for either $+ 1$, or $- 1$, ſubſtituted for x, according as the ſigns of the co-efficients may require, will obviouſly render the whole expreſſion equal to zero, and is therefore a root of the equation. The equation may, therefore, be immediately reduced to another of lower dimenſions by diviſion, according to the known theory of equations; thus, let the propoſed equation be

$$x^5 - 5 x^4 + 7 x^3 + 7 x^2 - 5 x + 1 = 0.$$

Here $x = - 1$ is obviouſly one of the roots, as this ſubſtituted for x renders the whole equal to zero; and conſequently the whole equation is diviſible by $x + 1$, according to the known theory of equation, which diviſion being made, we have, for our reduced equation,

$$x^4 - 6 x^3 + 13 x^2 - 6 x + 1 = 0,$$

which is now of even dimenſion one degree leſs than the original equation, and ſtill reciprocal. We need, therefore, only conſider equations of the latter form; *viz.* thoſe of which the index of the higheſt power is an even number.

Let $x^{2n} + p x^{2n-1} + q x^{2n-2} + \&c. q x^2 + p x + 1 = 0$ be any reciprocal equation, whoſe roots are $a, \frac{1}{a}$; $b, \frac{1}{b}$;

$c, \frac{1}{c}$, &c. Then from the theory of equations we may conſider this to be made up of the factors $(x - a)\left(x - \frac{1}{a}\right)$ $(x - b)\left(x - \frac{1}{b}\right)(x - c)\left(x - \frac{1}{c}\right)$, &c.

Or, putting $a + \frac{1}{a} = m$, $b + \frac{1}{b} = n$, $c + \frac{1}{c} = r$, &c. theſe become

$$(x^2 + m x + 1)(x^2 + n x + 1)(x^2 + r x + 1), \text{ &c.}$$

If, therefore, we really perform this multiplication, and equate the co-efficients, it is obvious, ſince the multiplication is reduced to half the number of factors, the equation by which the values of m, n, r, &c. are obtained, will be of only half the dimenſion of the original equation; and having found theſe, ſince

$$x^2 + m x + 1 = 0$$
$$x^2 + n x + 1 = 0$$
$$x^2 + r x + 1 = 0$$

we ſhall have $x = -\frac{m}{2} \pm \sqrt{\left(\frac{m^2}{4} - 1\right)}$

$$x = -\frac{n}{2} \pm \sqrt{\left(\frac{n^2}{4} - 1\right)}$$

$$x = -\frac{r}{2} \pm \sqrt{\left(\frac{r^2}{4} - 1\right)}, \text{ &c.}$$

Thus, for example, let there be propoſed the equation

$$x^4 + 5x^3 + 7x^2 + 5x + 1 = 0.$$

Multiply together $x^2 + m x + 1$
and $x^2 + n x + 1$

$$x^4 + \left.\begin{matrix} m \\ + n \end{matrix}\right\} x^3 + \left.\begin{matrix} m n \\ + 2 \end{matrix}\right\} x^2 + \left.\begin{matrix} m \\ + n \end{matrix}\right\} x + 1$$

Comparing the co-efficients, we have $m + n = 5$, and $mn + 2 = 7$.

Hence, $m = \frac{5 + \sqrt{5}}{2}$, and $n = \frac{5 - \sqrt{5}}{2}$

therefore, $x = \frac{5 + \sqrt{5}}{4} \pm \sqrt{\left(\frac{30 + 10\sqrt{5}}{16} - 1\right)}$

and $x = \frac{5 - \sqrt{5}}{4} \pm \sqrt{\left(\frac{30 - 10\sqrt{5}}{16} - 1\right)}$

which are the four roots of the propoſed equation.

From the preceding principles are readily deduced the ſolution of all reciprocal equations under the 10th power.

3d degree. $x^3 + p x^2 + p x + 1 = 0$.

Find z in the ſimple equation $z + p - 1 = 0$, and call it r; then

$$x = -1, \; x = \tfrac{1}{2} r \pm \sqrt{(\tfrac{1}{4} r^2 - 1)}$$

4th degree. $x^4 + p x^3 + q x^2 + p x + 1 = 0$.

Find the two values of z in the equation $z^2 + p z + q - 2 = 0$, and call them r, r'; then

$$x = \tfrac{1}{2} r \pm \sqrt{(\tfrac{1}{4} r^2 - 1)}, \; x = \tfrac{1}{2} r' \pm \sqrt{(\tfrac{1}{4} r'^2 - 1)}$$

5th deg. $x^5 + p x^4 + q x^3 + q x^2 + p x + 1 = 0$.

Find the two values of z in the equation $z^2 + (p - 1) z + q - p - 1 = 0$, and call them r, r'; then $x = -1$

$$x = \tfrac{1}{2} r \pm \sqrt{(\tfrac{1}{4} r^2 - 1)}, \; x = \tfrac{1}{2} r' \pm \sqrt{(\tfrac{1}{4} r'^2 - 1)}$$

6th deg. $x^6 + p x^5 + q x^4 + r x^3 + q x^2 + p x + 1 = 0$.

Find the three values of z in the cubic equation $z^3 + p z^2 + (q - 3) z + r - 2p = 0$, and call them r, r', r''; then

$$x = \tfrac{1}{2} r \pm \sqrt{(\tfrac{1}{4} r^2 - 1)} \; x = \tfrac{1}{2} r \pm \sqrt{(\tfrac{1}{4} r'^2 - 1)}$$
$$x = \tfrac{1}{2} r'' \pm \sqrt{(\tfrac{1}{4} r''^2 - 1)}$$

7th deg. $x^7 + p x^6 + q x^5 + r x^4 + r x^3 + q x^2 + p x + 1 = 0$

Find the three values of z in the cubic equation $z^3 + (p - 1) z^2 + (q - p - 2) z + r - p - q + 1 = 0$, and call them r, r', r''; then $x = -1$

$$x = \tfrac{1}{2} r \pm \sqrt{(\tfrac{1}{4} r^2 - 1)}; \; x = \tfrac{1}{2} r' \pm \sqrt{(\tfrac{1}{4} r'^2 - 1)}$$
$$x = \tfrac{1}{2} r'' \pm \sqrt{(\tfrac{1}{4} r''^2 - 1)}$$

8th deg. $x^8 + p x^7 + q x^6 + \ldots . q x^2 + p x + 1 = 0$.

Find the four values of z in the equation $z^4 + p z^3 + (q - 4) z^2 + (r - 3p) z + s - 2(q - 1) = 0$, and call them r, r', r'', r'''; then

$$x = \tfrac{1}{2} r \pm \sqrt{(\tfrac{1}{4} r^2 - 1)}; \; x = \tfrac{1}{2} r' \pm \sqrt{(\tfrac{1}{4} r'^2 - 1)}$$
$$z = \tfrac{1}{2} r'' \pm \sqrt{(\tfrac{1}{4} r''^2 - 1)}; \; x = \tfrac{1}{2} r''' \pm \sqrt{(\tfrac{1}{4} r'''^2 - 1)}$$

9th deg. $x^9 + p x^8 + q x^7 + \ldots . q x^2 + p x + 1 = 0$.

Find the four values of z in the equation $z^4 + (p - 1) z^3 + (q - p - 3) z^2 + (r - q - 2p + 2) z + s - r - q + p + 1 = 0$, and call them r, r', r'', r'''; then $x = -1$

$$x = \tfrac{1}{2} r \pm \sqrt{(\tfrac{1}{4} r^2 - 1)}; \; x = \tfrac{1}{2} r' \pm \sqrt{(\tfrac{1}{4} r'^2 - 1)}$$
$$x = \tfrac{1}{2} r'' \pm \sqrt{(\tfrac{1}{4} r''^2 - 1)}; \; x = \tfrac{1}{2} r''' \pm \sqrt{(\tfrac{1}{4} r'''^2 - 1)}$$

A reciprocal equation of the 10th and higher powers, requires the general ſolution of equations of the 5th and higher powers, and therefore cannot be exhibited analytically. Bonnycaſtle's Algebra, vol. i.

Binomial equations are all reciprocal equations of a peculiar kind, which renders them all reſolvable by means of certain trigonometrical formulæ.

Binomial equations are all reducible to the form $x^m \pm 1 = 0$; or $x^m = 1$; or $x^m = -1$. Where it is obvious, that if m is even, or $m = 2n$, then $x^{2n} = 1$ will have two real roots, *viz.* $+1$, and -1; and $x^{2n} = -1$ will have two of its imaginary roots $+\sqrt{-1}$, and $-\sqrt{-1}$; ſo that, in both caſes, ſuch an equation may be reduced two degrees lower, by dividing it by $x^2 - 1$, or $x^2 + 1$, and the reſulting equation will be a reciprocal one, having each of its co-efficients equal to unity. If m be odd, then the equation will neceſſarily have one real root, and no more, which will be $+1$ in the firſt caſe, and -1 in the ſecond; conſequently, ſuch an equation can be reduced but one degree, the ſame as thoſe above ſtated. We may, therefore, find a direct ſolution for all binomial equations of odd dimenſions as far as the 9th power, and of even dimenſions as far as the 10th power, by the principles and formulæ already given, by merely making $p = 1$, $q = 1$, $r = 1$, &c. and it would, therefore, be uſeleſs to repeat them again in this place; we ſhall proceed immediately to the general ſolution of binomial equations, on the principles of analytical trigonometry.

All the imaginary roots of the equation

$$x^n - 1 = 0$$

are contained in the general formula

$$x^2 - 2 \text{ cof. } \frac{2k\pi}{n} x + 1 = 0;$$

k being any integer not divisible by n, and π representing the semi-circumference. For it is a known trigonometrical property, that if

$$2 \text{ cof. } y = x + \frac{1}{x}, \text{ then } 2 \text{ cof. } ny = x^n + \frac{1}{x^n};$$

from which two equations we readily draw the two following; *viz.*

$$x^2 - 2 \text{ cof. } y \cdot x + 1 = 0$$
$$x^{2n} - 2 \text{ cof. } ny \cdot x^n + 1 = 0$$

which have necessarily one common root, being both derived from the same value of x; and since these are both reciprocal equations, if x be one root, $\frac{1}{x}$ will be another; they have therefore two roots common, and consequently, from the known theory of equations, the former is a divisor of the latter. If, now, we make $y = \frac{2k\pi}{n}$, or $ny = 2k\pi$, these equations become

$$x^2 - 2 \text{ cof. } \frac{2k\pi}{n} x + 1 = 0$$
$$x^{2n} - 2 \text{ cof. } 2k\pi x^n + 1 = 0$$

But the cof. $2k\pi = 1$, 2π representing the whole circumference; therefore the latter equation is the same as

$$x^{2n} - 2x^n + 1 = 0, \text{ or } (x^n - 1)^2 = 0,$$

having still for its divisor

$$x^2 - 2 \text{ cof. } \frac{2k\pi}{n} x + 1 = 0;$$

that is, the roots of the equation

$$(x^n - 1)^2 = 0, \text{ or } x^n - 1 = 0,$$

are all contained in the general formula

$$x^2 - 2 \text{ cof. } \frac{2k\pi}{n} x + 1 = 0;$$

and, therefore, by giving to k the successive values 1, 2, 3 . . . . $\frac{1}{2}(n-1)$, the following formulæ will be obtained; *viz.*

$$x^2 - 2 \text{ cof. } \frac{2\pi}{n} x + 1 = 0$$
$$x^2 - 2 \text{ cof. } \frac{4\pi}{n} x + 1 = 0$$
$$x^2 - 2 \text{ cof. } \frac{6\pi}{n} x + 1 = 0$$
. . . . . .
$$x^2 - 2 \text{ cof. } \frac{(n-1)\pi}{n} x + 1 = 0$$

which contain among them all the imaginary roots of the equation $x^n - 1 = 0$.

And if, instead of making $y = \frac{2k\pi}{n}$, as above, we make $y = \frac{(2k+1)\pi}{n}$, our second formula becomes

$$x^{2n} + 2x^n + 1 = 0, \text{ or } (x^n + 1)^2 = 0;$$

because cof. $(2k\pi + \pi) = -1$. Consequently, the equation $x^n + 1 = 0$, or $x^n = -1$, will have for its general factor

$$x^2 - 2 \text{ cof. } \frac{(2k+1)\pi}{n} x + 1 = 0;$$

which, by substituting for k as above, becomes

$$x^2 - 2 \text{ cof. } \frac{1\pi}{n} x + 1 = 0$$
$$x^2 - 2 \text{ cof. } \frac{3\pi}{n} x + 1 = 0$$
$$x^2 - 2 \text{ cof. } \frac{5\pi}{n} x + 1 = 0$$
&c. &c. &c.

which formulæ contain all the imaginary roots of the binomial equation $x^n + 1 = 0$.

Suppose, for example, all the imaginary roots of the binomial equation $x^{11} - 1 = 0$ were required.

Here we should have

$$x^2 - 2 \text{ cof. } \frac{360^\circ}{11} x + 1 = 0$$
$$x^2 - 2 \text{ cof. } \frac{2 \cdot 360^\circ}{11} x + 1 = 0$$
$$x^2 - 2 \text{ cof. } \frac{3 \cdot 360^\circ}{11} x + 1 = 0$$
$$x^2 - 2 \text{ cof. } \frac{4 \cdot 360^\circ}{11} x + 1 = 0$$
$$x^2 - 2 \text{ cof. } \frac{5 \cdot 360^\circ}{11} x + 1 = 0$$

whence, $x = \text{cof. } \frac{360^\circ}{11} \pm \sqrt{\left(\text{cof.}^2 \frac{360^\circ}{11} - 1\right)}$

$$x = \text{cof. } \frac{720^\circ}{11} \pm \sqrt{\left(\text{cof.}^2 \frac{720^\circ}{11} - 1\right)}$$
$x = \text{cof. }$ &c. &c.

And if the roots of $x^{11} + 1 = 0$ were required, we should have from the second general formula

$$x^2 - 2 \text{ cof. } \frac{180^\circ}{11} x + 1 = 0$$
$$x^2 - 2 \text{ cof. } \frac{3 \cdot 180^\circ}{11} x + 1 = 0$$
$$x^2 - 2 \text{ cof. } \frac{5 \cdot 180}{11} x + 1 = 0$$
&c. &c.

Whence,

$$x = \text{cof. } \frac{180^\circ}{11} \pm \sqrt{\left(\text{cof.}^2 \frac{180^\circ}{11} - 1\right)}$$
$$x = \text{cof. } \frac{540^\circ}{11} \pm \sqrt{\left(\text{cof.}^2 \frac{540^\circ}{11} - 1\right)}$$
$x = \text{cof. }$ &c. &c.

For more on this subject, see Barlow's Theory of Numbers, Bonnycastle's Algebra, and our article POLYGON.

RECIPROCAL *Figures*, in *Geometry*, are such as have the antecedents and consequents of the same ratio in both figures. See *Plate* XII. *Geom. fig.* 2. Here

A : B :: C : D, or,
12 : 4 :: 9 : 3

That

That is, as much longer as the ſide A, in the firſt rectangle, is than the ſide B of the ſecond rectangle; ſo much deeper is the ſide C in the ſecond rectangle, than the ſide D in the firſt; and, conſequently, the length of one is compenſated by the depth of the other.

Alſo, as the ſide A is $\frac{1}{4}$ longer than the ſide C, ſo the ſide B is $\frac{1}{4}$ longer than D: wherefore the rectangles muſt be equal.

This is the foundation of that Catholic theorem; that the rectangle of the extremes muſt always be equal to that of the means; and, conſequently, the reaſon of the rule of three, or golden rule.

For, ſuppoſe there were given any three numbers, or quantities, geometrically proportional, as A, B, and C; and, that it were required to find a fourth, D, proportional to them: ſince A : B :: C : D, therefore A D = B C, and, conſequently, $D = \frac{B\,C}{A}$; that is, the fourth term is equal to the quotient of the ſecond, multiplied by the third term, divided by the firſt.

Or, thus in numbers: ſuppoſe given 12, 4, and 9, required a fourth proportional. Now as 12 : 4 :: 9 : Q. But $12\,Q = 4 \times 9 = 36$. Therefore $Q = \frac{4 \times 9}{12} = 3$, by dividing both ſides by 12.

And hence it follows, that if any two triangles, parallelograms, priſms, parallelepipeds, pyramids, cones, or cylinders, have their baſes and altitudes reciprocally proportional, thoſe two figures or ſolids are equal to one another; and, *vice verſâ*, if they are equal, their baſes and altitudes are reciprocally proportional.

Reciprocal *Proportion*, is when in four numbers the fourth is leſs than the ſecond by ſo much as the third is greater than the firſt; and *vice verſâ*. See Proportion.

This is the foundation of the inverſe, or indirect rule of three. Thus, 4 : 10 :: 8 : 6.

Great uſe is made of this reciprocal proportion, by ſir Iſaac Newton, and others, in demonſtrating the laws of motion.

Reciprocal *Theorem*. See Theorem.

RECIPROCALLY, the property of being reciprocal; thus we ſay, that in bodies of the ſame weight, the denſity is reciprocally as the magnitude; *viz.* the greater the magnitude the leſs the denſity; and the leſs the magnitude the greater the denſity; ſo again, the ſpace being the ſame, the velocity is reciprocally as the time, and the contrary.

RECIPROCITY. The law of reciprocity is a term uſed by Legendre, in his "Theorie des Nombres," to denote a reciprocal law, which has place between prime numbers of different forms; which is this; that m and n being prime odd numbers,

$$\text{the remainder of } m^{\frac{n-1}{2}} \div n =$$

$$\text{the remainder of } n^{\frac{n-1}{2}} \div m$$

provided m and n are not both of the form $4x - 1$, and if they are both of this form, then

$$\text{the remainder of } m^{\frac{n-1}{2}} \div n = -$$

$$\text{the remainder of } n^{\frac{n-1}{2}} \div m,$$

or they will have only contrary ſigns.

RECISSION, in *Law*. See Ademption.

RECIT, Fr, a generical term in muſic, for what is ſung by a ſingle voice. It is likewiſe applicable to inſtruments; as, *recit de baſſe*, *recit de hautbois*, a ſolo part for the violoncello or hautbois. Indeed *recit*, in French, ſeems ſynonimous with the word ſolo in Italian, to whatever vocal or inſtrumental part it is applied, in oppoſition to *tutti*, or chorus, in which the whole band is employed.

Recit in France is not only a technical term in muſic, but in the drama, where, at the opening of a tragedy, or ſubſequent to an event, it implies an account, a narration, the recital of an event. In the French and Italian tragedies, in imitation of the Greeks, battles and murders are always recited, but never tranſacted on the ſtage.

RECITAL, in *Law*, the rehearſal, or making mention, in a deed or writing, of ſomething which has been done before.

A recital is not concluſive, becauſe it is no direct affirmation; and by feigned recitals in a true deed, men might make what titles they pleaſed, ſince falſe recitals are not puniſhable. If a perſon, by deed of aſſignment, recite that he is poſſeſſed of an intereſt in certain lands, and aſſign it over by the deed, and become bound by bond to perform all the agreements in the deed; if he is not poſſeſſed of ſuch intereſt, the condition is broken; and though a recital of itſelf is nothing, yet being joined and conſidered with the reſt of the deed, it is material. And where it is but a recital, that before the indenture the parties were agreed to do ſuch a thing, it is a covenant, and the deed itſelf confirms it. The recital of one leaſe in another, is not a ſufficient proof that there was ſuch a leaſe as is recited. But the recital of a leaſe in a deed of releaſe, is good evidence of a leaſe againſt the releſſor, and thoſe who claim under him. A new reverſionary leaſe ſhall commence from the delivery, where an old leaſe is recited, and there is none, &c. A. recites that he hath nothing in ſuch lands, and in truth he has an eſtate there, and makes a leaſe to B. for years; the recital is void, and the leaſe good. In this caſe, if the recital were true, the leaſe would not bind.

RECITATION, the act of reciting, or delivering a diſcourſe, either in the way of narration, rehearſal, declamation, or the like.

RECITATIVO, Ital., *Recitative*. The Cruſca Dictionary gives no more early authority for the uſe of this word, as a muſical term, than that of Batiſta Doni, de Præſt. Muſ. Veteris, publiſhed in 1647; who defines it, "a muſical compoſition in an andante or plain ſtyle, different from air: it is uſed in narrative poetry, in imitation of reciting on the ſtage."

Rouſſeau's definition is more full and clear. He terms it "a diſcourſe, or ſpeech, in muſical and harmonical tones. It is a melody nearly approaching to common ſpeech; a muſical declamation, in which the muſician ought to imitate, as much as poſſible, the inflexions of voice in declaiming. This melody is called recitative, becauſe it reſembles a narration, a recital; and is uſed in the dialogue of muſical dramas."

We have preſented our readers, under the article Opera, with extracts from the prefaces of the poets and compoſers by whom recitative was invented, as well as from contemporary writers, who thought its origin of ſufficient importance to be recorded.

Giovanni Batiſta Doni, about the middle of the 17th century, (Op. Omn. tom. ii. in Firenze, 1763, folio,) a learned and elegant writer on muſic, though extremely warped in his judgment by a predilection for the muſic of the ancients, in a diſſertation on the Origin of Stage-ſinging, during his own time, gives ſo curious and inſtructive an account of the firſt operas that were performed at Florence, that we ſhall tranſlate a part of it.

"Some kind of *cantilena*, or melody, has been introduced in

in dramatic repreſentations, at all times, either in the form of intermezzi (interludes), between the acts; or, occaſionally, in the body and buſineſs of the piece. But it is ſtill freſh in the memory of every one, when the whole drama was firſt ſet to muſic, and ſung from the beginning to the end."

The revival of theatrical muſic was brought about by the invention of recitative, as we have already ſtated in our article Opera.

"The beginning of this century (1600) was the era of muſical recitation on the public ſtage at Florence, though it had been uſed there in ſeveral private exhibitions before. There reſided in that city, during theſe times, ſignor Gio. Bardi de' Conti di Vernio, who was afterwards called to the ſervice of pope Clement VIII., by whom he was tenderly beloved, and made his maeſtro di camera. This moſt accompliſhed nobleman was particularly attached to the ſtudy of antiquity, and to the theory and practice of muſic, to which he had applied himſelf for many years ſo cloſely, that he became, for the time in which he lived, a correct and good compoſer. His houſe was the conſtant rendezvous of all perſons of genius, and a kind of flouriſhing academy, where the young nobility often aſſembled to paſs their leiſure hours in laudable exerciſes and learned diſcourſe; but particularly on muſical ſubjects, when it was the wiſh of all the company to recover that art of which the ancients related ſuch wonders, as well as other noble inventions, which had been ruined by the irruptions of barbarians.

"During theſe diſcuſſions, it was univerſally allowed that as modern muſic was extremely deficient in grace, and the expreſſion of words, it became neceſſary, in order to obviate theſe objections, that ſome other ſpecies of cantilena, or melody, ſhould be tried, by which the words ſhould not be rendered unintelligible, nor the verſe deſtroyed."

Euridice was the firſt muſical drama after the invention of recitative. It was written by Ottavio Rinuccini, ſet by Jacopo Peri, and performed at Florence in 1600, on occaſion of the marriage of Mary of Medicis with Henry IV. of France. The poem and the muſic were publiſhed ſeparately the ſame year. The poet, in his dedication to the queen of France, ſays, "It is generally imagined that the tragedies of the ancient Greeks and Romans were entirely ſung; but this noble kind of ſinging had not till now been revived, or even attempted, to my knowledge, by any one; and I uſed to think, that the inferiority of our muſic to that of the ancient was the cauſe; till hearing the compoſitions of Jacopo Peri to the fable of Daphne, I wholly changed my opinion. This drama, written merely as an experiment, pleaſed ſo much, that I was encouraged to produce Euridice, which was honoured with ſtill more applauſe, when ſung to the muſic of the ſame compoſer Jacopo Peri, who with wonderful art, unknown before, had merited the favour and protection of the grand duke our ſovereign, it was exhibited in a moſt magnificent manner at the nuptials of your majeſty, in the preſence of the cardinal legate, and innumerable princes and nobles of Italy and France."

Such is the abridged hiſtory of recitative. The only printed copy of the muſic to this primitive opera was in the library of the marcheſe Rinuccini, a deſcendant of the poet at Florence: in examining and making extracts from which, we obſerved that it was printed in ſcore, and barred; two very uncommon circumſtances at the time of its publication; that the recitative ſeemed to have been not only the model of ſubſequent compoſers of early Italian operas, but of the French operas compoſed by Lulli, a native of Florence; and that the time was as frequently changed as in the old French operas.

The confuſion ariſing from all the parts ſinging different words at the ſame time, together with ſome other circumſtances, mentioned under Opera, account for the neceſſity of a recitative, or a *muſica parlante*, a ſpeaking muſic, and for ſolo ſinging in general on the ſtage: beſides, poetry was injured, and rendered unintelligible in fugues, canons, and in choruſes, full of imitations and contrivances, all unfit for narration and dialogue.

To deſcribe the characteriſtic difference of recitative from air, and common ſpeech: it is not air, as no time is kept; it is not ſpeech, as every inflexion of voice is in tune with ſome one note of the inſtrument by which it is accompanied; and as to the length or ſhortneſs of the notes that are written, the accompanier watches for the accents or termination of phraſes, or lines in the verſe, to give the chord to which the note that is ſung belongs.

It is ſometimes accompanied by the orcheſtra with *ritornelli*, or interſtitial ſymphonies; but then a regular time muſt be kept. This only happens in ſolemn ſcenes of dignity or diſtreſs, and in ſoliloquies.

No flats or ſharps are placed at the clef in recitative: theſe are all regarded as accidental; nor is Italian recitative ever confined to any one key.

After recitative was found, it was long ere any thing like an air appeared in theſe muſical dramas. (See Opera, Air, Motivo, and Measure.) Rouſſeau has treated the article recitative at large, with great intelligence and good taſte.

Recitative *Style*, is the way of writing accommodated to this ſort of muſic.

RECIV, La, in *Geography*, a well-fortified town of Braſil, in the juriſdiction of Fernambuco.

RECKENITZ, a river which ſeparates the duchy of Mecklenburg from Pomerania, and runs into a lake, which communicates with the Baltic near Ribnitz.

RECKHEIM, or Rekum, a town of France, in the department of the Lower Meuſe, which gives name to a county, ſituated on the W. ſide of the Meuſe, and ſurrounded by the biſhopric of Liege; 7 miles N. of Maeſtricht.

RECKLING, in *Rural Economy*, a provincial word, ſignifying the laſt of the farrow or brood of pigs, poultry, or other ſorts of domeſtic birds.

RECKLINGHAUSEN, in *Geography*, a town of Germany, fortified by a caſtle, and capital of a county of the ſame name, which is ſituated between the biſhopric of Munſter, the duchy of Cleves, and the county of Mark; 16 miles S.S.W. of Munſter.

RECKON, in *Rural Economy*, a term ſometimes applied to a pair of pot-hooks of a certain make, occaſionally employed in dragging wells, ponds, &c.

RECKONING, in *Navigation*, the act of eſtimating the quantity of a ſhip's way; or of the diſtance run between one place and another.

Or, more generally, a ſhip's reckoning is that account, by which at any time it may be known where the ſhip is, and on what courſe or courſes ſhe is to ſteer to gain her port. See Log-*Board*, Log-*Book*, and Journal.

This is uſually performed by means of the log-line; the manner of applying which, ſee under its proper article, Log-*Line*.

Yet this is liable to great irregularities. Vitruvius adviſes an axis to be paſſed through the ſides of the ſhip, with two large heads projecting out of the ſhip, in which are to be included wheels touching the water, by whoſe revolution the ſpace paſſed over in any given time may be meaſured. The ſame has ſince been recommended by Snellius; but

but there are few who have written of navigation, that have not ſhewn the inſufficiency of this method.

Reckoning, *Dead.* See Dead *Reckoning.*

RECKSON, in *Geography*, a town of Bengal; 6 miles E. of Calcutta.

RECLAIMING, or Reclaming, in our *Ancient Cuſtoms*, the action of a lord purſuing, proſecuting, and recalling his vaſſal, who had gone to live in another place, without his permiſſion.

Reclaiming is alſo uſed in a ſimilar ſenſe, for the demanding of a perſon or thing to be delivered up, or ſurrendered, to the prince or ſtate it properly belongs to; when, by any irregular means, it has come into the poſſeſſion of another.

Reclaiming, in *Falconry*, is the calling of a hawk, or bird of prey, back to the fiſt.

The ſparrow-hawk, gos-hawk, &c. are reclaimed with the voice; the falcon only by ſhaking the lure. So that the term luring, with regard to the falcon, is more proper than reclaiming.

The partridge is alſo ſaid to reclaim her young ones, when ſhe calls them together upon their ſcattering too much from her.

Reclaiming is alſo uſed for taming animals that are wild by nature.

Reclaiming, in a monaſtic ſenſe. See Religious.

Reclaiming *Lands*, in *Agriculture*, the buſineſs of reſtoring and bringing them into a ſtate of cultivation and improvement. There are various kinds and ſtates of land, which admit of this ſort of amelioration and improvement; as among the wet ſorts, all thoſe of the bay or eſtuary deſcription, which are waſhed and occaſionally covered by the ſea or other waters; different deſcriptions of fen lands, and thoſe of the more firm marſhy nature, and thoſe in more interior ſituations, which are of a looſe ſwampy or watery quality, as moraſſes and boggy grounds. And among thoſe of the more dry, hard, waſte, and wild deſcriptions; all the varieties of the rough ſtony ſorts of unimproved lands; the many different kinds of rough woody grounds; and the numerous ſorts of moory lands, as well as other varieties, which are now and then to be met with in particular circumſtances and ſituations.

The firſt of the wet or watery ſorts of land, noticed above, are far from being always ready, or in a ripe ſtate for admitting improvement of this nature; yet in different ſituations and circumſtances, they occaſionally permit of its being accompliſhed, without any great difficulty or trouble. See Embankment, and Embanking *againſt the Sea.*

The fenny and marſhy lands, where, in the former, they are wholly or only in a partial manner overgrown by uſeleſs aquatic plants; and in the latter, are become ſo firm as to bear paſturing ſtock, and to afford nutritious herbage for their growth and ſupport, but are notwithſtanding ſtill liable to be overflowed by high tides, or land floods; are, of courſe, capable of very great improvement in the above ways, as well as by many other means. See Fen, Fenny *Land*, Marsh *Land*, and Salt *Marſh.*

Theſe ſorts of watery lands are not incident to the flat bays and inlets of the ſea-coaſts, or the mouths of the large rivers, in a particular manner; but are met with in the more inland ſituations of the country, accompanying the larger rivers and waters in the more central parts of the kingdom: conſequently ſuch ſorts of improvement muſt be very extenſive in their nature, and of very great importance to the nation.

The other kinds of ſwampy watery lands, which are liable to be covered with that fluid during wet ſeaſons; thoſe on the ſides of lakes and ponds; the moraſſes which are choaked and grown up with aquatic vegetables, ſo as to have ſome ſort of hardiſh cruſt formed upon them; and the ſoft boggy lands, formed in ſomewhat ſimilar ways, are all capable of allowing great improvement, by ſuitable draining, and other methods of management. See Spring and Surface *Draining*, Swamp, Bog, and Morass.

Lands of the above kinds are moſtly met with on the lower ſlopes, or at the feet of hilly grounds; being cauſed by the ſtagnation of water in their internal parts, which has the effect of chilling and rendering them too moiſt for the production of a nutritious and uſeful herbage, as well as of promoting the growth of coarſe plants of the aquatic nature, though their ſituations may occaſionally have ſome degree of relative height.

There are many valuable tracts of land of theſe kinds, in many different parts of the iſland, which have been already reclaimed by theſe methods of proceeding; which ſhould have the effect of ſtimulating the owners of ſuch lands in other places, where they ſtill remain unimproved, to exert themſelves in getting them reclaimed.

Among the more dry kinds of unreclaimed lands, the firſt, or thoſe of a rough, ſtony, waſte quality, are all thoſe in the vallies of hilly or mountainous tracts, on the ſkirts or lower parts of mountainous heights, and the rough ſtony lands, fit for cultivation, in other ſituations. They are the moſt readily reclaimed and improved, in the leſs hilly ſorts of lands and ſituations. In ſome caſes, where the ſurfaces of the ground were in a great meaſure covered by large rocks and ſtones of great ſizes, very hard in their qualities, and of ſcarcely any value, the lands have been reclaimed, and brought into an arable ſtate, and let for high rents: the ſtones which were removed paying, in a great degree, the expences of the labour; they being exported and ſold as paving-ſtones, and for other uſes to the metropolis. And though this cannot always be done, it ſhews what is capable of being performed by induſtry and perſeverance; and that, where ſurface ſtones can be turned to uſeful purpoſes, the moſt rugged and barren lands may be reclaimed with advantage, under proper modes of management. In ſuch inſtances, inſtead of leaving the ſurfaces of the grounds in worſe ſtates than they were before, by being taken up with pits, and heaps of uſeleſs rubbiſh, which buried the better moulds, as is common in working ſuperficial quarries, the pits and other hollows were levelled, and filled up to ſome height, with the coarſe and rubbiſh materials produced in the courſe of the works, and the finer mould from other parts thrown back upon the above ſub-ſoil materials, ſo as to form an even top-ſoil; the larger ſpaces of the ground being trenched over to a good depth, leaving the beſt ſoil on the ſurface. It is ſuggeſted, that by following ſimilar eaſy methods of management, in carrying on other undertakings of the ſame kind, lands of a value in proportion to that of the materials which are removed, may commonly be *created*, without incurring any very great expence. Hence it is thought to behove thoſe who have the direction and management of landed eſtates, that comprehend grounds of theſe ſorts, to examine and conſider well whether the ſtony materials which they contain, and encumber their ſurfaces, cannot be turned or converted to ſome profitable purpoſe, by the means of roads, iron railways, canals, or ſome other eaſy mode of conveyance for ſuch heavy ſubſtances.

It muſt be noticed, however, that the method of levelling and trenching over the lands by the ſpade, in ſuch circumſtances, can only be practiſed in a very few caſes, where labour is particularly cheap.

There is another deſcription of ſtony lands, of a much

leſs formidable nature, which frequently ſtands in need of being reclaimed, and in which the ſurface is leſs encumbered than the interior parts of the ſoil. In theſe caſes, the interrupting materials are rather large ſtones than rocks, though the latter may ſometimes in part form them. The means which are beſt ſuited to the bringing of theſe into a profitable ſtate of cultivation, are to be found in the more northern parts of the iſland, in the practice and exertions of particular ſpirited individuals. The plan of the improvement is perfectly ſimple, but it is expenſive in its performance; the whole of the lands being trenched over, by means of the ſpade, to a proper depth, as from one to two feet. The ſtones which are not wanted for uſe are thrown into pits, and the hollow parts, to contribute to their being made level, and ſometimes into the deep trenches formed in digging, being firſt covered over with the worſt of the earthy materials, upon which the better moulds and turfy ſubſtance, which are ſtirred in the work, are ſpread out as a ſoil, by which the whole is rendered very ſuitable for agricultural purpoſes.

The coſt of reclaiming lands in this way depends, in ſome meaſure, on the caſt of ſurface in the lands, the nature of the interrupting matters, and the depth of the earthy ſubſtances to be removed, in raiſing a ſufficiency of mould for forming the ſurface ſoil: but from five to twenty pounds the acre may be conſidered as the limits of the charges.

And this, it is ſuppoſed, leaves an ample profit in the ſale of ſuch lands, or otherwiſe, in theſe ſituations where tythes are not taken, and where the rates and taxes are ſo very few and trifling, and where labour and living is ſo cheap. It can now, however, be done in this manner in but few inſtances, as has been already noticed.

It is, notwithſtanding, believed that there are very many lands, not only in theſe northern parts, but in England and Wales, that would more than repay the expences of this ſpirited mode of improvement. It may be remarked, that where the ſtones are very large, or where fragments of rocks are met with, in theſe undertakings, they may be got rid of either by blaſting, or rending their upper parts, or by ſinking them in the ſoil, ſo as to allow the plough to paſs over them with ſafety.

The former method is more ſuited to the ſoft ſorts of ſtones; the latter to thoſe of the harder kinds.

Such rocky grounds as are common in hilly and mountainous ſituations, which, on account of their climate, and the compact nature of the rocky materials, as well as their quantity, are incapable of being cleared as corn-lands, or ſo as to admit the plough, may often be reclaimed and improved as paſture lands for ſheep, &c. or ſometimes as hay lands. The plan of proceeding, in theſe caſes, is that of removing the ſtony matter from the ſurface, and allowing it entirely to the growth of graſſy herbage; the means of accompliſhing which are ſimilar to thoſe already noticed, but the coſt conſiderably leſs: the main intention here being merely the ſmoothing of the ſurface ground, for the purpoſes of paſturing or mowing; but the more the ſtony ſubſtances are covered with good earthy mould, the better and greater will be the quantity of produce. See TILLAGE.

There are many rough woody tracts of ground, of the ſhrubby or other kinds, which may be cleared and reclaimed with vaſt advantage to their proprietors, as well as the community in general, as corn-lands, or for other uſes. The moſt uſual method of accompliſhing this ſort of improvement has been to dig out the whole of the roots, whether of low woods or timber woods, at the time of removing the tops, ſo as to admit the plough immediately. In performing this in this way, however, where the ſtools are of the timber kind, numerous and large, deep breaking of the ground is often neceſſary, which is laborious and expenſive; and rotten wood, mould, leaves, and other ſurface matters, are apt to be left in mixture with the infertile or poiſonous ſub-ſtrata. As lands, cleared and reclaimed in this manner, have been known to remain in a *raw* unprofitable condition, for ſeveral years, although limed, dunged, and raiſed in ſharp ridges, in order to its amelioration.

This improper practice has conſequently been highly diſadvantageous, injurious, and ruinous, and thrown much difficulty and interruption in the way of clearing and reclaiming ſuch waſte lands for the growth of corn, however ſuitable they may be for the purpoſe in the nature of their ſoils and ſituations, thereby tending to propagate and ſupport the notion, that ſuch ſorts of land will not repay the expences and trouble of being improved.

But from attending to what has naturally happened to the cleared parts of wood-lands, it will be ſeen that a depth of fertile mould, reſting on leſs fertile ſubſtances, form a regular ſoil and ſub-ſoil, which are free from the roots of trees, ready to receive the plough, and afford corn crops in due ſucceſſion. This is ſuppoſed to take place ſomewhat in this way. The trees having been ſuffered to become decayed, or more properly cut down in due ſeaſon, and the bruſh or underwood cut and cleared away from time to time by the occupiers, while ſuch commons or other places were fully or too much ſtocked with cattle and ſheep, the young ſhoots were of courſe browzed off and nibbled away quite to the ſtumps, conſequently weakened, and at length finally deſtroyed. The roots and other parts ſoon followed this courſe, and paſſed into a ſtate of vegetable mould, increaſing and enriching the ſoil at the ſame time. Nay, this may, in the natural ſtate, it is ſuppoſed, be, in ſome meaſure, effected alone by the grazing animals, as it is eſſential to their exiſtence.

This natural proceſs, however aſſiſted in this way, is ſlow, requiring a length of time for its completion; yet by proper means of art, well applied, it may be accompliſhed in a few years; the larger roots being extracted from the ground, inſtead of waiting for their reduction by a ſlow decay, without any unneceſſary diſturbance of the ſub-ſoil; and then filling in the pits by the roughneſſes of the natural ſurface: by which means the cleared ground will be ſmoothed, and made fit in due time for being cultivated. Where the ſurface is much incumbered with leaves and rotten woody matters, they are to be raked up, and put into heaps to decay; or they may be burnt, and the aſhes ſpread out over the ſurface of the land. Proper draining and further levelling muſt likewiſe take place, where neceſſary; as well as harrowing or hacking the ſurface ſward, ſo as to ſow it with proper graſs ſeeds; again raking off any rubbiſh that may ariſe, and then rolling the whole quite ſmooth for mowing. It ſhould be ſtocked hard, eſpecially with ſheep, mowing off occaſionally any woody ſhoots that may be permitted to ariſe; keeping the whole in the ſtate of cloſe paſturage, until the ſmaller roots, which were left, be ſo decayed as to become obedient to the plough-ſhare. At this period, but not before, ſuch paſture ground may be broken up for grain crops in proper ſucceſſion.

The proceſs might be haſtened by the uſe of lime, or other calcareous matters in union with the vegetable ſubſtances which were removed, as they would be ſooner diſſolved or reduced, and the compoſt be more rich. And by ſpreading them out on the land a ſimilar effect might be produced, and a finer ſort of herbage be encouraged, which would cauſe a cloſer bite, and ſooner bring the land into a more

more thick ſet ſtate of ſward, which is the prolific matrix for corn crops.

The really neceſſary expence of reclaiming and bringing theſe kinds of wooded lands into a ſtate of cultivation, by theſe means, is inconſiderable, particularly where fuel is dear. Where the timber wood is properly cut down by the axe, and the underwood taken off rather below the ſurface, the larger roots, and the ſtubs which are left, will, in ſome inſtances, more than repay the coſt of the clearing and levelling the ſurface. And the other expences will be repaid by the immediate production of a paſture ground, the value of which is conſtantly increaſing without any further charge, until it may probably be worth two or three times what the lands were while they were in the woody condition.

In caſes where fuel is cheap, and particularly when the timber wood is rapidly fallen, as in the barking ſeaſon, they may be cut off by the ſaw level with the ſurface of the land; the ſtools and large ſuperficial roots being after that carefully diſbarked to ſome inches within the ground, ſo as to prevent their throwing out ſhoots to injure the ſurface and keep the roots alive. In this way the ſtools will be ſo decayed in a few years as to be capable of being removed with little trouble or expence. See TILLAGE.

In clearing and reclaiming moory lands where they are too wet, the firſt ſtep is that of properly draining them; they are afterwards brought into cultivation and to their full value by other means, ſuch as in large undertakings, by ſuitable diviſions of the lands into fields proper for the farm or farms to which they are to be laid, and ſo ditched as that the ſurface water may be effectually taken off, without having deep, open, expenſive troubleſome drains in other parts; the ſurface of each field being adjuſted in ſuch a manner as to ſhoot off the rain water into the interſecting ditches, in order to prevent injury from happening, in that way, ſo as to impede the cultivation for any length of time.

As the ſurfaces of theſe kinds of land are moſtly rugged and uneven, as well as of a looſe ſpongy texture, which unfits them for the tillage proceſſes, without previous aſſiſtance from hand labour; where the moory earth, or vegetable mould, is deep, and riſes to the ſurface uncovered by foſſile matters, ſome length of time is requiſite to bring it to that ſolidity and firmneſs of texture which is ſuited to the common arable purpoſes. Hence the general principle of improving deep moory lands, where there is no foſſile covering, is ſuppoſed to be the ſame as that adviſed for bringing woodlands into cultivation; namely, that of converting them to a profitable ſtate of herbage, before corn crops are attempted to be produced.

The proceſs muſt be guided and regulated by the nature and ſituation of the tract to be improved. Where the ſurface is very irregular, full of inequalities, and of an abrupt nature, it muſt firſt be adjuſted ſo as to admit the means of tillage when they can be properly had recourſe to, and for carrying away the ſurface waters in the manner already noticed. Then to pare off the leſſer hillocks and riſings, as the tufts and haſſocks which were formed during its wet ſtate, and more or leſs of its general ſurface, ſo as to remove the coarſe plants and ſtale mould which occupy it, and thereby produce a freſhneſs in the whole.

In dry ſeaſons, when the ſurface has ſufficient firmneſs to bear the tread of animals, the paring may be done by the plough for that purpoſe, but in other caſes by the breaſt-plough or paring-ſpade. When the ſurface has been cut over in this manner, and any part has the appearance of being too wet, as may be judged of by the colour of the mould, in ſome degree, covered drains are to be formed in ſuch places, which may commonly be made in a cheap and durable manner by the firm fibrous tufts collected from the ſurface. The reſt of the roots and mould which were pared off ſhould be burnt, and their aſhes ſpread evenly over the ſurface, being immediately raked or harrowed into the ſoil. At this period of the improvement almoſt any kind of foſſile material can be thrown over the aſhes at a little expence; and a full quantity of different graſs ſeeds be covered in with it; leaving the ſurface to take on a ſward without any further trouble or outlay of money.

Afterwards the graſſy herbage is to be kept cloſely fed down when the weather will permit, firſt by ſheep and then by heavier ſorts of ſtock, until the ſurface becomes firm and the ſoil is well bound together by the fibrous roots of the herbage, ſo as to be capable of affording corn crops in proper ſucceſſion.

It has been objected to this ſummary mode of bringing the land into the ſtate of herbage, that there are no immediate groſs returns for the money laid out in reclaiming and bringing it into the cultivable ſtate. But although corn cannot be raiſed on ſuch raw looſe-textured ſorts of land at firſt, potatoes are found to anſwer well, and rape with ſtill more advantage in its culture, the labour attending it, and the profit which it affords. See MOOR, MOORY-*Land*, SPRING and SURFACE *Draining*, &c. See alſo the Inverneſsſhire Agricultural Report.

The reclaiming and bringing lands of theſe ſeveral different deſcriptions into a ſtate of cultivation and improvement is evidently a work of very great importance, particularly in a country where the population is getting too numerous for the produce, as by ſuch means the extent of agricultural territory may be juſtly ſaid to be increaſed. Extenſive improvements of theſe kinds have lately taken place in Cornwall, and ſome other ſouthern diſtricts.

RECLAIMING *Plantations and Timber Woods*, in *Rural Economy*, the reſtoring of ſuch as have grown into a wild, neglected, and improper ſtate from ſome ſort of miſmanagement, or want of attention. The cauſes which have a tendency to produce this effect are very numerous, and have been the means of vaſt individual as well as national loſs. One material and very frequent cauſe is the neglect of their boundary fences; another is the miſtaken notion of its being the beſt practice to leave them entirely to nature after they are once properly planted; a third is the very abſurd ſuppoſition, that nothing ſhould be done to them for a length of time after planting, in the way of rendering the trees more thin among themſelves, or in their branches; and laſtly, an univerſal careleſſneſs and diſregard of them, frequently from the narrow conception of expence being incurred without the chance of any immediate return of profit. It is, on the whole, much too common to take great care in firſt forming the plantations, without ever thinking or taking any ſort of intereſt in their after-management. But the buſineſs is by no means accompliſhed in the ſimple act or operation of planting out the trees. Good examples of this kind of management are indeed few, but they occaſionally exiſt, and much has been written on the matter, ſo that information may be readily obtained. And there is every inducement to get it; as well prepared, incloſed, planted, cultivated and managed plantations, will far outgrow others that have exiſted for a much longer time, but have been otherwiſe treated, often affording more than woods of three times their length of ſtanding.

In directing the proper management in all caſes of this nature, ſome attention muſt be paid to the particular kinds of the plantation which they may be, in the firſt place; after which, the means of reducing them to their appropriate ſtates, or to ſome other in the moſt eaſy and convenient

manner, may be taken into conſideration. It may often happen that their proper originally intended ſtates cannot be attempted, but that which has been gradually acquired muſt be promoted. With a view to the accompliſhment of thoſe intentions, plantations may be conſidered as conſiſting either of hard woods only, of evergreen or reſinous trees only, or of both theſe ſorts of trees in mixture.

In the firſt of theſe kinds, or thoſe which are compoſed ſolely of the hard-wooded ſorts of trees and plants, where they are to be brought to the ſtate of woods, as timber trees and undergrowths, and the latter to be uſed only as fuel, the good trees of ſuch kinds as are ſuitable to the ſoil, and the probable demand of the vicinity and other parts, ſhould be fixed upon, and left as ſtandard trees; the whole of the others being cut over by the ſurface of the ground, ſo that they may become ſtools for ſupplying the undergrowths. When this has been performed, the ground, where neceſſary, ſhould be dug, hoed, or trenched over, as circumſtances may direct; but where the trees and underwoods have been much crowded, theſe kinds of work will ſeldom be required. However, if, inſtead of the common underwood, oak be required, then after pitching upon the moſt proper and ſuitable ſtandard trees for remaining, the whole of the reſt are to be taken up by the roots, the land dug over, and acorns planted out upon it; which, when they are grown up, muſt be kept clean and free from weeds for ſome years, in order to promote their healthy growths and riſing to the ſtate of young trees.

Where the whole is to be reduced to the ſtate of copſe wood for fuel only, the beſt way is to cut over every part by the ſurface of the ground; and when for bark, to root out the whole, only reſerving the oaks, and planting with acorns, as already noticed.

In caſe the grove forms are to be produced, the moſt ſuitable and appropriate trees are to be left at proper diſtances, and the whole of the remainder taken out by the roots; after which the ground ſhould have the proper culture, until the trees are incapable of being injured by cattle ſtock; at which time the whole may be laid down with natural graſs ſeeds.

In the ſecond ſorts of plantations, where they have remained, after planting, without being in any way thinned, for a great many years, they are often, in a great meaſure, incapable of being remedied, as they are, for the moſt part, ſo overpowered by each other, that their growth is ſuſpended; wherever any thinning takes place, the trees all around are deſtroyed. In theſe caſes it is the advice of ſome to have the whole grubbed up by the roots and replanted, after the ground has been properly prepared by fallowing and repeated corn crops. But as there may ſometimes be much loſs in this way, it may be proper to try the cautious thinning of them, which ſhould be done during the latter ſummer months in a careful manner, as ſucceſs has occaſionally attended this method.

With natural plantations of this kind under twenty years' growth, and artificial ones under ten, much advantage has been gained by ſuitable cautious thinning and retrenching. In all theſe caſes there is no neceſſity whatever for the cultivation of the ground, as the trees ſuffer few or no plants to riſe below them, and beſides, injury may be done to their ſuperficial roots.

The management in the laſt or mixed kinds of plantations, where the evergreen trees are in ſuch proportions as not to admit of either of the above modes, is to reduce them to the grove plan only, or to this in ſome parts and the wood kind in others; the modes of accompliſhing both of which have been already laid down. However, in each of theſe methods, it will frequently happen that the tree or trees which are the moſt advantageous and deſirable in the parts where the plantations exiſt, are either very deficient, or wholly wanting. In all ſuch inſtances it is probably the beſt and moſt beneficial practice to grub up nearly the whole of ſuch trees, and replant the ground with the proper ſort or ſorts; care being taken to leave ſuch a number of the old trees, either in a ſcattered manner, or in narrow ſtripes and ſcreens, for ſheltering and protecting the young trees, plants, and ſeeds, which have been put in, planted, or ſown. See PLANTATION and WOOD.

It may be noticed that in reclaiming all kinds of wild and neglected plantations in lands which are inclined to the retention of moiſture; the firſt thing which is neceſſary is invariably that of the removal of the ſtagnant wetneſs, as where this is not properly performed, the other operations will be of but little avail, however well they may be executed. In many extenſive tracts of this nature, the injury which is ſuſtained by this ſort of neglect is ſcarcely to be calculated. There are many thouſands of acres, in different ſituations in this country, which would by this means alone be brought to twenty times and more their preſent value. And as this ſort of work in ſuch caſes can, for the moſt part, be accompliſhed by open cuts or gutters alone, at a very trifling expence in compariſon of that for arable and ſome other ſorts of land, it ſhould never be neglected where good management is in the leaſt degree attended to. See SPRING and SURFACE *Draining*.

It is a material point in reclaiming all theſe ſorts of plantations and timber woods, to keep the ſurrounding ditches and fences well up and in a proper ſafe ſtate, as large tracts are often completely ruined in a very ſhort time by inattention in this reſpect, from the cropping, rubbing, and deſtruction in other ways produced by the entrance of cattle of different kinds into them. There is hardly any thing ſo injurious to the more young timber plantations as cattle being ſuffered to get into them. See FENCE.

The retrenching of old ill-managed plantations of theſe kinds ſhould conſtantly be done in a very gradual manner, having due regard to their length of ſtanding, the nature of the trees, the quality of the land, the ſituation and expoſure, as well as ſome other points. Their outſide parts are in general to be left more thick and cloſe, than thoſe which are more in the interior, and the parts of the ſoil which are of a bad thin quality, ſhould be left leſs thick of trees and plants than where it is of greater depth and richneſs. And open expoſures ſhould be kept more thick and cloſe than where they are more warm and ſheltered.

In retrenching the branches of the different trees, the work ſhould be performed according to the length of time the trees have been growing, their particular growths and ſizes, the difference of kind, and the uſes, purpoſes, and intentions for which their wood or other parts are deſigned. It is always proper to ſtop rather ſhort, than to carry it to an extreme, as there is ſometimes danger in the latter caſe. See PRUNING.

It is always neceſſary and eſſential to reclaim theſe old wild ſorts of plantations as ſoon as poſſible, as the forming of new tracts of this kind chiefly benefit poſterity, while the ameliorating and improving of the other, by theſe means, are an immediate and direct gain to the preſent proprietors, of very great national importance at the preſent time, and which would otherwiſe be complete loſs to both.

No ſorts of woods of the timber kind ſhould indeed ever be ſuffered to remain any great length of time without being properly looked over and put into ſuch ſtates as that they may go on in the moſt beneficial and profitable manner, as

where

where they are in any way or by any means reſtricted or impeded in their growths, there is a conſtant and continual loſs taking place, and the ultimate diſadvantage is prodigiouſly great, as the timber never becomes either ſo good or in ſuch quantity; of courſe it is of inferior value in both reſpects, which makes a difference of much conſequence to the proprietors as well as to the nation at large. See Wood.

RECLINATION *of a Plane*, in *Dialling*, the number of degrees which a dial-plane leans backwards, from an exactly upright or vertical plane, *i. e.* from the zenith.

The reclination is eaſily found, by means of a ruler, and a quadrant; for having drawn an horizontal line on the plane by a level or quadrant, and to it another line at right angles, apply a ruler, ſo that one end of it may hang over, or reach beyond the plane; then will a quadrant, applied to the under edge of the ruler, ſhew the degrees and minutes of the plane's reclination; counting from that ſide of the quadrant that is contiguous to the edge of the ruler.

RECLINATUM Folium, in *Botany*, a leaf whoſe point is curved downwards, below the level of the baſe. See Leaf.

RECLINATUS Caulis, a reclined ſtem, is bent towards the earth, as in many ſpecies of *Ficus*, *Salix*, *Rubus*, &c.

RECLINER, or Reclining *Dial*, is a dial whoſe plane reclines from the perpendicular; *i. e.* leans from you when you ſtand before it.

When this reclination is equal to the height of the pole, the dial is ſaid to be equinoctial. See Dial.

Recliner, *Declining*, or *Declining reclining dial*, is a dial which neither ſtands perpendicularly, nor oppoſite to one of the cardinal points. See Dial.

RECLUSE, among *Religious*, a perſon cloſe ſhut up in a very narrow cell of an hermitage, or other religious houſe; and cut off, not only from all converſation with the world, but even with the houſe.

The word is chiefly uſed for ſuch as thus impriſon themſelves out of devotion, to do penance. It is ſometimes alſo applied to incontinent wives, whom their huſbands procure to be thus kept in a perpetual priſon in ſome convent.

Recluſes were anciently very numerous; they were then a kind of ſolitaries who ſhut themſelves up in ſome little cell, with a vow never to ſtir out of it.

None were admitted to this oath until they had given ſufficient proofs of their abſtinence, and had leave from the biſhop, or the abbot of the monaſtery where they were ſhut up; for the cells of the recluſes were always to join to ſome monaſtery.

The prelate's permiſſion being obtained, they were tried for a year in the monaſtery; out of which, during that time, they never ſtirred.

They were then admitted to their vow of ſtability in the church before the biſhop; which being done, and the recluſe having entered his little cell, the biſhop ſet his ſeal on the door.

The cell was to be very ſmall, and very exactly cloſed. The recluſe was to have every thing within it neceſſary to life; and even, if he were a prieſt, an oratory conſecrated by the biſhop, with a window which looked into the church, through which he might make his offerings at the maſs, hear the ſinging, ſing himſelf with the community, and anſwer thoſe who talked to him. But this window was to have curtains before it, both withinſide and without; ſo that the recluſe might neither ſee, nor be ſeen.

Indeed he was allowed a little garden in his recluſion, to plant a few herbs, and take freſh air; adjoining to his cell was that of his diſciples, which he was very rarely without; with a window, through which they ſerved him with neceſſaries, and received his inſtructions.

When it was judged proper to have two or three recluſes together, their cells were made contiguous to each other with windows of communication; if any woman would conſult them, or confeſs to them, it was to be in the church, and in the face of all the world.

Where there were two or three recluſes together, they were never to hold any conference, but on ſpiritual matters, and to confeſs to each other; where there was but one, he was to confeſs and examine himſelf.

If the recluſe fell ſick, his door was opened for people to come in and aſſiſt him; but he was not allowed to ſtir out on any pretence whatever.

Theſe articles are extracted from the rule, compiled for the recluſes, by Grimlaic, a prieſt in the ninth century.

There were alſo women recluſes, who led the ſame life, in proportion. St. Viborade lived a recluſe at St. Gall, and was there martyred by the Hungarians in 825.

RECLUSION, the ſtate of a recluſe; or the cell and other appurtenances of it.

F. Helyot gives a particular account of the ceremonies practiſed in the recluſion of a woman, in that of mother de Cambray, inſtitutrix of the order of the repreſentation of Nôtre Dame. A cell being built for her in 1625, adjoining to the church of St. Andrew, in Tournay, the biſhop waited for her early in the morning at the church-door. Upon her arrival, proſtrating herſelf at the feet of that prelate, he gave her his benediction; conducted her to the grand altar; and there bleſſing a mantle, veil, and ſcapular, he put them on her, and gave her a new name.

Having here made her vow, and the biſhop having harangued the people in praiſe of the new recluſe, he conducted her proceſſionally to her recluſion; the clergy all the way ſinging *Veni, ſponſa Chriſti*, &c.

Here the biſhop, bleſſing her afreſh, conſecrated the recluſion, and ſhut her up in perpetual confinement.

RECOGNISANCE. See Recognizance.

RECOGNITION, Recognitio, denotes an acknowledgment. The word is particularly uſed in our law-books, for the title of the firſt chapter of the ſtat. 1 Jac. I. by which the parliament acknowledged the crown of England, after the death of queen Elizabeth, to have rightfully deſcended to king James.

Recognitions *of Clement*, in *Eccleſiaſtical Hiſtory*, a ſuppoſititious or apocryphal book, aſcribed to St. Clement, but really compoſed by ſome learned and eloquent man in the ſecond century. Ruſinus, who tranſlated the ten books of Recognitions out of Greek into Latin, in whoſe tranſlation only we now have them, plainly ſuppoſes them to have been written by Clement of Rome; but that the copies, in his time, had been corrupted in ſome places. The firſt eccleſiaſtical writer who has mentioned this work is Origen, by whom it is cited twice; but he does not ſeem to have held it in high eſtimation. Euſebius, who is ſuppoſed to mention the Recognitions under the title of "The Acts of Peter," which made a part of them, rejects theſe, and owns no work for St. Clement, but his epiſtle to the Corinthians. Epiphanius mentions "The Travels of Peter" as written by Clement, but corrupted by the Ebionites, ſo that little was left that is genuine. St. Jerome's opinion of the works of Clement coincides with that of Euſebius. This book is, for a large part of it at leaſt, ſays the learned Dr. Lardner, a fiction or romance, in which divers things concerning the Chriſtian religion are repreſented in a philoſophical manner, in order to render them more agreeable to the Greeks. It

is called the "Circuits," or "Travels and Acts of Peter," from its ſubject, as it contains an account of the apoſtle Peter's diſputes with Simon Magus, and his diſcourſes to other people, and his miracles. It is called the "Recognitions," from Clement's recognizing his father, and mother, and brethren, who had been long ſeparated from each other.

Mr. Whiſton, though he allows that this work was not written by Clement himſelf, ſuppoſes that it was the production of ſome of the hearers of Clement, and other companions of the apoſtles; but Dr. Lardner is of opinion, that it muſt be reckonod to be Clement's, or to be ſuppoſititious. With regard to the age of this work, Lardner farther adds, that the arguments here urged againſt Heatheniſm ſeem to imply, that the Chriſtian was not yet the prevailing eſtabliſhed religion. And the author often ſpeaks of the power of Chriſtians to heal diſeaſes, and to expel dæmons, as if it was common in his time. That ſuch gifts were enjoyed by many Chriſtians in the ſecond, and in the beginning of the third, century, we are aſſured by Irenæus, Tertullian, Origen, and others; after which time, or however after the end of the third century, they were not ſo common, if they did not quite ceaſe. Mr. Whiſton's opinion of this book is, that if it be not, in ſome ſenſe or other, itſelf a ſacred book, yet it ought certainly to be eſteemed in the next degree to that of the really ſacred books of the New Teſtament. But in the opinion of many other learned men, it is a worthleſs piece, of little or no uſe. It contains, however, as Dr. Lardner ſuggeſts, ſome excellent ſentiments, and fine paſſages, intermixed with very great faults, for which no excuſe can be made. This book contains paſſages of our four goſpels, though it has been doubted whether he uſed the four, or ſome one goſpel containing in it all theſe. Its author ſeems to own the firſt epiſtle of St. John, and the book of the Revelation. He was alſo well acquainted with the book of the Acts of the Apoſtles; but it is not certain how far he owned it. The paſſages from St. Paul's epiſtles are not ſufficient to prove, that they were eſteemed by this writer to be of authority. The author does not ſeem, indeed, to have any great kindneſs for the apoſtle Paul, and on this account he made little uſe of his epiſtles, and of the Acts of the Apoſtles. From his ſly inſinuations, and injurious reflections upon St. Paul, it may be ſuſpected that he was a mere Ebionite; the ancients aſſuring us, that this ſect of Chriſtians rejected the authority of that apoſtle and his epiſtles. The author bears teſtimony to many principal facts of the New Teſtament. He gives an account of our Lord's temptation; he mentions the choice of the 12 apoſtles, and afterwards of other 72 diſciples. In one place he ſpeaks of the 12 apoſtles in ſuch a manner as if he intended to exclude Paul from the honour of the apoſtleſhip, and even to deny him the character of a ſufficient and faithful "preacher of Chriſt's word." We have alſo, in this book, relations of the miracles of our bleſſed Lord's miniſtry, and of his death and reſurrection, and the extraordinary ſigns attending theſe events. Grabe's Preface to the Writings of St. Clement in his "Spicilegium." Coteler apud Patr. Apoſt. tom. i. p. 484. Lardner's Works, vol. ii. p. 342, &c. See *Clementine* HOMILIES.

RECOGNITION, in the *Drama*. See DISCOVERY.

RECOGNITIONE *adnullanda per vim et duritiem facta*, in *Law*, is a writ to the juſtices of the common bench for ſending a record touching a recognizance, which the recognizor ſuggeſts to have been acknowledged by force and hard dealing; that, if it ſo appear, it may be annulled.

Tranſcriptio Recognitionis factæ coram juſtitiariis itinerantibus. See TRANSCRIPTIO.

RECOGNITORS, RECOGNITORES. The jury impanelled upon an aſſize are called recognitors, becauſe they acknowledge a diſſeiſin by their verdict.

RECOGNIZANCE, or RECOGNISANCE, a bond or obligation of record acknowledged to the king; teſtifying the *recognizor* to owe to the *recognizee* a certain ſum of money; with condition to do ſome particular act, as to appear at the aſſizes, to keep the peace, to pay a debt, or the like.

It is thus called, becauſe recognized, or acknowleged in ſome court of record, or before ſome judge, maſter in chancery, or juſtice of the peace.

It is, in moſt reſpects, like another bond; the difference being chiefly this: that the bond is the creation of a freſh debt or obligation *de novo*, whereas the recognizance is an acknowledgment of a former debt upon record; the form of which is "A. B. doth acknowledge to our lord the king, to the plaintiff, to C. D., or the like, the ſum of ten pounds," with condition to be void on performance of the thing ſtipulated; in which caſe the king, the plaintiff, C. D., &c. is called the "cognizee," *is cui cognoſcitur*, or recognizee, as he that enters into the recognizance is called the "cognizor," or recognizor, *is qui cognoſcit*. This, being either certified to, or taken by the officer of ſome court, is witneſſed only by the record of that court, and not by the party's ſeal; ſo that it is not in ſtrict propriety a deed, though the effects of it are greater than a common obligation; being allowed a priority in point of payment, and binding the lands of the cognizor, from the time of enrolment on record. Stat. 29 Car. II. c. 3.

There are alſo recognizances for *bail* (which ſee), others for appearing at the ſeſſions to proſecute a felon, others for good behaviour, &c. See GOOD *Abearing*.

There are alſo other recognizances of a private kind, in nature of a STATUTE *Staple*, (which ſee,) by virtue of the ſtatute 23 Hen. VIII. cap. 6. which are a charge upon real property. This recognizance is a ſecurity, acknowledged before either of the chief juſtices, or (out of term) before their ſubſtitutes, the mayor of the ſtaple at Weſtminſter, and the recorder of London: by which the benefit of their mercantile tranſactions is extended to all the king's ſubjects in general by the above cited ſtatute 23 Hen. VIII. c. 6. amended by 8 Geo. I. c. 25, which direct ſuch recognizances to be enrolled and certified into chancery. But theſe, by the ſtatute of frauds, 29 Car. II. c. 3. are only binding upon the lands in the hands of *bonâ fide* purchaſors, from the day of their enrolment, which is ordered to be marked upon the record.

RECOGNIZANCE is alſo uſed, in our *Ancient Statutes*, for the verdict of the twelve jurors impanelled upon an aſſize; hence called *recognitors*.

RECOGNIZEE, or COGNIZEE, is he to whom one is bound in a recognizance. He that is ſo bound is called *recognizor*.

RECOIL, or REBOUND, the reſilition of a body, chiefly a fire-arm; or the motion by which, upon exploſion, it ſtarts or flies backwards; the cauſe of which is the impelling force of the powder, which acts equally on the breech and on the ball; ſo that if the piece and ball were of equal weight, and other circumſtances the ſame, the piece would recoil with the ſame velocity as that with which the ball is diſcharged; but the heavier any body is, the leſs will its velocity be, when the force impelling it continues the ſame. Therefore ſo many times as the cannon and carriages are heavier than the ball, juſt as many times will the velocity of the cannon be leſs than that of the ball; and the ſpace through which the cannon recoils whilſt the ball moves

along the cylinder, is to the length of the cannon diminiſhed by the ſpace behind the ball, as the weight of the ball is to the weight of the cannon. Let a twenty-four pounder of ten feet be 6400 pounds weight, and when the ball quits the piece, the cannon will have recoiled $\frac{24}{6400} \times 10 = \frac{3}{80}$ of a foot, leſs than half an inch.

The greater the charge, *cæteris paribus*, the greater the rebound. By an experiment made before the Royal Society, and related in the Philoſophical Tranſactions, it was found, that cannons, charged to a certain degree, throw the ball from right to left of their own direction; but that the cannons themſelves recoil from left to right.

Some of the gentlemen of the French academy doubting the juſtneſs of the obſervation, M. Caſſini, the younger, undertook to repeat the experiment; which he did by means of a machine, as like that uſed in England as he could: and that tried over and over again.

The reſult was, that the ball, when the gun had liberty to recoil, was always thrown to the right of the point to which it was thrown when the gun was fixed without a poſſibility of rebounding; but then the recoil was always made the ſame way, *viz.* to the right; and he never found that contrariety of directions between the ball and the rebound, obſerved in the Engliſh experiment. See Hiſt. Acad. R. Scienc. A. 1703. p. 120, &c.

The cauſe of the phenomenon ſeems very difficult to aſſign; for ſuppoſing the guns of a common make, with the touch-hole on the top, we cannot ſo much as gueſs what cauſe ſhould conſtantly determine the ball from right to left; unleſs ſome very material circumſtances be omitted in the recital they have given us in the experiment.

Guns whoſe vents are a little forward in the chaſe recoil moſt. To leſſen the recoil of a gun, the platforms are generally made ſloping towards the embraſures of the battery. See Projectiles.

RECOLATION, a method of fining the decoctions of vegetables, &c. by repeated percolation, or ſtraining them ſeveral times ſucceſſively through a linen or woollen-bag.

RECOLLECTION, a mode of thinking, by which thoſe ideas, ſought after by the mind, are with pain and endeavour found, and brought again to view. See Memory and Imagination.

RECOLLETS, a congregation of reformed Franciſcans, called alſo *friers minor of St. Francis, of the ſtrict obſervance*. They were eſtabliſhed about the year 1532, when ſome religious of the order of St. Francis being willing to keep his rule to the letter, Clement VII. gave them houſes, whither they might retire, and receive ſuch as were diſpoſed to follow them. The ſame year he approved the reform; and in 1584 it was carried from Italy into France, where theſe religious had already been eſtabliſhed, in the towns of Tulles in Limoiſin, and Murat in Auvergne. They had a convent at Paris in 1603; and ſince they have erected no leſs than a hundred and fifty in the whole kingdom, where they are divided into ſeven provinces.

RECOLOGNE, in *Geography*, a town of France, in the department of the Doubs; eight miles W. of Beſançon.

RECOMMENDATI. See Affidavit.

RECOMMENDATION, in a *Military Senſe*, denotes a certificate, ſtating an individual to be properly qualified for a ſituation in the army. This certificate muſt be ſigned by a field-officer in the regulars, addreſſed to the commanding officer of the regiment, by whom it is forwarded to the commander-in-chief, who lays the name of the perſon recommended before the king.

RECOMPOSITION, in *Chemiſtry*, the compounding of bodies from their ſeparated parts, or principles, ſo as to compoſe the original whole again. This is extremely difficult to effect univerſally, but in ſome caſes it may be done, and that ſo perfectly, that the recompoſed body ſhall not be diſtinguiſhable by the ſenſes from that which had never been ſeparated by the fire. If the art of chemiſtry were perfect, we ſhould thus be able, at leaſt in ſome degree, to recompoſe all the bodies we divide; but this is far from being the caſe at preſent. We can by no means do this in vegetable and animal bodies, where there is a vaſcular ſtructure, and therefore we are carefully to diſtinguiſh between the regeneration of organized, and that of unorganized bodies.

RECONCILIARI, in our *Law Books*, &c. A church is ſaid *reconciliari*, to be reconciled, when it is conſecrated afreſh, after having been polluted or profaned; as by the poſſeſſion of pagans, heretics, &c.

RECONCILIATION *of Penitents*, in *Church Hiſtory*, See Poenitentes.

RECONNOITRE, in *War*, implies to view and examine the ſtate of things, in order to make a report of them.

The word is French, ſignifying, literally, *to know, recollect*.

We ſay to reconnoitre the coaſts, to reconnoitre a port, &c. A body of horſe was ſent to reconnoitre their camp, the ground, the condition of the roads, rivers, &c.

Parties ordered to reconnoitre, are to obſerve the country and the enemy; to remark the routes, conveniencies, and inconveniencies of the firſt; the poſition, march, or forces of the ſecond. In either caſe, they ſhould have an expert geographer, capable of taking plans readily; he ſhould be the beſt mounted of the whole, that in caſe the enemy happen to ſcatter the eſcort, he may ſave his works and ideas.

All parties that go for reconnoitring only, ſhould be but few in number: never more than twelve or twenty men. An officer, be his rank what it will, cannot decline going with ſo few under his command: the honour is amply made up by the importance of the expedition, frequently of the moſt intereſting conſequence, and the propereſt to recommend the prudence, bravery, and addreſs of any officer that has the fortune to ſucceed.

It is previouſly neceſſary that the officer ordered on this duty ſhould be well acquainted with the country, the roads, and the diſtance of the enemy. His party muſt conſiſt of men of approved fidelity, part of whom ſhould be diſguiſed. This detachment muſt march off in the night. The men muſt have ſtrict orders neither to ſmoke tobacco, make a noiſe, nor ſpeak. The officer muſt be provided with two guides, who are to be ſtrictly interrogated, but are to remain ignorant of the route you intend to take. A detachment of this kind ſhould be furniſhed with ſubſiſtence for two or three days. The horſes are to be fed every two or three leagues, for it is abſolutely neceſſary that they ſhould be always freſh and fit for duty. The officer will take care never to halt, but at a diſtance from any road, and alſo take every precaution to prevent his being ſurpriſed, whilſt his horſes are feeding, &c.

Reconnoitre is alſo uſed at ſea. To reconnoitre a veſſel, a fleet, &c. is to approach near enough to examine the rate and burden of a veſſel, &c. the force it may have aboard, what nation it is of, &c.

To reconnoitre a land, or ſhore, is to obſerve its ſituation, in order to find what land it is.

RECORD, Recordium, in *Law*, an authentic teſtimony of any thing in writing, contained in rolls of parchment, and preſerved in a court of record. See Court, and Custom.

Records

Records are ſaid to be *vetuſtatis & veritatis veſtigia.* So early as the Conqueſt we find the "*præteritorum memoria eventorum*" reckoned up as one of the chief qualifications of thoſe who were held to be "*legibus patriæ optimé inſtituti.*" For it is an eſtabliſhed rule to abide by former precedents, where the ſame points come again in litigation; as well to keep the ſcale of juſtice even and ſteady, and not liable to waver with every new judge's opinion, as alſo becauſe the law in that caſe being ſolemnly declared and determined, what before was uncertain, and perhaps indifferent, is now become a permanent rule, which it is not in the breaſt of any ſubſequent judge to alter or vary from, according to his private ſentiments: he being ſworn to determine not according to his own private judgment, but according to the known law and cuſtom of the land; not delegated to pronounce a new law, but to maintain and expound the old one. Yet this rule admits of exception, where the former determination is moſt evidently contrary to reaſon; much more if it be clearly contrary to the divine law. But even in ſuch caſes the ſubſequent judges do not pretend to make a new law, but to vindicate the old one from miſrepreſentation. For if it be found that the former deciſion is manifeſtly abſurd or unjuſt, it is declared, not that ſuch a ſentence was *bad law*, but that it was *not law*, that is, that it is not the eſtabliſhed cuſtom of the realm, as has been erroneouſly determined. An act committed to writing in any of the king's courts, during the term in which it is written, is alterable, being no record; but that term once ended, and the act inrolled, it is a record, and of ſuch credit as admits no alteration, or proof to the contrary.

It is a ſettled rule and maxim that nothing ſhall be averred againſt a record (ſee COURT,) nor ſhall any plea, or even proof, be admitted to the contrary. (Co. Litt. 260.) And if the exiſtence of a record be denied, it ſhall be tried by nothing but itſelf; that is, upon bare inſpection whether there be any ſuch record or no; elſe there would be no end of diſputes. But if there appears any miſtake of the clerk in making up ſuch record, the court will direct him to amend it. Courts of record, or repoſitories for the public records of the kingdom, were firſt eſtabliſhed by Edward I., our Engliſh Juſtinian, ſome of which are more ancient than the reign of his father, and thoſe were by him collected.

Lawyers reckon three ſorts of records; *viz.* a *judicial* record, as attainder, &c.; a *miniſterial* record upon oath, as an office of inquiſition found; and a record made by *conveyance* and conſent, as a fine, or deed inrolled, and the like.

RECORD, *Aſſurances by matter of*, are ſuch as do not entirely depend on the act or conſent of the parties themſelves; but the ſanction of a court of record is called in, to ſubſtantiate, preſerve, and be a perpetual teſtimony of the transfer of property from one man to another; or of its eſtabliſhment, when already transferred: of this nature are private acts of parliament, the king's grants, fines, and common recoveries.

RECORD, *Court of.* See RECORD, ſupra, and COURT.

RECORD, *Debt of*, is a ſum of money, which appears to be due by the evidence of a court of record. Thus, when a ſpecific ſum is adjudged to be due from the defendant to the plaintiff, on an action or ſuit at law, this is a contract of the higheſt nature, being eſtabliſhed by the ſentence of a court of judicature. Debts upon recognizances, together with ſtatutes merchant, and ſtatutes ſtaple, &c. if forfeited by non-performance of the condition, are alſo debts of record; the contract, on which they are founded, being witneſſed by the higheſt kind of evidence, *viz.* by matter of record.

RECORDS, *Imbezzling of.* See IMBEZZLE.

RECORD, *matter, muſter, oyer, priſoner upon matter of*, ſee MATTER, MUSTER, OYER, and PRISONER, &c.

RECORD, *Trial by*, is uſed only in one particular inſtance; where a matter of record is pleaded in any action, as a fine, a judgment, or the like; and the oppoſite party pleads "*nul tiel record*," that is, there is no ſuch matter of record exiſting: upon this, iſſue is tendered and joined in the following form, "and this he prays may be enquired of by *the record*, and the other doth the like;" and hereupon the party pleading the record has a day given him to bring it in, and proclamation is made in court for him "to bring forth his record, or he ſhall be condemned:" and, on his failure, his antagoniſt ſhall have judgment to recover. The trial of this iſſue is, therefore, merely by the record; for, as ſir Edward Coke obſerves (1 Inſt. 117. 260.), a record or enrolment is a monument of ſo high a nature, and imputeth in itſelf ſuch abſolute verity, that if it be pleaded there is no ſuch record, it ſhall not receive any trial by witneſs, jury, or otherwiſe, but only by itſelf. Thus, titles of nobility ſhall be tried by the king's writ or patent only, which is matter of record. (6 Rep. 53.) Alſo in caſe of an alien, whether alien, friend, or enemy, ſhall be tried by the league or treaty between his ſovereign and our's; for every league or treaty is of record. (9 Rep. 31.) And alſo whether a manor be held in ancient demeſne or not, ſhall be tried by the record of Domeſday in the king's exchequer. Blackſt. Com. book iii.

RECORD, among *Fowlers*. A bird is ſaid to record, when it begins to tune or ſing within itſelf; or to form its notes and diſpoſe its organs for ſinging.

The cock thruſh is diſtinguiſhed from the hen in recording; the firſt being more loud and frequent in it than the ſecond.

Inſtances have been known of birds beginning to record when they were not a month old. This firſt eſſay does not ſeem to have the leaſt rudiments of the future ſong; but as the bird grows older and ſtronger, one may perceive what the neſtling is aiming at. A young bird commonly continues to record for ten or eleven months, when he is able to execute every part of his ſong, which afterwards continues fixed, and is ſcarcely ever altered. The term record is probably derived from a muſical inſtrument, formerly uſed in England, called a *recorder*, which ſeems to have been a ſpecies of flute, and was probably uſed to teach young birds to pipe tunes. Lord Bacon deſcribes this inſtrument (in his ſecond Century of Experiments) to have been ſtraight, to have had a leſſer and greater bore, both above and below, to have required very little breath from the blower, and to have had what he calls a ſipple or ſtopper.

RECORDARI *facias loquelam*, in *Law*, a writ directed to the ſheriff to remove a cauſe depending in an inferior court, as hundred-court, county-court, court of ancient demeſne, &c. to the king's bench, or common pleas, &c.

It is thus called, becauſe it commands the ſheriff to *make a record* of the proceedings either by himſelf, or others; and then to ſend up the cauſe.

RECORDE, ROBERT, in *Biography*, an early Engliſh phyſician, of Welſh origin, commenced his education at Oxford about the year 1525; and in 1531 was elected fellow of All-Souls' College. Directing his ſtudies to phyſic, but where, or under what maſters, we are not told, he was created doctor in that faculty at Cambridge in 1545. Both before and after this period he is ſaid to have taught arithmetic at Oxford, and to have excelled all his predeceſ-

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ſors in rendering this branch of knowledge clear and familiar. He is likewiſe mentioned as remarkably ſkilled in rhetoric, aſtronomy, geometry, muſic, mineralogy, and every part of natural hiſtory. He was well acquainted with the Saxon language, and made large collections of hiſtorical and other ancient manuſcripts. To theſe various ſtudies he joined that of divinity, and was attached to the principles of the Reformers. But notwithſtanding he was juſtly deemed a prodigy of learning and talents, it does not appear that he met with encouragement at all adequate to his merits; ſince all that we know further of him is, that he died in the king's bench priſon, where he was confined for debt, in the year 1558.

He was author of ſeveral works, ſome of which were ſeveral times reprinted, on the following ſubjects.

"The Ground of Arts, teaching the Work and Practice of Arithmetic, both in whole Numbers and Fractions," 1540. This was dedicated to king Edward VI. "The Whetſtone of Wit," a ſecond part of the former. "The Path-way to Knowledge, containing the firſt Principles of Geometry." "The Caſtle of Knowledge, containing the Explanation of the Sphere." "The Urinal of Phyſick," 1547, which was reprinted in London in 1582, 1599, and 1665; and in the laſt mentioned year, the title of "The Judicial of Urines" was given to it. This book contains a deſcription of urinary veſſels with figures. It is a ſhort, but very methodical treatiſe, full of diviſions and ſubdiviſions relative to the different kinds of urines, and the prognoſtics to be deduced from them. Nevertheleſs he candidly acknowledges at the beginning, that the judgment to be formed in diſeaſes from the urine is not ſo certain as ſome have repreſented; and indeed the perplexity and variety of opinions concerning this ſubject are ſufficiently apparent from his treatiſe. His other works were, "Of Anatomy;" "Of Auricular Confeſſion;" "Of the Euchariſt;" and "The Image of a true Commonwealth." Aikin's Biog. Memoirs of Medicine.

RECORDER, Recordator, a perſon whom the mayor, or other chief magiſtrate of any city, or town corporate, having juriſdiction, and a court of record, within their precincts, does aſſociate with him, for his better direction in matters of juſtice, and proceedings according to law. He is uſually a counſellor, or other perſon, verſed and experienced in the law. In ſome towns, which have their particular aſſizes within themſelves, and no mayor, the recorder is the judge.

The recorder of London is one of the juſtices of oyer and terminer, and a juſtice of peace of the quorum, for putting the laws in execution for preſerving the peace and government of the city; and being the mouth of the city, he delivers the ſentences and judgments of the courts therein, and alſo certifies and records the city cuſtoms, &c. He is choſen by the lord mayor and aldermen, and attends the buſineſs of the city, on any warning by the lord mayor, &c.

Recorder, in *Muſic*. See Record, ſupra.

RECORDO *& proceſſu mittendis*, in *Law*, is a writ to call a record, together with the whole proceedings in the cauſe, out of an inferior court into the king's court.

RECOVERY, in a legal ſenſe, an obtaining of any thing by judgment, or trial at law; anſwering to *evictio* among the civilians.

There is a *true* and a *feigned* recovery.

Recovery, *True*, is an actual or real recovery of any thing, or of the value of it, by judgment. As if a man ſue for any land, or other thing, and have a verdict or judgment for him.

Recovery, *Feigned* or *Common*, is a ſort of *fictio juris*, being a certain form or courſe preſcribed by law to be obſerved for the better aſſuring of lands and tenements to us; the end and effect of which is, to diſcontinue and deſtroy eſtates-tail, remainders, and reverſions, and to bar the intails of them.

Theſe common recoveries were invented by the eccleſiaſtics to elude the ſtatutes of mortmain; and afterwards encouraged by the fineſſe of the courts of law in 12 Edw. IV. in order to put an end to all fettered inheritances, and bar not only eſtates-tail, but alſo all remainders and reverſions expectant thereon.

A common recovery is ſo far like a *fine* (which ſee), that it is a ſuit or action, either actual or fictitious; and in it the lands are *recovered* againſt the tenant of the freehold; which recovery, being a ſuppoſed adjudication of the right, binds all perſons, and veſts a free and abſolute fee-ſimple in the recoveror.

This recovery is either with a *ſingle* or *double voucher*; and ſometimes a treble or farther voucher, as the exigency of the caſe may require.

As a recovery is in the nature of an action at law, not immediately compromiſed like a fine, but carried through every regular ſtage of proceeding, its form and method are not eaſily underſtood by thoſe who are unacquainted with the courſe of judicial proceedings. Judge Blackſtone has, therefore, ſtated its nature and progreſs as clearly and conciſely as poſſible; avoiding, to the utmoſt of his power, all technical terms and phraſes not before interpreted. Of his luminous ſtatement we ſhall avail ourſelves in the ſequel of this article.

Let us (ſays he), in the firſt place, ſupppoſe David Edwards to be tenant of the freehold, and deſirous to ſuffer a common recovery, in order to bar all entails, remainders, and reverſions, and to convey the ſame in fee-ſimple to Francis Golding. To effect this, Golding is to bring an action againſt him for the lands; and he accordingly ſues out a writ, called a *præcipe quod reddat*, becauſe thoſe were its initial or moſt operative words, when the law proceedings were in Latin. In this writ the demandant, Golding, alleges, that the defendant, Edwards, (here called the tenant) has no legal title to the land; but that he came into poſſeſſion of it after one Hugh Hunt had turned the demandant out of it. The ſubſequent proceedings are made up into a record or recovery roll, in which the writ and complaint of the demandant are firſt recited; whereupon the tenant appears, and calls upon one Jacob Morland, who is ſuppoſed, at the original purchaſe, to have warranted the title to the tenant; and thereupon he prays, that the ſaid Jacob Morland may be called in to defend the title, which he ſo warranted. This is called the *voucher*, *vocatio*, or calling of Jacob Morland to warranty; and Morland is called the *vouchee*. Upon this, Jacob Morland, the vouchee, appears, is impleaded, and defends the title. Whereupon Golding, the demandant, deſires leave of the court to *imparl*, or confer with the vouchee in private; which is (as uſual) allowed him. And ſoon afterwards the demandant, Golding, returns to court, but Morland the vouchee diſappears, or makes the default. Whereupon judgment is given for the demandant, Golding, now called the recoveror, to recover the lands in queſtion againſt the tenant, Edwards, who is now the recoveree: and Edwards has judgment to recover of Jacob Morland lands of equal value, in recompenſe for the lands ſo warranted by him, and now loſt by his default; which is agreeable to the doctrine of warranty. This is called the recompenſe, or *recovery in value*. But Jacob Morland having no lands of his own, being uſually the cryer of the court

court (who, from being frequently thus vouched, is called the *common vouchee*) it is plain that Edwards has only a nominal recompenſe for the lands ſo recovered againſt him by Golding; which lands are now abſolutely veſted in the ſaid recoveror by judgment of law, and ſeiſin thereof is delivered by the ſheriff of the county. So that this colluſive recovery operates merely in the nature of a conveyance in fee-ſimple, from Edwards the tenant in tail, to Golding the purchaſor.

The recovery, here deſcribed, is with a ſingle voucher only; but ſometimes it is with *double*, *treble*, or farther voucher, as the exigency of the caſe may require. And indeed it is now uſual always to have a recovery with double voucher at the leaſt: by firſt conveying an eſtate of freehold to any indifferent perſon, againſt whom the *præcipe* is brought; and then he vouches the tenant in tail, who vouches over the common vouchee. For, if a recovery be had immediately againſt tenant in tail, it bars only ſuch eſtate in the premiſes of which he is then actually ſeiſed; whereas if the recovery be had againſt another perſon, and the tenant in tail be vouched, it bars every latent right and intereſt which he may have in the lands recovered. If Edwards therefore be tenant of the freehold in poſſeſſion, and John Barker be tenant in tail in remainder, here Edwards doth firſt vouch Barker, and then Barker vouches Jacob Morland the common vouchee; who is always the laſt perſon vouched, and always makes default: whereby the demandant, Golding, recovers the land againſt the tenant Edwards, and Edwards recovers a recompenſe of equal value againſt Barker the firſt vouchee; who recovers the like againſt Morland the common vouchee, againſt whom ſuch ideal recovery in value is always ultimately awarded.

This ſuppoſed recompenſe in value is the reaſon why the iſſue in tail is held to be barred by a common recovery. For if the recoveree ſhould obtain a recompenſe in lands from the common vouchee (which there is a poſſibility in contemplation of law, though a very improbable one, of his doing) theſe lands would ſupply the place of thoſe ſo recovered from him by colluſion, and would deſcend to the iſſue in tail. This reaſon will alſo hold with equal force, as to *moſt* remainder-men and reverſioners; to whom the poſſibility will remain and revert, as a full recompenſe for the reality, which they were otherwiſe entitled to: but it will not *always* hold; and therefore, as Pigott ſays, the judges have been even *aſtuti*, in inventing other reaſons to maintain the authority of recoveries. And, in particular, it hath been ſaid, that, though the eſtate-tail is gone from the recoveree, yet it is not *deſtroyed*, but only *transferred*; and ſtill ſubſiſts, and will ever continue to ſubſiſt (by conſtruction of law) in the recoveror, his heirs, and aſſigns: and, as the eſtate-tail ſo continues to ſubſiſt for ever, the remainders or reverſions expectant on the determination of ſuch eſtate-tail can never take place.

To ſuch awkward ſhifts, ſuch ſubtile refinements, and ſuch ſtrange reaſoning, were our anceſtors obliged to have recourſe, in order to get the better of that ſtubborn ſtatute *de donis*. The deſign, for which theſe contrivances were ſet on foot, was certainly laudable; the unrivetting the fetters of eſtates-tail, which were attended with a legion of miſchiefs to the commonwealth: but, while we applaud the end, we cannot but admire the means. Our modern courts of juſtice have indeed adopted a more manly way of treating the ſubject; by conſidering common recoveries in no other light, than as the formal mode of conveyance, by which tenant in tail is enabled to alienе his lands. But, ſince the ill conſequences of fettered inheritances are now generally ſeen and allowed, and of courſe the utility and expedience of ſetting them at liberty are apparent; it hath often been wiſhed, that the proceſs of this conveyance was ſhortened, and rendered leſs ſubject to niceties, by either totally repealing the ſtatute *de donis*; which perhaps, by reviving the old doctrine of conditional fees, might give birth to many litigations: or by veſting in every tenant in tail of full age the ſame abſolute fee-ſimple at once, which now he may obtain whenever he pleaſes, by the colluſive fiction of a common recovery; though this might poſſibly bear hard upon thoſe in remainder or reverſion, by abridging the chances they would otherwiſe frequently have, as no recovery can be ſuffered in the intervals between term and term, which ſometimes continue for near five months together: or, laſtly, by empowering the tenant in tail to bar the eſtate-tail by a ſolemn deed, to be made in term time and enrolled in ſome court of record; which is liable to neither of the other objections, and is warranted not only by the uſage of our American colonies, and the deciſions of our own courts of juſtice, which allow a tenant in tail (without fine or recovery) to appoint his eſtate to any charitable uſe, but alſo by the precedent of the ſtatute 21 Jac. I. c. 19. which, in caſe of a bankrupt tenant in tail, empowers his commiſſioners to ſell the eſtate at any time, by deed indented and enrolled. And if, in ſo national a concern, the emoluments of the officers, concerned in paſſing recoveries, are thought to be worthy attention, thoſe might be provided for in the fees to be paid upon each enrolment.

The *force* and *effect* of common recoveries may appear, from what has been ſaid, to be an abſolute bar not only of all eſtates-tail, but of remainders and reverſions expectant on the determination of ſuch eſtates. So that a tenant in tail may, by this method of aſſurance, convey the lands held in tail to the recoveror, his heirs and aſſigns, abſolutely free and diſcharged of all conditions and limitations in tail, and of all remainders and reverſions. But, by ſtatute 34 and 35 Hen. VIII. c. 20. no recovery had againſt tenant in tail, of the king's gift, whereof the remainder or reverſion is in the king, ſhall bar ſuch eſtate-tail, or the remainder or reverſion of the crown. And by the ſtatute 11 Hen. VII. c. 20. no woman, after her huſband's death, ſhall ſuffer a recovery of lands ſettled on her by her huſband, or ſettled on her huſband and her by any of his anceſtors. And by ſtatute 14 Eliz. c. 8. no tenant for life, of any ſort, can ſuffer a recovery, ſo as to bind them in remainder or reverſion. For which reaſon, if there be tenant for life, with remainder in tail, and other remainders over, and the tenant for life is deſirous to ſuffer a valid recovery; either he, or the tenant to the *præcipe* by him made, muſt *vouch* the remainder-man in tail, otherwiſe the recovery is void: but if he does vouch ſuch remainder-man, and he appears and vouches the common vouchee, it is then good; for if a man be vouched and appears, and ſuffers the recovery to be had againſt the tenant to the *præcipe*, it is as effectual to bar the eſtate-tail as if he himſelf were the recoveree. Salk. 571.

In all recoveries it is neceſſary that the recoveree, or tenant to the *præcipe*, as he is uſually called, be actually ſeiſed of the freehold, elſe the recovery is void. (Pigott, 28.) For all actions to recover the ſeiſin of lands, muſt be brought againſt the actual tenant of the freehold, elſe the ſuit will loſe its effect; ſince the freehold cannot be recovered of him who has it not. And, though theſe recoveries are in themſelves fabulous and fictitious, yet it is neceſſary that there be *actores fabulæ*, properly qualified. But the nicety thought by ſome modern practitioners to be requiſite in conveying the legal freehold, in order

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to make a good tenant to the *præcipe*, is removed by the proviſions of the ſtatute 14 Geo. II. c. 20. which enacts, with a retroſpect and conformity to the ancient rule of law, that, though the legal freehold be veſted in leſſees, yet thoſe who are entitled to the next freehold eſtate in remainder or reverſion may make a good tenant to the *præcipe*;—that, though the deed or fine which creates ſuch tenant be ſubſequent to the judgment of recovery, yet, if it be in the ſame term, the recovery ſhall be valid in law;—and that, though the recovery itſelf do not appear to be entered, or be not regularly entered, on record, yet the deed to make a tenant to the *præcipe*, and declare the uſes of the recovery, ſhall after a poſſeſſion of twenty years be ſufficient evidence, on behalf of a purchaſor for valuable conſideration, that ſuch recovery was duly ſuffered. And this may ſuffice to give the ſtudent a general idea of common recoveries, the laſt ſpecies of aſſurances by matter of record.

For an account of deeds to lead, or declare, the *uſes* of fines, and recoveries; ſee USES.

In ſome manors, by ſpecial cuſtom, recoveries may be ſuffered of copyhold (Moor, 637.); but as theſe differ in nothing material from recoveries of free land, excepting only that they are not ſuffered in the king's courts, but in the court baron of the manor, we ſhall refer this ſubject to the article SURRENDER. In this place we ſhall obſerve, however, that a fine or recovery had of copyhold lands in the king's court may, if not duly reverſed, alter the tenure of the lands, and convert them into frank-fee, which is defined in the old book of tenures to be "land pleadable at the common law:" but upon an action on the caſe, in the nature of a writ of "deceit," brought by the lord in the king's court, ſuch fine or recovery will be reverſed, the lord will recover his juriſdiction, and the lands will be reſtored to their former ſtate of copyhold. Blackſt. Com. b. ii.

Clerk of Inrolments of Recoveries and Fines. See CLERK.

RECOVERY, *Fort*, in *Geography*, a fort of America, in the Indiana territory, ſituated on a branch of the Wabaſh river, about 23 miles from Greenville. It conſiſts of two block-houſes, and barracks with curtains, ſufficient for 60 men.

RECOUPE, French; formed of *re*, and *couper*, *to cut again*, in *Law*, to rebate, or diſcount.

Thus, if a man have ten pounds iſſuing out of certain lands, and he diſſeiſes the tenant of the land; in an aſſiſe brought by the diſſeiſee, if he recover the land and damages, the diſſeiſor ſhall recoupe the rent due in the damages.

RECOUPE alſo denotes a quick, ſharp reply, to a peremptory demand. See REPARTEE.

RECREANT, in our old *Law-Books*, implies cowardly, faint-hearted.

Hence *recreantiſe*. See CRAVEN and CHAMPION.

Recreant was ſo reproachful a word, that Glanville would not deſcribe it. *Recreantes equi* is uſed by Fleta, lib. ii. cap. 2. for dull, jaded horſes.

RECREATION ISLAND, in *Geography*, a fertile iſland in the Southern Pacific ocean, diſcovered by Roggewin in the year 1722. Some of the ſhip's company obtained a quantity of antiſcorbutic herbs; but upon venturing into the country, they were aſſaulted by the natives, who, by caſting ſtones at them, killed ſome, and wounded almoſt all. Many of the iſlanders were killed by the fire-arms in return. The ſoil produces ſugar-canes, cocoa-nuts, pomegranates, Indian figs, &c. The inhabitants were well made, robuſt, and very lively: their bodies were painted, and they were armed. S. lat. 16°. W. long. 148°.

RECREMENT, RECREMENTUM, in *Medicine*, ſome ſuperfluous matter ſeparated from ſome other that is uſeful.

In which ſenſe, it amounts to much the ſame with fæces, or excrement.

Recrements of vegetables are uſeful as manure.

RECREMENT is ſometimes alſo uſed to denote ſuch ſecreted juices in the body, as are afterwards of uſe in the economy; as the lympha, gall, &c. which are thus called, in contradiſtinction to excrements, which are expelled out of the body, as of no farther uſe.

RECRIMINATION, a poſterior accuſation brought by the accuſed againſt his accuſer, upon the ſame fact.

When two parties have made their mutual complaint at the ſame time; the buſineſs is, firſt, to determine who ſhall be the accuſer, and who the accuſed, *i. e.* on whom ſhall fall the recrimination.

By the French laws, recrimination is of no force till the criminal hath been purged legally.

RECRUDESCENCE, RECRUDESCENTIA, in *Medicine*, is a relapſe, when a diſeaſe that has gone off returns again.

RECRUITS, in the *Military Art*, new men raiſed to ſupply the places of ſuch as have loſt their lives in the ſervice, or are rendered unſerviceable by age or wounds. See LISTING.

RECRUIT-*Horſes*, are the horſes brought up for completing the regiments of horſe or dragoons every year.

RECTANGLE, in *Geometry*, called alſo *oblong*, and *long ſquare*, a quadrilateral rectangular figure M L I K, (*Plate* XII. *Geometry*, *fig.* 3.) whoſe oppoſite ſides, M I. and I K, as well as M J and L K, are equal.

Or, a rectangle is a parallelogram, whoſe ſides are unequal, but its angles right.

To find the area of a rectangle, ſee PARALLELOGRAM.

If from the ſame point A, (*fig.* 4.) be drawn two lines, one of which, A D, is a tangent to a circle, the other a ſecant A B; the ſquare of the tangent A D will be equal to the rectangle under the ſecant A B, and that part of it without the circle A C. If two or more ſecants, A *a*, A B, &c. be drawn from the ſame point A; the rectangles, under their wholes, and their parts without the circle, will be equal. If two chords interſect each other, the rectangles under their ſegments will be equal. The rectangles under equal lines are equal. The ſum of all the rectangles contained under a given line, and all the parts of another any how divided, is equal to the rectangle contained under the two whole lines. If from any point, within a rectangle, to the angles of a rectangle, four lines be drawn, the ſums of the ſquares of thoſe drawn to the oppoſite angles will be equal. The rectangles contained under the correſponding ſides of equiangular triangles, taken alternately, are equal. The rectangle under the two ſides of any triangle is equal to the rectangle under the perpendicular to its baſe, and the diameter of the circumſcribing circle. The ſquare of a line biſecting any angle of a triangle, and terminating in the oppoſite ſide, together with the rectangle under the two ſegments of that ſide, is equal to the rectangle of the two ſides, including the propoſed angle. The rectangle of the two diagonals of any quadrilateral inſcribed in a circle, is equal to the ſum of the two rectangles contained under the oppoſite ſides.

RECTANGLES, *Similar*. See SIMILAR.

RECTANGLE, in *Arithmetic*, is the ſame with product or factum.

RECTANGLED, RIGHT-ANGLED, *Triangle*, is a triangle, one of whoſe angles is right, or equal to 90°. See TRIANGLE.

There can be but one right angle in a plain triangle; therefore a rectangled triangle cannot be equilateral.

RECTANGULAR, in *Geometry*, is applied to figures and ſolids which have one or more angles right.

Such are ſquares, rectangles, and rectangled triangles, among plain figures; cubes, parallelepipeds, &c. among ſolids.

Solids are alſo ſaid to be rectangular with reſpect to their ſituation: thus, if a cone, cylinder, &c. be perpendicular to the plane of the horizon, it is called a rectangular or right cone, cylinder, &c.

The ancients uſed the phraſe *rectangular ſection of a cone*, to denote a parabola; that conic ſection, before Apollonius, being only conſidered in a cone, whoſe ſection by the axis would be a triangle, right-angled at the vertex. See CONIC *Sections*.

Hence it was that Archimedes entitled his book of the quadrature of the parabola, by the name of "Rectanguli Coni Sectio."

RECTANGULAR *Barometer*. See BAROMETER.

RECTANGULAR *Windmills*. See WINDMILLS.

RECTIFICATION, compounded of *rectus*, *right*, *direct*, and *fio*, *I became*, the act of *rectifying*, *i.e.* of correcting, remedying, or redreſſing, ſome defect or error, in reſpect either of nature, art, or morality.

RECTIFICATION, in *Chemiſtry*, is the repeating of a diſtillation or ſublimation ſeveral times, and generally with a leſs degree of heat than at firſt, in order to render the ſubſtance purer, finer, and freer from aqueous and earthy parts.

Rectification is a reiterated depuration of a diſtilled matter, *e. gr.* brandy, ſpirits, or oils, by diſtilling them over again, to render them more ſubtile, and exalt their virtues.

That the rectification of ſpirits may, in all caſes, proceed with the greateſt exactneſs, a due regard to it muſt be had even from the firſt fermenting the ſubſtance from which they are to be made, and continued through all the ſtages of diſtillation, the low wines, proof ſpirit, and alcohol. The management of the fermented liquor, to this purpoſe, is principally the letting it ſtand to ſubſide after the fermentation is over, and the drawing it off clear and thin, not too rich for the ſtill. The ſtill is not to be overfilled with this. Great care muſt be taken to prevent its burning, and the faints that run laſt muſt be kept ſeparate, not mixed with the reſt of the liquor diſtilled, which is now called the low wines. In the rectifying of theſe into proof ſpirit, great caution muſt be uſed that the fire be kept regular, not raiſed by ſudden ſpirts, which always throw up the oil in large quantities, which is to be left behind. In the ſucceeding rectification of the proof ſpirit into alcohol, the ſame cautious management of the fire is neceſſary; and, in both this and the laſt, the faints are not to be ſuffered to run in among the ſpirit, but to be ſaved ſeparate. They may be all mixed together at laſt, and reduced to a ſpirit fit for burning in lamps; but the keeping out of the rectified liquor will keep away the coarſeſt and moſt ſtinking part of the oil of the ingredients.

By theſe eaſy means, without any additional trouble or charge, we might be furniſhed with a ſpirit greatly exceeding what we commonly meet with. And in general, the art and myſtery of our ſellers of the ſeveral ſorts of Engliſh brandies, ſeem to conſiſt in this prudent management, and in the adding a little of the *oleum vini*, or oil of wine-lees, to the ſpirits thus procured pure: this gives the flavour of foreign brandies, and is ſo extenſive in its uſe, that half an ounce of it is ſufficient for a hogſhead of pure ſpirit.

Malt ſpirit is that which principally requires all this care in the rectification, becauſe its oil is more nauſeous and offenſive than that of any other ſpirit; but all others will be greatly the better for being treated in the ſame manner, and it is indeed neceſſary that they ſhould for ſome particular uſes.

It is remarkable, that no one method of combinatory rectification, that is, of the rectification performed by means of ſalt, and other additions, is ſuited to all the ſeveral kinds of ſpirits; ſcarcely indeed will any one way ſerve for any two ſpirits: but this method, by ſimple and careful diſtillation, is equally ſuited to all. Molaſſes-ſpirit, cyder-ſpirit, wine-ſpirit, or brandy, rum, and arrack, are all improved by it; and all of them are then known to be perfectly rectified, when, in the ſtate of alcohol, they not only prove totally inflammable in a little veſſel floating upon cold waters, but when poured into the pureſt ſpring water they have not the leaſt power of making any change in it, nor leave any marks of oilineſs, or that unctuoſity which, on the mixture of the leſs pure ſpirits, floats on the top, and in certain lights gives the rainbow colours. Shaw's Eſſay on Diſtillery. See ALCOHOL and DISTILLATION.

Fixed ſalts are rectified by calcination, diſſolution, or filtration.

Metals are rectified, *i. e. refined*, by the coppel; and reguluſes by repeated fuſions, &c.

In a word, all rectifications are founded upon the ſame principle; and conſiſt in ſeparating ſubſtances more volatile from ſubſtances leſs volatile; and the general method of effecting this is to apply only the degree of heat which is neceſſary to cauſe this ſeparation.

RECTIFICATION *of vitriolic Acid*. See CONCENTRATION.

RECTIFICATION, in *Geometry*, is the finding of a right line equal to a propoſed curve, or ſimply finding the length of a curve line; a problem which, even in the preſent advanced ſtate of analyſis, is attended in many caſes with conſiderable difficulty; and was, *in all*, totally beyond the reach of the ancient geometers, who were not able to aſſign the length of any curve line whatever; though they could, in a few inſtances, determine the area of a curvilinear ſpace. See QUADRATURE.

The firſt rectification of a curve line was effected by Mr. H. Neal, as we are informed by Dr. Wallis, at the concluſion of his Treatiſe on the Ciſſoid. This curve was the ſemicubical parabola, and Neal's rectification of it was publiſhed in July or Auguſt, 1657; and two years after, *viz.* in 1659, the ſame was done by Van Haureat in Holland. See Schooten's Commentary on Deſcartes' Geometry.

It is, however, to the doctrine of fluxions that we owe the complete rectification of curve lines, in finite terms, when they admit of it; and in others by means of infinite ſeries, circular arcs, logarithms, &c.; of which method we ſhall give a general view in the preſent article.

Let A M O (*Plate* XIII. *Analyſis*, *fig.* 10.) be a curve of any kind, whoſe ordinates are parallel to one another, and perpendicular to the axis A H; and let the fluxion of the abſciſs A P be denoted by P p or M R, and R m be taken to repreſent the correſponding fluxion of the ordinate P M, then will the tangent M m be the line which the generating point of the curve would deſcribe, if its motion were to become uniform at M; conſequently this line will truly expreſs the fluxion of the ſpace A M. Hence putting A P $= x$, P M $= y$, and A M $= z$, we have $\dot{z} =$ M $m = \sqrt{(\mathrm{M R}^2 + \mathrm{R}m^2)} = \sqrt{(\dot{x}^2 + \dot{y}^2)}$; from which, and the equation of the curve, the value of z may be determined. But if all the ordinates of the propoſed curve A R M (*fig.*) be referred to a centre C; then, putting the tangent R P, intercepted by the perpendicular C P, $= t$, the arc B N, of a circle deſcribed about the centre C, $= x$, the

radius

radius C N (or C B) = a, &c. (ſee QUADRATURE *of Curves, Caſe* 2.) we ſhall have $\dot{z} : \dot{y} :: y\ (C R) : t\ (R P)$; and conſequently, $\dot{z} = \frac{y\dot{y}}{t}$; whence the value of z will be found, if the relation of y and t is given.

I. To find the length of the ſemi-cubical parabola, of which the equation is $a x^2 = y^3$, or $x = \frac{y^{\frac{3}{2}}}{a^{\frac{1}{2}}}$.

Here $\dot{x} = \frac{3 y^{\frac{1}{2}} \dot{y}}{2 a^{\frac{1}{2}}}$, or $\dot{x}^2 = \frac{9 y \dot{y}^2}{4 a}$; ſubſtituting, therefore, this value of $\dot{x}^2$ in the general expreſſion $\dot{z} = \surd (\dot{x}^2 + \dot{y}^2)$, we have

$$\dot{z} = \surd \left(\frac{9 y \dot{y}^2}{4 a} + \dot{y}^2 \right) = \frac{\dot{y}}{2 a^{\frac{1}{2}}} \surd (9 y + 4 a);$$

the fluent of which is

$$z = \frac{1}{27 a^{\frac{1}{2}}} \times (9 y + 4 a)^{\frac{3}{2}} + C, \text{ correction.}$$

Now when the arc = o, then $y = o$; therefore

$$\frac{4 a^{\frac{3}{2}}}{27 a^{\frac{1}{2}}} + C = o, \text{ or } C = -\frac{4 a^{\frac{3}{2}}}{27 a^{\frac{1}{2}}};$$

whence the complete fluent is

$$z = \frac{(9 y + 4 a)^{\frac{3}{2}} - 4 a^{\frac{3}{2}}}{27 a^{\frac{1}{2}}},$$

which is the length of the curve, anſwering to any length of the ordinate y.

II. *To rectify the common parabola;* or to find the length of any parabolic arc A M (*fig.* 11.) Let the parameter = a, the abſciſs = A P = x, &c. as above. From the well known property of this curve, $a x = y^2$; and $a \dot{x} = 2 y \dot{y}$; conſequently $\dot{x} = \frac{2 y \dot{y}}{a}$, and $\dot{x}^2 = \frac{4 y^2 \dot{y}^2}{a^2}$, which ſubſtituted for $\dot{x}^2$ in the general expreſſion for the length of the curve, makes $\dot{z} = \left(\frac{4 y^2 \dot{y}^2}{a^2} + \dot{y}^2 \right)^{\frac{1}{2}} = \frac{\dot{y}}{a} \times (a^2 + 4 y^2)^{\frac{1}{2}}$; which, thrown into an infinite ſeries, becomes $= \frac{\dot{y}}{a} \times \left(a + \frac{2 y^2}{a} - \frac{2 y^4}{a^3} + \frac{4 y^6}{a^5}, \text{ &c.} \right)$ *i. e.* $\dot{z} = \dot{y} + \frac{2 y^2 \dot{y}}{a^2} - \frac{2 y^4 \dot{y}}{a^4} + \frac{4 y^6 \dot{y}}{a^6}$, &c.

The fluent of this ſeries is $z = y + \frac{2 y^5}{3 a^2} - \frac{2 y^5}{5 a^4} + \frac{4 y^7}{7 a^6} -$, &c. = the length of the curve A M required.

Otherwiſe: the above $\dot{z} = \frac{\dot{y}}{a} \times (a^2 + 4 y^2)^{\frac{1}{2}}$ is $= \frac{\dot{y}}{a} \times \frac{a^2 + 4 y^2}{(a^2 + 4 y^2)^{\frac{1}{2}}} = \frac{a^2 y \dot{y} + 4 y^3 \dot{y}}{a \times (a^2 y^2 + 4 y^4)^{\frac{1}{2}}} = \frac{\frac{1}{2} a^2 y \dot{y} + 4 y^3 \dot{y}}{a \times (a^2 y^2 + 4 y^4)^{\frac{1}{2}}} + \frac{\frac{1}{2} a^2 \dot{y}}{a \times (a^2 + 4 y^2)^{\frac{1}{2}}} = \frac{1}{a} \times (a^2 y^2 + 4 y^4)^{-\frac{1}{2}} \times (\frac{1}{2} a^2 y \dot{y} + 4 y^3 \dot{y}) + \frac{1}{4} a \times \frac{\dot{y}}{(\frac{1}{4} a^2 + y^2)^{\frac{1}{2}}}$. But the fluent of the firſt of theſe two terms is $= \frac{1}{2a} \times (a^2 y^2 + 4 y^4)^{\frac{1}{2}} = \frac{y}{a} \times (\frac{1}{4} a^2 + y^2)^{\frac{1}{2}}$; and the fluent of the laſt of the two terms is $= \frac{1}{4} a \times$ hyp. log. of $y + (\frac{1}{4} a^2 + y^2)^{\frac{1}{2}}$; therefore $z = \frac{y}{a} \times (\frac{1}{4} a^2 + y^2)^{\frac{1}{2}} + \frac{1}{4} a \times$ hyp. log. of $y + (\frac{1}{4} a^2 + y^2)^{\frac{1}{2}}$. But when z and y vaniſh, or become equal o, as they do at the vertex, this fluent becomes $= \frac{1}{4} a \times$ hyp. log. of $\frac{1}{2} a$; and, therefore, the ſaid fluent being corrected, gives the true value of z, or the length of the curve A M $= \frac{y}{a} \times (\frac{1}{4} a^2 + y^2)^{\frac{1}{2}} + \frac{1}{4} a \times$ hyp. log. of $y + (\frac{1}{4} a^2 + y^2)^{\frac{1}{2}} - \frac{1}{4} a \times$ hyp. log. of $\frac{1}{2} a = \frac{y}{a} \times (\frac{1}{4} a^2 + y^2)^{\frac{1}{2}} + \frac{1}{4} a \times$ hyp. log. of $\frac{y + (\frac{1}{4} a^2 + y^2)^{\frac{1}{2}}}{\frac{1}{2} a}$.

Hence, if A C and D C (*fig.* 12.) be the conjugate ſemi-axes of an equilateral hyperbola; and A C = a, M P = $2y$, Q M = x, then will A P = $x - a$; and $x^2 - a^2 = 4 y^2$; therefore $x^2 = 4 y^2 + a^2$; conſequently $x = \surd (4 y^2 + a^2)$. If then $q m$ be ſuppoſed infinitely near Q M, we ſhall have Q $q = \dot{y}$, and therefore the element of the area C Q M A $= \dot{y} \times \surd (a^2 + 4 y^2)$. Whence it appears, that the rectification of the parabola depends on the quadrature of the hyperbolic ſpace C Q M A.

III. *To determine the length of an arc of the common hyperbola.* Let the ſemitranſverſe axis be repreſented by b, and the ſemiconjugate by c, and we ſhall have $\frac{b^2 y^2}{c^2} = 2 b x + x^2$, from the nature of the curve (ſee HYPERBOLA); and therefore $x = \frac{b \surd (c^2 + y^2)}{c} - b$: hence $\dot{x} = \frac{b y \dot{y}}{c \surd (c^2 + y^2)}$, and $\dot{z} = \surd (\dot{y}^2 + \dot{x}^2) = \surd \left\{ \dot{y}^2 + \frac{b^2 \dot{y}^2 y^2}{c^2 \times (c^2 + y^2)} \right\} = \dot{y} \surd \left(1 + \frac{b^2 y^2}{c^4 + c^2 y^2} \right)$; which, by converting $\frac{b^2 y^2}{c^4 + c^2 y^2}$ into an infinite ſeries, becomes $\dot{y} \surd (1 + \frac{b^2 y^2}{c^4} - \frac{b^2 y^4}{c^6} + \frac{b^2 y^6}{c^8} - \frac{b^2 y^8}{c^{10}}$, &c.) But ſtill we have the ſquare root to extract: in order to which, let it be aſſumed $= 1 + A y^2 + B y^4 + C y^6 + D y^8$, &c. Then, by ſquaring, and tranſpoſing, there ariſes

$$\left.\begin{array}{l} 1 + 2 A y^2 + 2 B y^4 + 2 C y^6 + 2 D y^8, \text{ &c.} \\ \qquad + A^2 y^4 + 2 A B y^6 + 2 A C y^8, \text{ &c.} \\ \qquad\qquad + B^2 y^8, \text{ &c.} \\ - 1 - \frac{b^2}{c^4} \times y^2 + \frac{b^2}{c^6} \times y^4 - \frac{b^2}{c^8} \times y^6 + \frac{b^2}{c^{10}} \times y^8, \text{ &c.} \end{array}\right\} = o.$$

Hence $A = \frac{b^2}{2 c^4}$; $B = -\frac{b^2}{2 c^6} - \frac{1}{2} A^2 = -\frac{b^2}{2 c^6} - \frac{b^4}{8 c^8}$; $C = \frac{b^2}{2 c^8} - A B = \frac{b^2}{2 c^8} + \frac{b^4}{4 c^{10}} + \frac{b^6}{16 c^{12}}$, &c. &c. Therefore $\dot{z} = \dot{y} \surd (1 + \frac{b^2 y^2}{c^4}$, &c.) $= \dot{y} \times (1 + A y^2 + B y^4$, &c.) $= \dot{y} + \frac{b^2}{2 c^4} \times y^2 \dot{y} - \left(\frac{b^2}{2 c^6} + \frac{b^4}{8 c^8} \right) \times y^4 \dot{y} + \left(\frac{b^2}{2 c^8} + \right.$

$\frac{b^4}{4c^{10}} + \frac{b^6}{16c^{12}}\Big) \times y^6\dot{y}$, &c. And consequently $z = y + \frac{b^2y^3}{6c^4} - \Big(\frac{b^2}{c^2} + \frac{b^4}{4c^4}\Big) \times \frac{y^5}{10c^4} + \Big(\frac{b^2}{c} + \frac{b^4}{2c^4} + \frac{b^6}{8c^6}\Big) \times \frac{y^7}{14c^6}$, &c.

By the very ſame way of proceeding, the arc of an ellipſis may be found, the equations of the two curves differing in nothing but their ſigns.

IV. *To rectify the ſpiral of Archimedes.* The value of t (A T, *fig.* 13.) being denoted by $\frac{b\,y}{\sqrt{(b^2+y^2)}}$ (ſee TANGENT *of the Spiral*, &c.) we have $\dot{z}\,\Big(= \frac{y\dot{y}}{t}\Big) = \dot{y}\,\frac{\sqrt{(b^2+y^2)}}{b}$; which fluxion being the ſame as that expreſſing the arc of the common parabola (Prob. II.), by inſerting in the expreſſion $\dot{z} = \frac{\dot{y}}{a} \times (a^2 + 4y^2)^{\frac{1}{2}}$, b for $\frac{1}{2}a$, its fluent will, therefore, be truly repreſented by the meaſure of the ſaid arc, or by $\frac{\frac{1}{2}y\sqrt{(b^2+y^2)}}{b} + \frac{1}{2}b \times$ hyp. log. $\frac{y + \sqrt{(b^2+y^2)}}{b}$, the value there found, by making the propoſed ſubſtitution.

V. *To rectify the involute of a circle*, whoſe nature is ſuch, that the part P R (*fig.* 14.) of the tangent intercepted by the point of contact and the perpendicular C P, is every where equal to the radius C O of the generating circle. In this caſe $\dot{z}\,\Big(= \frac{y\dot{y}}{t}\Big) = \frac{y\dot{y}}{a}$, we obtain $z = \frac{y^2}{2a}$, which, corrected by making $y = a =$ A C, becomes $\frac{y^2 - a^2}{2a}\Big(\frac{\text{C P}^2}{2\,\text{C A}}\Big)$, the true meaſure of the required arc A R.

VI. *To find the length of a circular arc.*—This may be expreſſed either in terms of the ſine, coſine, verſed ſine, or any other trigonometrical line, as follows. Firſt,

Let the verſed ſine $= x$, the ſine $= y$, radius $= r$, and arc $= z$, then, by the property of the circle, $y^2 = 2rx - x^2$

or, putting tangent $= t$ - - - $y^2 = \frac{r^2t^2}{r^2+t^2}$

and ſecant $= s$, gives - - - $y^2 = \frac{s^2 - r^2}{s^2}\,r^2$

as are readily deduced from the known properties of the circle.

Now, by means of theſe values of y^2, or of $2rx - x^2$, and the general equation $\dot{z} = \sqrt{(\dot{x}^2 + \dot{y}^2)}$, we readily draw the following values of $\dot{z}$, *viz.*

$$\dot{z} = \begin{cases} \frac{r\dot{x}}{\sqrt{(2rx - x^2)}} = \frac{r\dot{y}}{\sqrt{(r^2 - y^2)}} = \\ \frac{r^2\dot{t}}{r^2 + t^2} = \frac{r^2\dot{s}}{\sqrt{(s^2 - r^2)}} \end{cases}$$

the fluents of which can only be found in ſeries, which are as follows; making radius $r = 1$, *viz.*

$$z = \Big(1 + \frac{x}{2\cdot 3} + \frac{3x^2}{2\cdot 4\cdot 5} + \frac{3\cdot 5x^3}{2\cdot 4\cdot 6\cdot 7} + \text{&c.}\Big) \times \sqrt{x}$$

$$z = \Big(1 + \frac{y^2}{2\cdot 3} + \frac{3y^4}{2\cdot 4\cdot 5} + \frac{3\cdot 5y^6}{2\cdot 4\cdot 6\cdot 7} + \text{&c.}\Big) \times y$$

$$z = \Big(1 - \frac{t^2}{3} + \frac{t^4}{5} - \frac{t^6}{7} + \frac{t^8}{9} + \text{&c.}\Big) \times t$$

$$z = \Big(\frac{s - r}{s} + \frac{s^3 - r^4}{2\cdot 3\,s^3} + \frac{3\,(s^5 - r^3)}{2\cdot 4\cdot 5\,s^5} + \text{&c.}\Big) \times r$$

where r is retained in the latter for ſake of analogy.

It is obvious, therefore, that the arc may be computed by any of theſe, in terms either of the ſine or verſed ſine, tangent or ſecant, and conſequently alſo in terms of the coſine, co-tangent, co-ſecant, &c.

Thus, in the firſt, taking $x = \frac{1}{2}$, which is the verſed ſine of 60°, we have

$$\text{arc } 60^\circ = \Big(1 + \frac{1}{2\cdot 3} + \frac{3}{2^3\cdot 3\cdot 4\cdot 5} + \frac{3\cdot 5}{2^5\cdot 4\cdot 6\cdot 7}\Big)\sqrt{\frac{1}{2}}.$$

In the ſecond, aſſuming $y = \frac{1}{2} =$ ſin. 30°, we have

$$\text{arc } 30^\circ = \Big(1 + \frac{1}{2^1\cdot 3} + \frac{3}{2^5\cdot 4\cdot 5} + \frac{3\cdot 5}{2^7\cdot 4\cdot 6\cdot 7}\Big) \times \frac{1}{2}.$$

In the third, aſſuming $t = 1 =$ tang. 45°, we obtain

$$\text{arc } 45^\circ = \Big(1 - \frac{1}{3} + \frac{1}{5} - \frac{1}{7} + \frac{1}{9} - \frac{1}{11} + \text{&c.}\Big)\cdot r$$

In the fourth, aſſuming $s = 2 =$ ſec. 60°, we get

$$\text{arc } 60^\circ = \Big(\frac{2 - 1}{2} + \frac{2^3 - 1^3}{2^4\cdot 3} + \frac{3\,(2^5 - 1^5)}{2^6\cdot 4\cdot 5} + \text{&c.}\Big)\cdot r$$

Then multiplying the numbers obtained from theſe ſeries by the number of times that the arc is contained in the whole circumference, will give the circumference required.

But no one of theſe ſeries is ſufficiently convergent for aſcertaining the circumference of the circle to a great degree of accuracy, and therefore other methods have been contrived, in order to produce ſeries better calculated for this purpoſe, of which that of Machin has been the moſt popular; though it does not appear that he employed it in his celebrated quadrature or rectification, in which he found the circumference to one hundred places of figures.

In order to render theſe ſeries more converging, it is obvious that leſs arcs muſt be aſſumed, and the difficulty conſiſts only in finding the tangents (for example, uſing that ſeries) of a ſmall arc, which may be expreſſed in numbers that are tolerably manageable in the general ſeries.

For this purpoſe Machin, knowing the tangent of 45° to be 1, and that the tangent of an arc being known, any multiple of it is readily found, conſidered, that if there were aſſumed ſome ſmall ſimple number for the tangent of an arc, and then the tangent of the double arc were continually taken, until a tangent be found nearly equal to 1, the tangent of 45°: by taking the tangent of this ſmall difference between 45° and the multiple arc, there would be had two very ſmall tangents, the one of the firſt arc, and the other of this difference. Then computing the arc to theſe tangents, whether the meaſure of them in degrees, &c. were known or not, the whole arc of 45° would become known; *viz.* by multiplying the firſt by the aſſumed multiple, and adding the laſt arc to the product, if the tangent of the multiple arc were leſs than 1, or the arc itſelf leſs than 45°; but ſubtracting it if greater.

Having

Having thus laid down his plan of operation, by a few trials he fell upon a number well fuited to his purpofe, *viz.* knowing the tangent of $\frac{1}{4}$ of 45°, or 11° 15′, to be very nearly $\frac{1}{5}$, radius being 1, he aflumed for his firft arc that whofe tangent is $\frac{1}{5}$; then fince tan. $2a = \frac{2 \text{ tan. } a}{1 - \text{tan.}^2 a}$, he had $\frac{5}{12}$ for the tangent of his double arc, and $\frac{120}{119}$ for the double of this, or of four times the firft, which being a little greater than 45°, was well adapted to his views; for by a known trigonometrical property, tan. $(a - 45) = \frac{\text{tan. } a - 1}{\text{tan. } a + 1}$; that is, the tangent of the fmall arc, which is equal to the excefs of his multiple above 45°, was $\frac{\frac{120}{119} - 1}{\frac{120}{119} + 1} = \frac{1}{239}$. He had, therefore, two arcs to compute, the one having for its tangent $\frac{1}{5}$, and the other $\frac{1}{239}$; and then four times the firft of thefe arcs minus the latter, would evidently give the exact arc of 45°, and both thefe numbers being fuch as to converge very well in the general feries, the difficulty attending the ufual approximation was avoided. Other approximations, however, have fince been difcovered, which, if not more rapid, their inveftigation is, at leaft, more fimple, of which, perhaps, that of Euler's is the moft deferving of notice. This celebrated geometer obferves, that every arc whofe tangent is commenfurable with the radius, as, for inftance, 45°, may be divided into two arcs, of which the tangents, though much fmaller, are ftill commenfurable with the radius; for fince

$$\text{tan. } (a + b) = \frac{\text{tan. } a + \text{tan. } b}{1 - \text{tan. } a \text{ tan. } b},$$

we have alfo

$$\text{tan. } a = \frac{\text{tan. } (a + b) - \text{tan. } b}{\text{tan. } (a + b) \cdot \text{tan. } b + 1};$$

where it is obvious that if tan. $(a + b)$ and b be rational, tan. a will alfo be rational; thus, if tan. $(a + b) = \text{tan. } 45° = 1$, and tan. $b = \frac{1}{2}$, we have tan. $a = \frac{1}{3}$, and we fhall evidently have a fimilar refult, whatever rational fraction we affume for tan. b.

We fhall find, therefore, by the feries which gives the arc in terms of the tangent, each of thefe arcs, the fum of which will evidently be the meafure of the whole arc fought; whether the arcs themfelves, which belong to thefe tangents, be rational or irrational, with refpect to the whole arc of which they form the parts. Thefe tangents, fubftituted in the general ferics above, give arc to tan. $\left(\frac{1}{2}\right) =$

$$\frac{1}{2} - \frac{1}{3 \cdot 2^3} + \frac{1}{5 \cdot 2^5} - \frac{1}{7 \cdot 2^7} + \frac{1}{9 \cdot 2^9} - \text{ &c.}$$

and arc to tan. $\left(\frac{1}{3}\right) =$

$$\frac{1}{3} - \frac{1}{3 \cdot 3^3} + \frac{1}{5 \cdot 3^5} - \frac{1}{7 \cdot 3^7} + \frac{1}{9 \cdot 3^9} - \text{ &c.}$$

In both which feries, the terms diminifh much more rapidly than in the original feries, and may therefore be computed with tolerable eafe.

But it is evident that we may proceed farther in this approximation, by dividing each of thefe into other two arcs, by which means the convergency will obviouſly be much more rapid; and though, generally fpeaking, for every fubdivifion we double the number of our feries, yet the degree of convergency is fo much the greater as amply to compenfate for the additional number of feries. Befides, we may always fubdivide our greater arc, fo that one of its fubdivifions fhall be the fame as the fmaller arc, in which cafe we do not increafe the number of feries. Thus; arc to tan. $\frac{1}{2}$ = arc to tan. $\frac{1}{3}$ + arc to tan. $\frac{1}{7}$; therefore arc to tan. 1 = 2 arc to tan. $\frac{1}{3}$ + arc to tan. $\frac{1}{7}$. Again; arc to tan. $\frac{1}{3}$ = arc to tan. $\frac{1}{7}$ + arc to tan. $\frac{2}{11}$; therefore arc to tan. 1 = 3 arc to tan. $\frac{1}{7}$ + 2 arc to tan. $\frac{2}{11}$, and fo on to any extent required, which might in courfe be purfued fo far as to render the operation as fimple and as little laborious as can be expected in fuch kind of computations. Even with thefe already mentioned, the circumference of the circle might undoubtedly be computed to 200 places of decimals, with lefs labour than it coft Vieta to carry them to 10 places, or Romanus to 15.

The reader will obferve, that this approximation differs from Machin's in nothing except the fimplicity and generality of the inveftigation; for if we make the fucceffive fubdivifion of the greater arc, fo as always to include in it the fmaller one, we fhall find in our refults the identical formula of Machin.

Let us repeat our former expreffion

$$\text{tan. } a = \frac{\text{tan. } (a + b) - \text{tan. } b}{1 - \text{tan. } a \cdot \text{tan. } b}.$$

Let tan. $(a + b) = \frac{R}{T}$, tan. $a = \frac{R'}{T'}$, tan. $b = \frac{r}{t}$, and we fhall have generally $\frac{R'}{T'} = \frac{Rt - Tr}{Rr + Tt}$.

Let now tan. $(a + b) = 1$, anfwering to arc 45°, fo that $R = 1$, and $T = 1$; affume alfo $r = 1$, then, by conftantly fubftituting, in the general expreffion, the values found for R′, R″, R‴, &c. and T′, T″, T‴, &c. for R and T refpectively, we fhall have

$$\frac{R'}{T'} = \frac{t - 1}{t + 1}$$

$$\frac{R''}{T''} = \frac{t^2 - 2t - 1}{t^2 + 2t - 1}$$

$$\frac{R'''}{T'''} = \frac{t^3 - 3t^2 - 3t + 1}{t^3 + 3t^2 - 3t - 1}$$

$$\frac{R^{iv}}{T^{iv}} = \frac{t^4 - 4t^3 - 6t^2 + 4t + 1}{t^4 + 4t^3 - 6t^2 - 4t + 1}$$

$$\frac{R^{v}}{T^{v}} = \frac{t^5 - 5t^4 - 10t^3 + 10t^2 + 5t - 1}{t^5 + 5t^4 - 10t^3 - 10t^2 + 5t + 1}$$

$$\frac{R^{(n)}}{T^{(n)}} = \frac{t^n - nt^{n-1} - \frac{n(n-1)}{1 \cdot 2} t^{n-2} + \&c.}{t^n + nt^{n-1} - \frac{n(n-1)}{1 \cdot 2} t^{n-2} - \&c.}$$

So that, generally, arc to tan. $1 = n \times$ arc to tan. $\frac{1}{t}$ + arc to tan. $\frac{R^{(n)}}{T^{(n)}}$. If we take $n = 1$, and $t = 3$, we have arc tan. $1 =$ arc tan. $\frac{1}{3}$ + arc tan. $\frac{1}{2}$. If $n = 2$, and $t = 3$, we have arc tan. $1 = 2 \times$ arc tan. $\frac{1}{3}$ + arc tan. $\frac{1}{7}$. If $n = 4$, and $t = 5$, we have arc. tan. $1 = 4 \times$ arc tan. $\frac{1}{5}$ − arc tan. $\frac{1}{239}$; which is the formula of Machin; and by giving other values to n and t, a variety of other formulæ might be found, though it would, probably, be difficult to find one more convergent than the laſt. The reader will find more on this ſubject in vol. i. of Dr. Hutton's Tracts.

We ſhall conclude this article by giving the circumference of the circle to 155 places, as given by Zach, from a manuſcript which he ſaw in the Ratcliff library at Oxford, diſtinguiſhing the periods of the ſeveral approximations of different authors mentioned in the preceding part of this article, and the article QUADRATURE.

The diameter of a circle being 1, the circumference will be

a	b	c		d
3.14 159,	2 6535,	89793,		2 3846,
			e	
26433,	83279,	50288,		41971,
69399,	37510,	58209,		74944,
			f	
59230,	78164,	06286,		20899,
				g
86280,	34825,	34211,		70679,
			*	
82148,	08651,	32823,		06647,
	h			
09384,	46 095,	50582,		23172,
			i	
53594,	08128,	4802.		

a, Archimedes; b, Métius; c, Vieta; d, Adrianus Romanus; e, Van Ceulen; f, Abraham Sharp; g, Machin; h, Lagny; i, Oxford Manuſcript.

* This figure is a 7 in Lagny's approximation, but Vega, in the reviſion of the computation, aſſerts that it ought to be an 8, as we have given it.

RECTIFIED SPIRITS, &c. are ſuch as have undergone the operation of rectification, or have been diſtilled over and over, to ſeparate from them any heterogeneous matter, which might have ariſen with them in the former diſtillations.

Hence we ſay, ſpirit of wine twice rectified, thrice rectified, &c.

It is the rectification that makes the difference between brandy and rectified ſpirits of wine. See SPIRITS.

RECTIFIER, in *Navigation*, is an inſtrument uſed for determining the variation of the compaſs, in order to rectify the ſhip's courſe, &c.

It conſiſts of two circles, either laid upon, or let into one another, and ſo faſtened together in their centres, that they repreſent two compaſſes, the one fixed, the other moveable: each is divided into thirty-two points of the compaſs, and three hundred and ſixty degrees, and numbered both ways, from the north and the ſouth, ending at the eaſt and weſt in ninety degrees.

The fixed compaſs repreſents the horizon, in which the north, and all the other points, are liable to variation.

In the centre of the moveable compaſs is faſtened a ſilk thread, long enough to reach the outſide of the fixed compaſs: but if the inſtrument be made of wood, an index is uſed inſtead of the thread.

RECTIFIER, in the *Diſtillery*, the perſon whoſe employment is to take the coarſe malt-ſpirit of the malt-ſtiller, and re-diſtil it to a finer and better liquor. The art of the rectifier might be entirely ſet aſide, if the malt-ſtiller could make his ſpirit perfect at a ſecond operation; which ſeems very practicable, if the malt-ſtillers could be induced to forſake their old practice. The great things to be recommended for the improvement of their art, would be, firſt, the brewing in perfection; and ſecondly, the keeping of their waſh after the manner of ſtale beer, till it has entirely loſt its malt flavour, and acquired a pungent acid vinoſity; and then, thirdly, leaving out the lees, to diſtil with a well-regulated fire. It is ſcarcely to be thought how pure a ſpirit is to be obtained from malt this way; but the great art would be, the finding of a method to make malt liquors artificially ſtale, bright, and flavourleſs, though otherwiſe vinous. Shaw's Lectures, p. 223.

RECTIFYING *of Curves*. See RECTIFICATION.

RECTIFYING *of the Globe* or *Sphere*, is a previous adjuſting of the globe or ſphere, to prepare it for the ſolution of problems. For the method of doing it, ſee *Uſe of the Celeſtial* GLOBE.

RECTILINEAR, RIGHT-LINED, in *Geometry*, is applied to figures whoſe perimeter conſiſts of right lines.

RECTILINEAR *Angle*, *Maps*, and *Superficies*. See the ſubſtantives.

RECTITUDE, RECTITUDO, *Rectum*, in matters of philoſophy, refers either to the act of judging, or of willing; and therefore, whatever comes under the denomination of rectitude is either what is true, or what is good: theſe being the objects about which the mind exerciſes its two faculties of judging and willing.

Rectitude of the mind, conſidered as it judges, *i. e.* rectitude of the faculty of judgment, conſiſts in its agreement and conformity to the nature and reaſon of things, and in its determining and deciding about them according to what their conſtitutions, properties, uſes, &c. really are.

Rectitude of the mind, conſidered as it wills, called alſo *moral rectitude*, or *uprightneſs*, conſiſts in the chooſing and purſuing of thoſe things which the mind, upon due enquiry and attention, clearly perceives to be good; and avoiding thoſe that are evil.

RECTITUDINES, in *Law*, rights, or legal dues, belonging either to God, or man. See RIGHT.

RECTO, a writ uſually called a *writ of right*; of ſo high a nature, that whereas other writs in real action are only to recover the poſſeſſion of the lands, &c. in queſtion, loſt by the plaintiff, or his anceſtor; this aims to recover both the ſeiſin thus loſt, and the property of the thing: ſo that both rights are here blended together; that of *property*, and that of *poſſeſſion*.

If a man loſe his cauſe upon this writ, he is without all remedy.

There are two kinds of this writ: *breve magnum de recto*,

or

or *breve de recto patens*, a writ of right patent; and *recto clauſum*, a writ of right cloſe.

The firſt is ſo called, becauſe ſent open. It lies only for him that hath fee-ſimple in the lands ſued for, againſt the tenant of the freehold at leaſt.

Indeed, the writ of right patent is extended, in practice, beyond its original intention; for a writ of right of dower, which lies for the tenant in dower, is patent; and ſo in ſeveral other caſes. Fitzherb.

The writ of right cloſe, called alſo *breve parvum de recto*, is directed to the lord of ancient demeſne, or the bailiff of the king's manors; and lies for thoſe who hold lands and tenements by charter, in fee-ſimple, or in fee-tail, or for term of life, or in dower, if they be ejected out of ſuch lands, or diſſeiſed. In ſuch caſe a man, or his heirs, may ſue out the writ of right cloſe, directed to the lord of ancient demeſne, commanding him to do him right in his court. This is called a writ *ſecundum conſuetudinem manerii*. See Possession, Property, Title, and Writ.

Recto *de advocatione eccleſiæ*, a writ of right, lying where a man has right of advowſon in fee to him, and his heirs; and, the incumbent dying, a ſtranger preſents his clerk to the church; and he, not having brought his action of *quare impedit*, nor *darrein preſentment*, within ſix months, has ſuffered the ſtranger to uſurp upon him. See *Diſturbance of* Patronage, Quare *impedit*, and Assisa *darrein preſentment*.

Recto *de cuſtodia terræ & hæredis*, a writ which lies for him whoſe tenant dying in his nonage, a ſtranger enters, and takes the body of the heir.

This writ as to lands holden *in capite*, or by knight's ſervice, is become uſeleſs by the ſtat. 12 Car. II. but not where there is a guardian in ſocage, or appointed by the laſt will of the anceſtor. See Guardian.

Recto *de dote*, a writ of right of dower, which lies for a woman that has received part of her dower, and proceeds to demand the remnant in the ſame town againſt the heir, or his guardian. This extends either to part or the whole, and is a more general remedy than that mentioned in the next article.

Recto *de dote unde nihil habet*, is a writ of right which lies in caſe where the huſband, having divers lands and tenements, has aſſured no dower to his wife; and ſhe is thereby driven to ſue for her thirds againſt the heir, or his guardian. See Dower, and *Writ of* Entry.

Recto *quando* or *quia dominus remiſit*, a writ of right, which lies in caſe where lands or tenements in the ſignory of any lord, are in demand by a writ of right.

If the lord hold no court, or, at the prayer of the demandant or tenant, ſend his writ to the king's court, to put the cauſe thither for that time; this writ iſſues for the other party, and has its name from the words compriſed, which is the true occaſion of it.

Recto *de rationabili parte*, a writ that lies between privies of blood, as brothers in gavel-kind, or ſiſters, or other coparceners, as nephews and nieces, and for land in fee-ſimple.

If a man leaſe his land for life, and afterwards die, leaving iſſue two daughters, and, after, the tenant for life likewiſe dies; the one ſiſter entering on all the land, and ſo deforcing the other, the ſiſter ſo deforced ſhall have this writ to recover her part.

Recto *ſur diſclaimer*, a writ which lies where the lord, in the court of common pleas, does avow upon his tenant, and the tenant diſclaims to hold of him; upon which diſclaimer the lord ſhall have this writ. This takes place when the tenant upon a writ of aſſiſe for rent, or on a replevin, diſowns or diſclaims his tenure; whereby the lord loſes his verdict; in which caſe the lord may have this writ, grounded on this denial of tenure, and ſhall, upon proof of the tenure, recover back the land itſelf ſo holden, as a puniſhment to the tenant for ſuch his falſe diſclaimer. This piece of retaliating juſtice, whereby the tenant who endeavours to defraud his lord is himſelf deprived of the eſtate, as it evidently proceeds upon feodal principles, ſo it is expreſsly to be met with in the feodal conſtitutions: "vaſallus, qui abnegavit feudum ejuſve conditionem, exſpoliabitur."

Recto *folio*. See Folio.

RECTOR of a pariſh, the parſon, or he who has the charge or cure of a pariſh church. See Parson.

If the predial tythes of the pariſh be impropriated, or appropriated, *i. e.* either in lay hands, or in thoſe of ſome eccleſiaſtical community, then, inſtead of *rector*, the parſon is called *vicar*, (which ſee). In England are reckoned 3485 rectories.

The name rector denotes him governor or ruler, *quia tantum jus in eccleſia parochiali habet, quantum prælatus in eccleſia collegiata.*

Rector alſo denotes the chief elective officer in ſeveral foreign univerſities, particularly in that of Paris.

Rector is alſo uſed in ſeveral convents for the ſuperior, or officer who governs the houſe.

The Jeſuits uſed it for the ſuperiors in ſuch of their houſes as were either ſeminaries, or colleges.

RECTORY, or Rectorate, *Rectoria*, a pariſh chureh, parſonage, or ſpiritual living, with all its rights, glebes, and tythes.

RECTRICES, in *Ornithology*, denote the ſtrong feathers of the tails of birds.

RECTUM Intestinum, in *Anatomy*; or in Engliſh, ſimply the *rectum*; is the laſt portion of the large inteſtine, and of the whole alimentary canal. It begins at the left ſacro-iliac ſymphyſis, below the ſigmoid flexure of the colon, and ends at the anus. See Intestine.

Rectum, *Abſceſſes in the Neighbourhood of*. See Fistula *in Ano*.

Rectum, *Concretions and extraneous Subſtances lodged in*. The concretions formed in the larger inteſtines, and eſpecially in the rectum, by the accumulation and protracted lodgment of the feces, may become the cauſe of obſtinate conſtipation, which can only be removed by their extraction. Sometimes theſe maſſes of indurated matter include no extraneous ſubſtance; in other inſtances, their nucleus is a biliary calculus; in a vaſt number of caſes, they are merely compoſed of the feces in a dry hardened ſtate. It is remarked that women, and perſons of advanced age, are moſt ſubject to the conſtipation ariſing from the obſtruction thus occaſioned in the large inteſtines. Children and adults in the vigour of life are not, however, entirely exempt from the diſorder, though they ſeldom have it, except when the formation of ſuch concretions in the bowels has been brought on by ſwallowing a large quantity of hard indigeſtible bodies, like cherry and plum-ſtones. Laſtly, exceſſively hardened maſſes of fecal matter have been noticed in patients who have for a long while been confined to bed in the recumbent poſture by ſevere diſeaſes.

Whatever may be the cauſe of the diſorder, whether the defect itſelf conſiſts in a mere accumulation of indurated feces, with which the rectum is diſtended, and behind which the excrement is detained; or whether the conſtipation is not complete, the concretion allowing the liquid part of the feces to paſs out between it and the inſide of the inteſtine; the exiſtence of the hardened maſs may be known

by the conſtipation which it produces; by the ſenſe of weight which the patient feels about the fundament; and alſo by the poſſibility of actually touching the indurated obſtructing body, when a finger is introduced up the rectum.

Oily emollient clyſters, and carminative draughts, will ſerve for expelling ſuch concretions as are not of too firm a conſiſtence; but the extraction of them is abſolutely neceſſary when they are particularly hard. The operation is to be done with a ſpoon, or ſuitable forceps, properly oiled; and, after the concretion has been removed, an emollient clyſter is to be adminiſtered, in order to allay any irritation which may have been cauſed by the introduction of the requiſite inſtruments. When the ſphincter ani contracts ſo forcibly, that the operation is attended with extreme pain and difficulty, we are adviſed by ſurgical writers to make a dilatation of the anus, by practiſing an inciſion at its poſterior angle. A wound made in this direction cannot do injury to any part of conſequence, whilſt there would be a riſk of wounding the urethra in the male, or the vagina in the female ſubject, if the cut were made at the anterior angle. An inciſion, carried laterally, would be apt to injure the pudic veſſels. A diviſion of the fibres of the ſphincter ani does not produce any material permanent weakneſs of its action, and a paralyſis of this muſcle, according to Richerand, can never proceed from ſuch a cauſe. Noſographie Chirurgicale, tom. iii. p. 414. edit. 2.

The hard concretions which lodge in the rectum cannot be reached with the finger when they are ſituated high, and, in this circumſtance, the ſurgeon muſt uſe a probe, or ſound, in order to aſſure himſelf poſitively of their preſence, their moveableneſs, and their ſize.

With regard to foreign bodies lodged in this inteſtine, ſome have been ſwallowed, and have paſſed through the whole extent of the alimentary canal; while others have been puſhed up the anus to a greater or leſſer height. The extraction of theſe laſt is generally attended with a great deal of difficulty, and even demands on the part of the operator more than ordinary ſagacity, in conſequence of the various ſhapes, the hardneſs, and the fragility of theſe different bodies. Glaſs phials, inſtrument caſes, ſhuttles, &c. have been introduced into the rectum by maniacs. One perſon of this deſcription put into his rectum a flint-ſtone, which did not admit either of being extracted, or broken, owing to its hardneſs, and ſlippery ſurface, and which in the end cauſed the patient to die in the greateſt agony, with ſwelling and gangrenous miſchief in the abdomen. Marchetti has recorded an inſtance, in which a pig's tail, hardened by cold, was forcibly thruſt up the rectum of a girl of the town. This extraneous body could not be withdrawn, as the ſhort briſtles, which all inclined outward, immediately came into contact with and pierced the inner part of the bowel. It remained in the part ſix days, and occaſioned a train of alarming ſymptoms, ſuch as fever, vomiting, ſwelling of the abdomen, and obſtinate conſtipation. Marchetti faſtened a ligature to the end of the foreign body, which protruded at the anus, and then paſſed the ligature through a long piece of reed, which he introduced up the rectum, in order that the foreign body might be drawn through this tube without the inteſtine being lacerated. The experiment was completely ſucceſsful. Obſ. Med. Chir. p. 126.

In another example a piece of wood, three inches long, and two in width, was introduced into the rectum. Colic, tenſion of the abdomen, fever, conſtipation, and difficulty of making water, came on, and laſted ſix days. The impoſſibility of removing the extraneous ſubſtance with a pair of forceps, led to the idea of uſing a borer, which, having been paſſed up the rectum under the guidance of the finger, was inſerted deeply enough into the piece of wood to draw it out. The extraction, however, could not be effected without a great deal of pain. See Mélanges de Chirurgie, par M. Saucerotte, p. 484. Mémoires de l'Academie de Chirurgie, tom. v. p. 605. Laſſus, Pathologie Chirurgicale, tom. ii. p. 569, edit. 2.

Rectum, *Congenital and Syphilitic Contractions of its inferior Portion.* A contraction of the lower end of the rectum is ſometimes an original malformation; but more frequently it ariſes from what has been conſidered by various ſurgical authors to be a venereal thickening of the parietes of this inteſtine. If this be really a ſyphilitic diſorder, a circumſtance which is to be doubted, it is certainly as grievous as any of the more common effects of the venereal diſeaſe. Excreſcences grow from the mucous membrane at the rectum, and diſcharge a purulent matter, which is continually oozing from the anus. When a finger is paſſed within this aperture, the irregularities occaſioned by the tumour may be plainly felt. Such writers as believe in the ſyphilitic nature of this complaint inform us, that the truth of this may be known by the antecedent and co-exiſtent ſymptoms of the venereal diſeaſe. They admit, however, that the diſorder almoſt always laſts after the cure of every other mark of ſyphilis, and they caution us not to perſiſt raſhly in adminiſtering mercury any longer for a diſeaſe which cannot be further benefited by it. Theſe circumſtances are quite ſufficient to prove that there is not much reaſon for the doctrine, that this ſort of contraction of the lower end of the rectum is venereal.

Such writers as conſider the complaint to be connected with ſyphilis, of courſe recommend the exhibition of mercury, and they further adviſe the frequent injection into the rectum of a weak ſolution of the oxymuriate of the ſame mineral. Tents, ſmeared with mercurial ointment, are alſo recommended to be paſſed into the bowel. The latter applications are ſtated to have the advantage; 1ſt, of oppoſing, by mechanical preſſure, the further increaſe of the excreſcences; 2dly, of dilating the contracted part; and, 3dly, of acting on the diſeaſe by their medicinal quality.

For our own part, we much doubt the reality of the venereal nature of the foregoing complaint. The language of the advocates for ſuch a doctrine muſt raiſe ſuſpicions, that they are influenced in their judgment more by prejudice than reaſon. "The venereal affection of the coats of the rectum (ſays one of theſe writers) almoſt always laſts after the total extinction of the ſyphilitic virus. Then, we ought to be content with the employment of dilating mechanical means, without perſiſting in the uſe of medicines, which would ſerve only to ruin the patient's conſtitution. An elaſtic gum cannula is to be preferred, and it ſhould be of a conical ſhape, in order that it may be gradually introduced further and further, in proportion as the dilatation of the bowel is effected." Richerand, Noſographie Chirurg. tom. iii. p. 418, edit. 2.

In caſes of congenital contraction of the rectum, the only plan which can be adopted, is that of making an inciſion through the poſterior part of the inteſtine.

Rectum, *Polypi of.* Sometimes, though not often, polypi grow from the mucous membrane of the rectum, and by their ſize obſtruct the paſſage of the feces. Their exiſtence is at firſt manifeſted by an uneaſy ſenſe of heavineſs, and afterwards they are protruded outwardly in the efforts which the patient makes at ſtool. The anus contracting after their expulſion, their roots become ſtrangulated, ſo that they cannot return, and exceſſive agony is produced.

In this circumſtance, the ſurgeon ſhould take the opportunity of removing them with a knife, after having tied their root, or even without this precaution. The lining of the rectum, freed from the weight of the tumour, immediately retracts, and if the polypus ſhould have received a ſupply of blood from a large veſſel, hemorrhage may enſue. Such accident may be remedied by completely diſtending the wounded part of the rectum with a large piece of ſponge, or with a compreſs of lint; but as it is eaſier to prevent the hæmorrhage altogether, than to ſtop it after it has occurred, we would adviſe ſurgeons, whenever the excreſcence is of any ſize, always to tie its root before removing the reſt of it with a cutting inſtrument.

RECTUM, *Prolapſus of.* See PROLAPSUS *Ani.*

RECTUM, *Scirrho-contracted.* Scirrhus of the rectum is not uncommon at an advanced period of life. Sometimes it extends over a conſiderable length of the gut, but generally it is more circumſcribed. The coats of the bowel become much thicker and harder than in the natural ſtate. The muſcular coat is ſubdivided by membranous ſepta, and the internal coat is ſometimes formed into hard irregular folds. The ſurface of the inner membrane is occaſionally ulcerated, ſo as to form a cancerous diſeaſe. Every veſtige of the natural ſtructure is occaſionally loſt, and the gut is changed into a griſtly ſubſtance. The cavity of the bowel is always rendered narrow at the ſcirrhous part, and is ſometimes almoſt obliterated. When the paſſage through the gut is much obſtructed, the bowel is always a good deal enlarged juſt above the ſtoppage, or ſtricture, from the accumulation of the feces there. As the diſeaſe advances, adheſions form between the rectum and adjacent parts, and ulcerations produce communications between them.

The diſeaſe is uſually not much noticed till ſomewhat advanced, not being at firſt very painful. The patient only thinks that he is coſtive, and that he voids his ſtools with a little difficulty. In time, a good deal of pain is felt in the part affected, eſpecially at ſtool, after which ſome relief is experienced. Pus and blood may ſometimes be noticed with the excrement, particularly when the diſeaſe has advanced to the ulcerated ſtate. The patient at length becomes ſallow, the conſtitution ſuffers, and diſſolution follows. Severe teneſmus attends the whole courſe of the diſeaſe.

Deſault has often ſeen the diſeaſe form a communication between the rectum and vagina, and the feces have paſſed through the latter part. In the latter ſtage of the affliction, the rectum, bladder, vagina, uterus, and adjacent parts, are all involved in one common ulceration.

When the diſeaſe has attained the ulcerated ſtate, it is probably always incurable. Palliatives can now only be reſorted to, ſuch as anodyne and emollient glyſters, the warm-bath, &c. with the exhibition of medicines like opium, cicuta, uva urſi, &c. Claudius applied his remedies to the inſide of the bowel by means of tents, and did not employ the latter as a mode of curing the diſeaſe, when leſs advanced. Valſalva uſed to introduce a cannula pierced with numerous holes, when his patient got into the bath, ſo as to let the fluid enter the inteſtine. Numerous practitioners, among them Morgagni, made mercurials the baſe of their treatment, from a ſuppoſition that the complaint was of venereal origin.

When the diſeaſe is not attended with ulceration, the contraction and thickening of the gut may be diminiſhed by introducing bougies, keeping them for a certain time, every day, ſo introduced, and increaſing their ſize gradually. The preſſure of theſe inſtruments ſeems to leſſen the diſeaſe, and ſtop its progreſs; a proof that its nature differs from that of what is uſually underſtood by ſcirrhus. Deſault uſed to employ long tents, made of lint, ſmeared with cerate, and paſſed into the bowel by means of a probe, with a forked end. This ſurgeon gradually increaſed the ſize of the tents, ſo as to continue the compreſſion, to which he conceived all the good was owing. Their length was alſo augmented by degrees. Freſh ones were, at firſt, introduced twice every day. When any hardneſſes were ſituated on the outſide of the anus, Deſault cured them on the ſame principle, *viz.* by making preſſure on them with compreſſes and a bandage. This eminent ſurgeon effected a cure of a ſcirrho-contracted rectum by this method. The woman was taught to paſs occaſionally the tents herſelf, ſo as to prevent a relapſe. The diſeaſe is ſaid to afflict women more frequently than men: from a comparative table kept at the Hôtel-Dieu, this has been the caſe there in the proportion of ten to one. See Œuvres Chirurgicales de Deſault, tom. ii. p. 422.

RECTUM, *Hemorrhoidal Swellings of.* See HEMORRHOIDS.

RECTUM, in *Law.* See RECTO.

RECTUM, in our old *Law Writers*, is alſo uſed for a trial or accuſation.

RECTUM, *Commune*, denotes a trial at law, or in the common courſe of law. *Stare ad rectum*, denotes to ſtand a trial. *Rectum rogare*, to petition the judge to do right.

RECTUS, in *Anatomy*, a name applied to ſeveral muſcles, generally, but not invariably, diſtinguiſhed by the ſtraightneſs of their fibres, or of their general direction.

RECTUS *abdominis.* See OBLIQUUS.

RECTUS *abducens*, or *externus*,
RECTUS *adducens*, or *internus*,
RECTUS *attollens*, or *ſuperior*,
RECTUS *deprimens*, or *inferior*,
} muſcles of the globe of the eye. See EYE.

RECTUS *anterior cruris*, or *femoris*,
RECTUS *extenſor cruris*, or *femoris*,
} ſynonyms of the RECTUS *cruris*; which ſee.

RECTUS *capitis anticus major et minor.* See RECTUS *internus.*

RECTUS *capitis internus major*, rectus anticus major, trachèlo-ſous-occipitien; a muſcle of the head, flattened, broader and thicker above than below, occupying the anterior and lateral part of the neck, and reaching from the tranſverſe proceſs of the ſixth cervical vertebra, to the inferior ſurface of the baſilary proceſs of the occiput. Its anterior ſurface is covered by the carotid artery, the internal jugular vein, the nerve of the eighth pair, the great ſympathetic, and the pharynx. The longus colli, the rectus capitis internus minor, the articulations of the occciput and atlas, and of the latter bone, and the ſecond vertebra, are covered by its poſterior ſurface. The inner edge lies on the longus colli, and is connected to it by cellular ſubſtance: the outer is fixed to the front of the tranſverſe proceſſes of the ſixth, fifth, fourth, and third cervical vertebræ, and is unattached above the latter. The lower end, very thin and pointed, is fixed to the tranſverſe proceſs of the ſixth cervical vertebra: it aſcends with a little obliquity from without inwards, increaſing in breadth and thickneſs: it approaches the muſcle of the oppoſite ſide, and is attached by its upper end to the baſilary proceſs of the occipital bone, in front of the foramen magnum. At the upper part of this muſcle is a broad and thin aponeuroſis, which deſcends on the anterior and inner ſurface: the attachments to the tranſverſe proceſſes are by ſmall tendons terminating in muſcular portions. The muſcular fibres run obliquely between the laſt mentioned tendons and the aponeuroſis.

This muſcle bends the head forwards on the neck; and reſtores it after it has been carried backwards. The muſcle

of one ſide, acting ſingly, inclines the head towards its own ſide.

Rectus *capitis internus minor*, or rectus anticus minor, trachèli-ſous-occipitien; a ſmall muſcle of the head, lying under the laſt, ſhort, narrow, and flattened, and extending from the atlas to the occiput. It is covered in front by the rectus internus major, the internal carotid artery, and the great ſympathetic nerve: behind it covers the capſule of the articulation between the atlas and occiput. The outer and inner edges preſent nothing remarkable. Its lower extremity is fixed to the anterior ſurface of the lateral portion of the atlas, and to the neighbouring part of its tranſverſe proceſs. Thence it aſcends, increaſing ſomewhat in ſize, and inclined a little inwards, and is fixed to the under ſurface of the baſilary proceſs of the occiput, behind and a little on the outſide of the rectus internus major, and to the cartilaginous maſs filling the ſpace between the occipital and temporal bones. It has aponeuroſes at its extremities, and very ſhort muſcular fibres between theſe.

Its action on the head is exactly the ſame with that of the rectus internus major.

Rectus *capitis lateralis*, le premier tranſverſaire anterieur Winſlow, atloïdo-maſtoïdien, petit droit lateral; a ſmall muſcle of the head, ſituated at the upper and lateral part of the neck, flattened and quadrilateral, reaching from the tranſverſe proceſs of the atlas to the occiput. It is covered in front by the internal jugular vein; and it covers behind the vertebral artery. The two edges preſent nothing remarkable. Below it is fixed to the front of the upper ſurface of the tranſverſe proceſs of the atlas: thence it aſcends a little outwards, and is attached above to the rough impreſſion behind the jugular foſſa. It is muſcular, except juſt at the attachments, which are tendinous. Its action, like that of the two laſt muſcles, is to reſtore the head, when it has been bent backwards; to bend it forwards; and, when one muſcle acts ſingly, to incline it laterally.

Rectus *capitis poſticus major*, axoïdo-occipitien; a muſcle of the head, of a triangular flattened figure, placed at the upper and back part of the neck, and extending from the ſpinous proceſs of the ſecond cervical vertebra to the occiput. Its poſterior ſurface is covered by the complexus, and above by the obliquus ſuperior capitis; the anterior ſurface covers the poſticus minor, and the occiput. The inferior extremity, narrow, and almoſt pointed, is attached to the ſpinous proceſs of the ſecond cervical vertebra, thence it aſcends, directed outwards, and a little backwards, and gradually increaſing in breadth, to be inſerted in the inferior ſurface of the occiput, at about an equal diſtance from the great external tranſverſe ridge, and the foramen magnum, between the complexus, the obliquus ſuperior, and the rectus poſticus minor. The extremities alone are tendinous; the reſt being muſcular. It reſtores the head, when it has been bent forwards; and carries it back on the vertebral column. When one muſcle acts ſingly, it will have the power, from the oblique direction of its fibres, of rotating the head, ſo as to turn the face towards its own ſide.

Rectus *capitis poſticus minor*, atloïdo-occipitien; a ſmall flattened muſcle with radiated fibres, and conſequently a triangular figure, placed at the upper and back part of the neck, extending from the atlas to the occiput, and lying with its fellow in the interval between the two recti majores. Its poſterior ſurface is inclined downwards and covered by the complexus; the anterior ſurface correſponds to the occiput, and to the interval between it and the atlas. The lower extremity is the narroweſt part, and is fixed to the rough impreſſion in the middle of the poſterior ſurface of the poſterior arc of the atlas: it aſcends parallel to the oppoſite muſcle and directed backwards, and is fixed to the external ſurface of the occipital bone at a ſhort diſtance from the foramen magnum. It raiſes the head when bent forwards; and extends it or carries it back on the neck.

Rectus *cruris*, rectus extenſor or anterior cruris, droit ou grêle anterieur, ileo-rotulien; a muſcle of the thigh, long and flat, broad in the middle, and narrow towards its extremities, occupying the middle and front part of the limb, and reaching from the anterior and inferior ſpine of the ilium to the patella. It is covered in front by the iliacus internus, the ſartorius, and the faſcia lata; behind it covers the orbicular ligament of the hip, the great extenſors of the knee, and the external or anterior circumflex veſſels. The outer and inner margins of the muſcle are unattached in their upper three-fourths; they are confounded, in their lower fourth, with the extenſors of the knee.

The ſuperior extremity of the rectus cruris preſents two tendons, one of which is ſtraight, the other curved. The former is fixed to the anterior and inferior ſpine of the os innominatum: the latter, curved from before backwards, and from above downwards, is fixed to the outer ſurface of the os innominatum for about an inch, immediately above the edge of the acetabulum. From this upper attachment the muſcle deſcends vertically in front of the thigh, growing broader to the middle of the limb; it then becomes narrow towards the lower part, and is fixed to the baſis of the patella.

The rectus is tendinous at its extremities, and fleſhy in the middle. The upper tendon has been already deſcribed as divided into two portions; the anterior of theſe, attached to the anterior and inferior ſpine of the os innominatum, is the thickeſt and ſhorteſt, and has the ſame direction as the muſcle; the other is longer and curved, and detaches ſome fibres to ſtrengthen the orbicular ligament of the hip. The two portions ſoon unite in a common tendon; this ſpreads out into a broad aponeuroſis, which deſcends about four inches on the front of the muſcle, and then dips into its ſubſtance. The inferior tendon is broad and flat, and riſes from the baſis of the patella; its poſterior ſurface is united to the great extenſors of the knee, and the edges are ſtrongly connected to the vaſtus externus and internus. It is broad at the patella, grows a little narrower as it riſes, then ſpreads out again, and forms a broad aponeuroſis, covering the back of the muſcle above its middle. The ſuperficial fibres of this tendon deſcend over the front of the patella, to which they are ſtrongly united, and are loſt below in the tendon which unites this bone to the tibia. The muſcular fibres are placed very obliquely between the ſuperior and inferior tendons: they cover the back of the firſt up to the part where its two portions ſeparate; and they deſcend on the front of the ſecond to within two inches of the patella.

It extends the knee-joint, either by bringing the leg forwards upon the thigh, or the thigh upon the leg, according as the one or the other part is rendered a fixed point. If the knee be extended, or firmly retained in the bent poſition by its flexor muſcles, the rectus may bend the thigh upon the pelvis: when the leg and thigh are fixed, it can bend the pelvis forwards upon the latter, as in the attitude of ſtooping to pick up any object from the ground. In the erect attitude it prevents the pelvis from inclining backwards; and reſtores it when it has been carried in that direction.

Rectus *in curia*, in *Law*, one who ſtands at the bar, and no man objects any thing againſt him.

When

When a man hath reverſed the outlawry, and can participate of the benefit of the law, he is ſaid to be *rectus in curia*.

RECULVER, in *Geography*, a village and pariſh in the upper half-hundred of Blean-Gate, lathe of St. Auguſtine, and county of Kent, England, is ſituated at the diſtance of 10 miles N.E. by N. from Canterbury. It is noted in hiſtory as the ſcite of the Roman *Regulbium*, the ſtation or caſtle which defended the northern entrance to the celebrated *Portus Rutupenſis*. It is remarkable, that while the ocean has receded from the ſouthern entrance, leaving Richborough (Rutupium) conſiderably inland, it has gradually advanced upon Reculver. This is proved on the authority of ſeveral ancient writers, particularly Leland, who ſtates, that in his time it ſtood about half a mile from the ſhore, whereas, at preſent, the tide waſhes the walls of many of the village houſes, and threatens to overwhelm the whole at no diſtant period. Regulbium was a ſtation of much importance, as it not only commanded an extenſive view of the open ſea, but likewiſe of the mouths of the Thames and the Medway. It was therefore uſed as a watch-poſt to diſcover the approaches of an enemy; and alſo as a light-houſe to guide ſailors. In its perfect ſtate the ſtation was of a ſquare form, with the angles rounded off, and was environed by a ditch exterior to the walls, of which a conſiderable portion ſtill remains. The extent of the incloſed area from eaſt to weſt is about 190 yards, and from ſouth to north about 198 yards. The ancient town was without the ſtation, and is ſuppoſed to have ſtood towards the north, on that part of the coaſt long ſince ſwallowed up by the waves: "and from the preſent ſhore, as far as a place called Black Rock, ſeen at low water mark, where, according to tradition, a church once ſtood, there have been found great quantities of tiles, bricks, fragments of walls, teſſellated pavements, and other marks of a ruinated town; and remains of the houſehold furniture, dreſs and equipment of the horſes belonging to its inhabitants, are continually met with among the ſands; for after the fall of the cliffs, the earthen parts of them being waſhed away, theſe metalline ſubſtances remain behind." When a part of the cliff here fell down about the concluſion of the ſeventeenth century, a number of ſmall vaults, arched over, and ſeveral ciſterns, were diſcovered. The latter were all of the ſame figure, namely, ſquare, and meaſured from ten to twelve feet in length each ſide, and the ſame in depth. They were conſtructed of poſts, driven deep into the ground, with planks two inches thick fixed to them. Their uſe was evidently the reception and preſervation of rain water, which the Romans thought more wholeſome than ſpring water. Vaſt quantities of Roman coins have been diſcovered both in the fields and along the ſhore here; and Du Freſne has produced many, which, from the markings upon them, appear to have been ſtruck at a mint in this place. Britiſh and Gauliſh coins are likewiſe occaſionally found here; alſo ſeals, keys, ſpoons, gold rings, bracelets, figulæ, bullæ, belts, bridles, harneſs, beams of ſcales or ſtiliards, and many other articles of which the uſe has not yet been determined.

When Kent was ſubdued by the Saxons, Regulbium became a principal ſeat of the monarchs of that dynaſty. It was then called *Raculf* and *Raculf-ceſter*; and hither king Ethelred retired with his court, after his converſion to Chriſtianity by St. Auguſtine. In the next century it obtained the name of Raculf-minſter, from a Benedictine abbey founded here by Baſſa, a prieſt and nobleman, to whom lands were granted for that purpoſe by king Egbert, as an atonement for the murder of his two nephews. This abbey was diſſolved previous to the Conqueſt, having probably been deſtroyed by the Danes. The town, however, continued in a flouriſhing condition for many years after that event, and had the privilege of a weekly market granted to it in 1313; but this right has been long diſcontinued. The church here is an ancient and ſpacious edifice, conſiſting of a nave, with two aiſles, a chancel, and two lofty towers, ſurmounted by ſpires at the angles of the weſt front. The nave is ſeparated from the aiſles by five pointed arches, riſing from ſhort oblong piers; and from the chancel by three ſmall ſemi-circular arches, ſpringing from tall round columns, with very ſingular capitals. In this church kings Ethelbert I. and II. are ſaid to have been buried; and a monument erected to the memory of the firſt is deſcribed by Weever in his "Funeral Monuments," though it has now diſappeared. On the floor of the chancel are ſeveral braſſes of great antiquity. (See RICHBOROUGH.) Beauties of England and Wales, vol. vii. by E. W. Brayley. Hiſtory and Antiquities of Reculver and Herne, by W. Battely, D. D. 8vo.

RECUMPADO, in *Geography*, a town of Hindooſtan, in the circar of Rajamundry; 23 miles N.W. of Rajamundry.

RECUPERATORES, among the Romans, were commiſſioners appointed to take cognizance of private matters in diſpute, between the ſubjects of the ſtate and foreigners, and to take care that the former had juſtice done them.

It came at laſt to be uſed for commiſſioners, to whom the prætor referred the determination of any affair between one ſubject and another.

RECURRENS, in *Anatomy*, a name under which the inferior laryngeal branch of the par vagum is often deſcribed, from the circumſtance of its ariſing in the cheſt below the point of its diſtribution to the larynx, and then going back into the neck in a retrograde courſe. See NERVE.

RECURRING SERIES, is a ſeries ſo conſtituted, that each ſucceeding term is connected with a certain number of the terms immediately preceding it, by a certain and invariable law; as the ſums or differences of ſome multiples of thoſe terms. Thus the ſeries

$$\begin{array}{cccccc} \alpha & \beta & \gamma & \delta & \varepsilon & \theta \quad \&c. \\ 1, & 3x, & 5x^2, & 7x^3, & 9x^4, & 11x^5, \ \&c. \end{array}$$

is a recurring ſeries; for theſe terms being reſpectively repreſented by $\alpha, \beta, \gamma, \delta$, &c. we have

$$\begin{aligned} \gamma &= 2x\beta - x^2\alpha \\ \delta &= 2x\gamma - x^2\beta \\ \varepsilon &= 2x\delta - x^2\gamma \\ \theta &= \&c. \quad \&c. \end{aligned}$$

that is, each term is equal to $2x$ times that which precedes it, minus x^2 times the one preceding the laſt.

Or, generally, let

$$\begin{array}{cccccc} \alpha & \beta & \gamma & \delta & \varepsilon & \theta \quad \&c. \\ a, & bx, & cx^2, & dx^3, & ex^4, & fx^5, \ \&c. \end{array}$$

be any ſeries whoſe terms are denoted as above, by $\alpha, \beta, \gamma, \delta$, &c. Alſo, let μ, ν, ϱ, &c. repreſent the ſucceſſive multipliers by which the terms are connected, ſo that

$$\begin{aligned} \alpha &= \alpha \\ \beta &= \beta \\ \gamma &= \mu x\beta + \nu x^2\alpha + \&c. \\ \delta &= \mu x\gamma + \nu x^2\beta + \&c. \\ \varepsilon &= \mu x\delta + \nu x^2\gamma + \&c. \\ \theta &= \&c. \quad \&c. \end{aligned}$$

then this ſeries is called a recurring ſeries; and $\mu + \nu +$ &c. De Moivre calls the *ſcale of relation*, which is ſaid to be of *one*, *two*, *three*, &c. terms, according to the number of

multipliers by which it is connected. In the above we have used only two, μ and ν, whence $\mu + \nu$ is called the scale of relation, which is here of two terms; and 1 minus the scale of relation, as $1 - \mu - \nu$, is called by the same author the *differential scale*, which is always equal to the denominator of the fraction from which the series is produced.

If, in the above series, the terms had the relation

$$\begin{aligned}
\alpha &= \alpha \\
\beta &= \beta \\
\gamma &= \gamma \\
\delta &= \mu x \cdot \gamma + \nu x^2 \cdot \beta + \varrho x^3 \alpha \\
\varepsilon &= \mu x \cdot \delta + \nu x^2 \cdot \gamma + \varrho x^3 \beta \\
\theta &= \mu x \cdot \varepsilon + \nu x^2 \cdot \delta + \varrho x^3 \gamma \\
&\text{\&c.} \qquad\quad \text{\&c.} \qquad\quad \text{\&c.}
\end{aligned}$$

then the scale of relation would be $\mu + \nu + \varrho$, which is of three terms; and the differential scale, or the denominator of the fraction, is $1 - \mu - \nu - \varrho$.

The following problems are naturally connected with the doctrine of recurring series; *viz.*

1. Any recurring series being proposed, to find the scale of relation, or the law of the series, which is not always obvious on inspection.

2. To find the sum of an infinite recurring series, or the sum of any number of its terms (n).

3. To find a general expression for any indefinite term of such a series, as, for example, the nth term.

We shall consider each of these problems under their separate heads.

I. *To find the scale of relation in any proposed recurring series.*

Let $\alpha, \beta, \gamma, \delta, \varepsilon, \theta$, &c. be a recurring series, of which it is required to find the scale of relation

$$\begin{aligned}
\text{Assume} \qquad \delta &= \mu' \gamma + \nu' \beta + \text{\&c.} \\
\varepsilon &= \mu' \delta + \nu' \gamma + \text{\&c.} \\
\theta &= \text{\&c.} \qquad\quad \text{\&c.}
\end{aligned}$$

Where β, γ, δ, &c. are known, and μ, ν, &c. unknown quantities, whose numeral values are required, and which are readily found by the usual method of elimination. Thus in the above, using only μ and ν, we have

$$\mu' = \frac{\delta\gamma - \varepsilon\beta}{\gamma\gamma - \delta\beta}, \text{ and } \nu' = \frac{\delta\delta - \gamma\varepsilon}{\beta\delta - \gamma^2}.$$

These values of μ', and ν', will obviously contain in them the powers of the indeterminate quantity x, which being taken out, we shall have the required numeral values of μ and ν.

Let it be required to ascertain the scale of relation in the series

α	β	γ	δ	ε	θ	&c.
1,	$3x$,	$5x^2$,	$7x^3$,	$9x^4$,	$11x^5$,	&c.

Here, by substituting the proper values of β, γ, δ, &c. in the above equation, we have

$$\mu' = \frac{35x^5 - 27x^5}{26x^4 - 21x^4} = \frac{8x^5}{4x^4} = 2x$$

$$\nu' = \frac{49x^6 - 45x^6}{21x^4 - 25x^4} = \frac{4x^6}{-4x^4} = -1x^2$$

when $\mu = 2$, and $\nu = -1$.

The same method may obviously be employed in any other case; but in order to know whether or not we have assumed a scale of relation of a sufficient number of terms, we must repeat the same operation upon three other terms, of which one at least was not before employed; and if both give the same values, we may be assured of the truth of our results: or we may otherwise, instead of repeating the operation, examine the several terms, and see whether they agree with the law we have determined, and if not, we must increase the terms in our scale of relation; for it may be observed, that we can never fail of determining them in consequence of having assumed too many terms, as we shall, in that case, have one of our results zero.

Lagrange has formed a different rule for ascertaining whether a given series be recurring or not, which Mr. Bonnycastle has given at p. 323 of his Algebra; but as it does not seem adapted for detecting the law of formation, we shall not insert it.

II. *To find the sum of any recurring series, of which the scale of relation is known.*

$$\text{Let} \begin{cases} \alpha & \beta & \gamma & \delta & \varepsilon & \theta & \text{\&c.} \\ a, & bx, & cx^2, & dx^3, & ex^4, & fx^5, & \text{\&c.} \end{cases}$$

be a recurring series, of which the scale of relation is $\mu + \nu$, so that

$$\begin{aligned}
\alpha &= \alpha \\
\beta &= \beta \\
\gamma &= \mu x \cdot \beta + \nu x^2 \alpha \\
\delta &= \mu x \cdot \gamma + \nu x^2 \beta \\
\varepsilon &= \mu x \cdot \delta + \nu x^2 \gamma \\
&\text{\&c.} \qquad \text{\&c.} \qquad \text{\&c.}
\end{aligned}$$

Here it is obvious, that the whole sum

$$\begin{aligned}
S &= \alpha + \beta + \gamma + \delta + \varepsilon + \text{\&c.} \\
S &= \alpha + \beta + \mu x (\beta + \gamma + \delta +) + \nu x^2 (\alpha + \beta + \gamma + \text{\&c.}) \\
S &= \alpha + \beta + \mu x (S - \alpha) + \nu x^2 \cdot S
\end{aligned}$$

$$\text{whence } S = \frac{\alpha + \beta - \mu a x}{1 - \mu x - \nu x^2}$$

which is a general expression when the scale of relation is of two terms.

When the scale of relation is of three terms, so that

$$\begin{aligned}
\alpha &= \alpha \\
\beta &= \beta \\
\gamma &= \gamma \\
\delta &= \mu x \cdot \gamma + \nu x^2 \cdot \beta + \varrho x^3 \alpha \\
\varepsilon &= \mu x \cdot \delta + \nu x^2 \cdot \gamma + \varrho x^3 \beta \\
\theta &= \mu x \cdot \varepsilon + \nu x^2 \cdot \delta + \varrho x^3 \gamma \\
&\text{\&c.} \qquad \text{\&c.} \qquad \text{\&c.}
\end{aligned}$$

it is equally obvious that

$$S = \alpha + \beta + \gamma + \delta + \varepsilon + \theta + \text{\&c. or}$$

$$S = \begin{cases} \alpha + \beta + \gamma + \\ \mu x \ (\gamma + \delta + \varepsilon + \text{\&c.}) + \\ \nu x^2 \ (\beta + \gamma + \delta + \text{\&c.}) + \\ \varrho x^3 \ (\alpha + \beta + \gamma + \text{\&c.}), \text{ or} \end{cases}$$

$$S = \alpha + \beta + \gamma + \mu x (S - \alpha - \beta) + \nu x^2 (S - \alpha) \varrho x^3 + S$$

whence we have

$$S = \frac{\alpha + \beta + \gamma - \mu x (\alpha + \beta) - \nu x^2 \cdot \alpha}{1 - \mu x - \nu x^2 - \varrho x^3}$$

which is the general expression for the sum, when the scale of relation is of three terms.

In the same manner we have

$$S = \frac{\alpha + \beta + \gamma + \delta - \mu x (\alpha + \beta + \gamma) - \nu x^2 (\alpha + \beta) - \varrho x^3 \cdot \alpha}{1 - \mu x - \nu x^2 - \varrho x^3 - \sigma x^4}$$

for a scale of relation of four terms; and so on.

But as the terms $\alpha, \beta, \gamma, \delta$, &c. contain in them certain powers of x, we may reduce the above expressions to simpler forms

forms by fubſtituting a for α, $b\,x$ for β, $c\,x^2$ for γ, &c. in which caſe the above become

$$S = \frac{a + (b - a\mu)\,x}{1 - \mu x - \nu x^2}$$

$$S = \frac{a + (b - a\mu)\,x + (c - b\mu - a\nu)\,x^2}{1 - \mu x - \nu x^2 - \varsigma x^3}$$

$$S = \frac{a + (b - a\mu)\,x + (c - b\mu - a\nu)\,x^2 - (d - c\mu - b\nu - a\varsigma)\,x^3}{1 - \mu x - \nu x^2 - \varsigma x^3 - \sigma x^4}$$

which are the ſeveral expreſſions for the ſcales of relation of two, three, or four terms, and the law of formation is ſufficiently obvious for any other ſcale.

The ſame law might have been otherwiſe obtained as follows. It is evident, from what is done above, that the ſcale of relation ſubtracted from unity is always equal to the denominator of the generating ſeries, and the ſame may alſo be demonſtrated on other principles. In order, therefore, to find the numerator, we might aſſume the propoſed ſeries

$$a + b\,x + c\,x^2 + d\,x^3 + \text{ &c.} = \frac{a' + b'x + c'x^2 + d'x^3 + \text{ &c.}}{1 - \mu x - \nu x^2 - \varsigma x^3 - \text{ &c.}}$$

then multiplying this denominator by the propoſed ſeries, and equating the co-efficients of the products with thoſe of the like powers of x in the numerator, we ſhould find

$$a' = a$$
$$b' = b - a\mu$$
$$c' = c - b\mu - a\nu$$
$$d' = \text{ &c.} \qquad \text{ &c.}$$

as in the preceding formulæ.

It is only neceſſary to obſerve, farther, that if the indices of x do not follow the law we have ſuppoſed, we muſt make the neceſſary correction in the general expreſſion, and if the propoſed ſeries have no power of x in it, as commonly happens, we muſt, in the concluſion, make $x = +1$.

The above formulæ, it will be obſerved, give the ſum of the infinite ſeries. When only a certain number of terms are to be ſummed, different formulæ are required, which we ſhall inveſtigate, after having ſhewn how to obtain a general expreſſion for the nth term of ſuch recurring ſeries. We propoſe, however, in the firſt place, to illuſtrate the above rules by one or two examples.

Exam. 1.—Required the ſum of the infinite recurring ſeries $1 + 6x + 12x^2 + 48x^3 + \text{ &c.}$ the ſcale of relation being $1 + 6$.

Here $a = 1$, $b = 6$, $\mu = 1$, and $\nu = 6$, whence

$$\frac{a + (b - a\mu)\,x}{1 - \mu x - \nu x^2} = \frac{1 + 5x}{1 - x - 6x^2},$$

the ſum required.

Exam. 2.—Required the ſum of the infinite recurring ſeries

$$1 + 4x + 6x^2 + 11x^3 + 28x^4 + 63x^5, \text{ &c.}$$

the ſcale of relation being $2, -1, +3$.

Here $a = 1$, $b = 4$, $c = 6$; $\mu = 2$, $\nu = -1$, and $\varsigma = 3$; whence

$$S = \frac{a + (b - a\mu)\,x + (c - b\mu - a\nu)}{1 - \mu x - \nu x^2 - \varsigma x^3} = \frac{1 + (4 - 2)\,x + (6 - 8 + 1)\,x^2}{1 - 2x + x^2 - 3x^3} = \frac{(1 + x)^2 - 2x^2}{(1 - x)^2 - 3x^3},$$

as required

III.—*To find the general term of any propoſed recurring ſeries.*

From the preceding part of this article it appears, that every recurring ſeries may be conſidered as ariſing from the developement or expanſion of ſome rational fraction of the form

$$\frac{a + bx + cx^2 + dx^3 + \text{ &c.}}{1 - \alpha x - \beta x^2 - \gamma x^3 - \delta x^4 - \text{ &c.}}$$

Let us, therefore, ſuppoſe this fraction to be converted into the infinite recurring ſeries $A + Bx + Cx^2 + Dx^3 + Ex^4 + \text{ &c.}$ of which we already know how to determine the co-efficients, and the law of their formation.

Now if this rational fraction be decompoſed into its ſimple fractions by the method explained under the article RATIONAL *Fractions*, and each of theſe ſimple fractions be then converted into a recurring ſeries, it is evident that the ſum of all theſe ſeries ought to be equal to the original ſeries

$$A + Bx + Cx^2 + Dx^3 + Ex^4 + \text{ &c.}$$

Now each of theſe partial fractions being of the form $\frac{A'}{1 - rx}$, the ſeries thence ariſing will have the form

$$A' + A'rx + A'r^2x^2 + A'r^3x^3 \ldots A'r^nx^n$$

of which $A\,r^n x^n$ is the general term. Hence, the ſeveral ſeries ariſing from the partial fractions may be ſuppoſed to be

$$\begin{aligned}
&A' + A'\,r\,x + A'\,r^2\,x^2 + A'\,r^3\,x^3 \ldots A'\,r^n x^n\\
&A'' + A''\,r'\,x + A''\,r'^2\,x^2 + A''\,r'^3\,x^3 \ldots A''\,r'^n x^n\\
&A''' + A'''\,r''\,x + A'''\,r''^2\,x^2 + A'''\,r''^3\,x^3 \ldots A'''\,r''^n x^n\\
&A^{\text{iv}} + A^{\text{iv}}\,r'''\,x + A^{\text{iv}}\,r'''^2\,x^2 + A^{\text{iv}}\,r'''^3\,x^3 \ldots A^{\text{iv}}\,r'''^n x^n
\end{aligned}$$

and ſince the ſum of theſe ſeries is equal to the original one propoſed, we know that the co-efficients of the like powers of x are alſo equal, whence we have

$$A = A' + A'' + A''' + A^{\text{iv}} + \text{ &c.}$$
$$B = A'r + A''r' + A'''r'' + A^{\text{iv}}r'' + \text{ &c.}$$

whence it appears that the co-efficient of any term x^n of the recurring ſeries is equal to the ſum of the co-efficients of the ſame power of x, which ariſe from expanding the ſeveral ſimple fractions into which the given fraction is decompoſed; and this co-efficient is always equal to the ſum of each of the numerators of the ſeveral ſimple fractions, multiplied into the nth power of the correſponding value of r in the denominator of the ſame fraction, at leaſt while the denominator contains no equal factor. But if, among the partial fractions, there is any one of the form $\frac{A'}{(1 - rx)^2}$, the general term of this will be $(n + 1)\,A\,r^n x^n$; of $\frac{A}{(1 - rx)^3}$, the general term is $\frac{(n + 1)(n + 2)}{1 \cdot 2} A\,r^n x^n$; and univerſally $\frac{A}{(1 - rx)^k}$, the general term is

$$\frac{(n + 1)(n + 2)(n + 3) \ldots (n + k - 1)}{1 \cdot 2 \cdot 3 \ldots (k - 1)}$$

we may, therefore, in all caſes wherein the generating fraction of the original ſeries admits of a rational decompoſition, arrive very readily at the general term upon the principles above explained.

Thus,

Thus, as an example, let there be propoſed the recurring ſeries

$$1 + 4x + 14x^2 + 46x^3 + 146x^4 + \&c.$$

to find the general term, or the co-efficient of x^n.

The ſum of this ſeries is found by the preceding part of this article to be $\frac{1 - x}{1 - 5x + 6x^2}$.

This rational fraction is equal to $\frac{-1}{1 - 2x} + \frac{2}{1 - 3x}$. Now the general term of $\frac{1}{1 - 2x}$ is $- 2^n x^n$; and of $\frac{2}{1 - 3x}$ is $- 2 \cdot 3^n x^n$, as ſhewn above, therefore the general term of the propoſed ſeries will be $(2 \cdot 3^n - 2^n)\, x^n$.

It may be obſerved, however, that this method is in ſome caſes very laborious, and not always practicable; it will, therefore, frequently be better to make uſe of the *multinomial theorem*, which may be done by putting the generating fraction under the form

$$(a + bx + cx^2 + \&c.)\,(1 - \alpha x - \beta x^2 - \gamma x^3 - \&c.)^{-1}$$

See *Multinomial* THEOREM.

IV.—*To find the ſum of any number* (n) *terms of a recurring ſeries.*

For this purpoſe it is only neceſſary to find the co-efficient of the $n + 1$th term of the ſeries. Then, from the ſum of the entire ſeries ſubtract the ſum of the ſeries beyond the nth term, and the difference will obviouſly be the ſum of the firſt n terms ſought.

Let there be propoſed as an example to find the ſum of n terms of the ſeries

$$1 + 2x + 3x^2 + 4x^3 + \ldots\ldots nx^{n-1}.$$

The infinite ſum of this ſeries is readily found $= \frac{1}{(1 - x)^2}$

In the ſecond caſe, *viz.* of the terms beyond nx^{n-1}, the ſeries is

$$(n+1)x^n + (n+2)x^{n+1} + (n+3)x^{n+2}, \&c.;$$

and in the formula $s = \frac{\alpha + \beta - \alpha\mu x}{1 - \mu x - \nu x^2}$ we have only to ſubſtitute $\alpha = (n+1)x^n$, and $\beta = (n+2)x^{n+1}$, inſtead of $\alpha = 1$ and $\beta = 2x$, as in the former. Hence we have

$$s' = \frac{(n+1)x^n + (n+2)x^{n+1} - 2(n+1)x^{n+1}}{1 - 2x + x^2}, \text{ or}$$

$$s' = \frac{(n+1)x^n - nx^{n+1}}{(1 - x)^2};$$

and, therefore, $s - s'$, or the ſum of the firſt n terms is equal to

$$\frac{1 - (n+1)x^n + nx^{n+1}}{(1 - x)^2}.$$

2. Required the ſum of n terms in the ſeries

$$1 + 3x + 5x^2 + 7x^3 + \ldots\ldots (2n - 1)x^{n-1}.$$

Here, by trial, we find the ſcale of relation to be $\mu = +2$, and $\nu = -1$, as before, therefore the infinite ſum is

$$s = \frac{\alpha + \beta - \alpha\mu x}{1 - \mu x - \nu x^2} = \frac{1 + 3x - 2x}{1 - 2x + x^2} = \frac{1 + x}{(1 - x)^2}.$$

After n terms, the ſeries becomes

$$(2n+1)x^n + (2n+3)x^{n+1} + (2n+5)x^{n+2} + \&c.$$

which therefore ariſes from the fraction

$$\frac{(2n+1)x^n + (2n+3)x^{n+1} - 2(2n+1)x^{n+2}}{1 - 2x + x^2} =$$

$$\frac{(2n+1)x^n - (2n-1)x^{n+1}}{(1 - x)^2}$$

whence the ſum of n terms is

$$\frac{1 + x - (2n+1)x^n + (2n-1)x^{n+1}}{(1 - x)^2}$$

3. Required the ſum of n terms of the ſeries

$$(n-1)x + (n-2)x^2 + (n-3)x^3 + \&c.$$

Here again the ſcale of relation is $+2 - 1$, therefore the infinite ſum is

$$\frac{(n-1)x + (n-2)x^2 - 2(n-1)x^3}{(1 - x)^2} =$$

$$\frac{(n-1)x - nx^2}{(1 - x)^2}.$$

After n terms, it becomes $- x^{n+1} - 2x^{n+2} - \&c.$ the ſum of which is found in the ſame manner to be $\frac{-x^{n+1}}{(1 - x)^2}$; therefore n terms of the propoſed ſeries is

$$\frac{(n-1)x - nx^2 + x^{n+1}}{(1 - x)^2}$$

Hence, alſo, n terms of the ſeries

$$\frac{(n-1)x}{n} + \frac{(n-2)x^2}{n} + \frac{(n-3)x^3}{n} + \&c. \text{ is}$$

$$\frac{(n-1)x - nx^2 + x^{n+1}}{n(1 - x)^2}$$

In a ſimilar manner the ſum of n terms of the ſeries

$$1^2 + 2^2x + 3^2x^2 + 4^2x^3 + \&c.$$

is found to be

$$\frac{1 + x - (n+1)^2 x^n + (2n^2 + 2n - 1)x^{n+1} - n^2 x^{n+2}}{(1 - x)^3}$$

the ſcale of relation being $3 - 3, 1$.

In all the preceding examples we have determined the infinite ſum of the ſeries, as beginning at the firſt term, and at the $(n+1)$th term, a more eaſy method is as follows, which is due to Simpſon. Eſſays, p. 96.

Let $A + B + C + D + \ldots + K + L + M + N$ be any finite recurring ſeries, of which each term depends upon the three which precede it, the ſcale of relation being p, q, r, ſo that

$$\begin{array}{lll} pA + qB + rC = D \\ pB + qC + rD = E \\ \&c. \quad\quad \&c. \quad\quad \&c. \end{array}$$

or, which is the ſame,

$$\begin{array}{l} pA + qB + rC - D = 0 \\ pB + qC + rD - E = 0 \\ pC + qD + rE - F = 0 \\ \quad\ldots\ldots\ldots \\ pK + qL + rM - N = 0 \end{array}$$

whence,

whence, by addition

$$\left.\begin{array}{l} p(A+B+C+..K)+q(B+C+D+L)+ \\ r(C+B+D+..M)-(D+E+F+N) \end{array}\right\} = 0$$

Or, repreſenting the whole ſum by S,

$$\left.\begin{array}{l} p(S-L-M-N)+q(S-A-M-N+ \\ r(S-A-B-N)-(S-A-B-C \end{array}\right\} = 0$$

which, by addition and diviſion, gives

$$S = \frac{p(L+M+N)+q(A+M+N)+r(A+B+N)-(A+B+C)}{p+q+r-1}$$

where the ſum depends merely upon the three firſt and the three laſt terms of the ſeries; and a ſimilar expreſſion, it is obvious, may be obtained for any other ſcale of relation.

It may not be amiſs to obſerve, that when the propoſed ſeries is wholly numeral, (the ſum of which, as we have before obſerved, is to be found by making $x = 1$); both this formula and the preceding one fail, in the caſe in which the denominator of the fraction becomes zero, and we muſt, therefore, in ſuch caſes, have recourſe to other methods of ſummation, as given under the article SERIES.

On this ſubject the reader ſhould conſult De Moivre's Miſc. Analyt. and his Doctrine of Chances, and Euler's Analyſis Infinitorum, where he will find an explanation of its application to the approximation to the roots of equations. Colſon's Comment on Newton's Fluxions. Stirling's Methodus Differ. Cramer's Analyſis des Lignes Courbes. Bernoulli de Serieb. Inf. &c. See alſo a chapter on this ſubject, in vol. ii. of Bonnycaſtle's Algebra.

RECURVIROSTRA, the *Avocet*, in *Ornithology*, a genus of birds of the order Grallæ, of which the generic character is; bill depreſſed, ſubulate, recurved, pointed, flexible at the tip; the feet are palmate, four-toed, the hind toe not connected, very ſhort, and placed high up; the noſtrils are narrow, pervious; the tongue is ſhort. There are only three

Species.

* AVOCETTA; Scooping Avocet; called alſo in different parts of this country, butter-ſlip, ſcooper, yelper, crooked-bill, &c. This bird is variegated with white and black; the bill is three inches and a half long; irides hazel; crown black; a white ſpot behind and beneath the eyes; reſt of the head, neck, back, exterior part of the wings, leſſer quill-feathers, tail, and under part of the body, white; inner ſcapulars and greater quill-feathers without and at the tips black; legs blueiſh, and very long; membrane connecting the toes indented. It reſides in the temperate parts of Europe, weighing thirteen ounces; and meaſuring, from the tip of the bill to the end of the tail, eighteen inches. It breeds in the fens of Lincolnſhire, and on Romney Marſh, in Kent. The female lays two white eggs, tinged with green, and marked with large black ſpots. In winter theſe birds aſſemble in ſmall flocks of ſix or ſeven, and frequent the ſhores, particularly the mouths of large rivers, in ſearch of worms and marine inſects, which they ſcoop out of the mud or ſand. They ſeem to be particularly fond of the cancer, pulex, or locuſta. By means of their long legs, they run over ſhores that are covered five or ſix inches with water. In their movements they are lively, alert, volatile, and difficult to catch. When the female is frightened off her neſt ſhe counterfeits lameneſs; and when a flock is diſturbed, they fly with their necks ſtretched out, and their legs extended behind, over the head of the ſpectator, making a ſhrill noiſe, and uttering a yelping cry of twit, twit, all the time.

AMERICANA; American Avocet. The head and neck are reddiſh; back black, beneath it is white. It inhabits North America and New Holland; is fourteen inches long. Bill black; front duſky-white; neck above white; primary and tertial wing-coverts black, the middle ones, and ſome of the ſecondary quill-feathers, white.

ALBA; White Avocet. This ſpecies is white; the lower wing-coverts browniſh; bill orange; legs brown. Inhabits Hudſon's Bay; fourteen inches and a quarter long. Bill tipt with black; edge of the wings, greater quill-feathers, and tail, tinged with yellowiſh.

RECUSANTS, in a general ſenſe, perſons, whether Papiſts or others, who refuſe to go to church and to worſhip God after the manner of the church of England. Popiſh recuſants are Papiſts, who ſo refuſe; and a popiſh recuſant convict is a Papiſt legally convicted of ſuch offence. See PAPIST, PRÆMUNIRE, and TOLERATION.

RECUSATION, RECUSATIO, an act by which a judge is deſired to refrain from judging ſome certain cauſe, on account of his relation to one of the parties; or of ſome capital enmity, or the like.

By the French laws, kinſhip within the fourth degree is deemed a legal cauſe of recuſation; as alſo the judge's being godfather, &c. of one of the parties.

By the laws of England alſo, in the times of Bracton and Fleta, a judge might be refuſed for good cauſe; but now the law is otherwiſe, and it is held that judges or juſtices cannot be challenged. Co. Litt. 254. See CHALLENGE.

RED, in *Phyſics*, one of the ſimple or primary colours of natural bodies, or rather of the rays of light.

The red rays are thoſe which are of all rays the leaſt refrangible: hence, ſir Iſaac Newton ſuppoſes the different degrees of refrangibility to ariſe from the different magnitudes of the luminous particles of which the rays conſiſt, the red rays, or red light, is concluded to be that which conſiſts of the largeſt particles. See COLOUR, LIGHT, and RAY.

Authors diſtinguiſh three general kinds of red; one bordering on the blue, as colombine, or dove-colour, purple, and crimſon; another bordering on yellow, as flame-colour and orange; and between theſe extremes is a medium, partaking neither of the one nor the other, which is what we properly call *red*.

Acids generally turn black blue, and violet into red; and red into yellow, and yellow into a very pale yellow.

Alkalies change red into violet, or purple; and yellow into feuillemort, or dead leaf-colour.

Terreſtrial and ſulphureous matters become red by extreme heat; and ſome, at length, black, as we ſee in brick, red bole, red chalk, ſlate, &c. All theſe, when vitrified by a burning-glaſs, become black.

Lobſters become red by a moderate fire; and by a violent one, black. Mercury and ſulphur mixed and heated over a moderate fire make a beautiful red, called *artificial cinnabar*.

An acid ſpirit, as lemon juice, being poured on a blue ſolution of turnſole, turns it into a beautiful red. Alkali reſtores it again to its original blue. Filtrating of ſome reddiſh wines takes from them all their red colour.

M. De la Hire obſerves, that a very luminous body viewed through a black one, always appears red; as when the ſun is ſeen ſhining through a black cloud. He adds, that ſome people who ſee all the other colours perfectly well, yet have no idea of red, and only ſee it as black.

RED, in *Coſmetics*, a fucus or paint with which the ladies enliven their cheeks and lips.

There

There are two kinds of reds; the one in leaves, called Spaniſh red; the other a liquor, which is an extract of a ſcarlet dye.

Red, in *Dyeing*, is one of the five ſimple or mother colours of the dyers.

Some reckon ſeven kinds, or caſts of red: *viz.* ſcarlet-red, crimſon-red, madder-red, half-grain-red, half-crimſon-red, lively orange-red, and ſcarlet of cochineal. But they may be all reduced to three, according to the three principal drugs which give the colours; which are kermes, cochineal, and madder.

The fine ſcarlet, called *ſcarlet of the Gobelins*, is given with agaric, bran-water, woad, and ſcarlet grain, or kermes. Some dyers add cochineal, and others fenugreek; brightening it with bran-water, agaric, tartar, and turmeric. See Kermes and Scarlet.

Crimſon-red is dyed with bran-water, tartar, and meſtique cochineal. See Crimson.

Madder-red is dyed with madder; to which ſome add realgar, or red arſenic: others, common ſalt, or other ſalts, with wheat-flour; or agaric with ſpirit of wine, with galls or turmeric. See Madder.

The half-grain is made with agaric and bran-water, half ſcarlet grain, half madder, and ſometimes turmeric.

The half-crimſon is made of half madder, half cochineal. As to the lively orange-red, the ſtuff muſt be firſt put in yellow, then in a liquor made of goat's hair, (which has been boiled ſeveral times with madder,) diſſolved over the fire with certain ſaline liquors, as urine, tartar, &c.

The ſcarlet of cochineal, or Dutch ſcarlet, as the French call it, is made with ſtarch, tartar, and cochineal; after firſt boiling it with alum, tartar, ſal gemma, and aqua fortis in which pewter has been diſſolved.

Beſides theſe ſeven reds, which are good and allowed colours, there is alſo a Braſil red; which is diſcouraged, as fading eaſily.

Of the ſeven good reds, only four have particular caſts, or ſhades; the madder-red, crimſon-red, lively orange-red, and ſcarlet of cochineal.

The caſts or ſhades of crimſon are fleſh colour, peach colour, carnation roſe colour, and apple-tree flower colour. Thoſe of madder are fleſh colour, onion-peel colour, and flame colour. Thoſe of orange are the ſame with thoſe of crimſon. Scarlet, beſides the ſhades of all the reſt, has ſome peculiar to itſelf, as cherry colour, fire colour, &c. See Dyeing.

Red, in the *Manufacture of Glaſs*. See *Red* Glass.

To make a deep red in glaſs, the following method is that moſt practiſed by the glaſs-men. Take cryſtal frit twenty pounds, broken pieces of white glaſs one pound, calcined tin two pounds; mix theſe well together, and put them into a pot to melt and purify. When theſe are melted, take ſteel calcined, ſcales of iron from the ſmith's anvil, both powdered very fine, of each an equal quantity; put leiſurely an ounce of this mixed powder to the before mentioned metal; mix all well together, and let them ſtand ſix or eight hours in fuſion to incorporate; take out a proof after this, and if there be too little of the powder, it will appear of a duſky yellow; then more of the powder muſt be added, and then add three quarters of an ounce of calcined braſs, ground to a fine powder; mix them thoroughly together, and the maſs will be of a blood red; continue ſtirring the whole together, and frequently taking out proofs of the colour, when it is right, work it immediately, otherwiſe it will loſe its colour and become black. The mouth of the pot muſt in this proceſs be left open, elſe the colour will be loſt. Neri's Art. of Glaſs, p. 100.

Red, in *Heraldry*. See Gules.

Red, in *Painting*. For painting in oil colours they uſe a red called *cinnabar*, or vermilion; and another called *lacca*. See each in its place.

In limning and freſco, for a violet red, inſtead of lacca they uſe reddle, a natural earth found in England; for a brown red, they uſe burnt ochre, which is a native yellow earth, made red by calcination. It is chiefly brought from Oxfordſhire; and burnt by thoſe who prepare it in large ovens. The marks of its goodneſs are brightneſs of colour, and a friable chalky texture, without manifeſting any gritty roughneſs when rubbed betwixt the fingers.

The common Indian red, which is of a hue verging to the ſcarlet, is much uſed, on account of its ſtanding and warm though not bright colour, in finer as well as coarſer paintings in oil. It may be prepared by taking of the caput mortuum or ochre left in the iron pots after the diſtillation of aqua fortis from nitre and vitriol, two parts; and of the caput mortuum or colcothar left in the long necks after the diſtillation of oil of vitriol, one part; breaking the lumps found among them, and putting them into tubs with a good quantity of water: and having left them to ſtand for a day or two, frequently ſtirring them, then lading off as much water as can be obtained clear from them, and adding a freſh quantity; repeating the ſame treatment till all the ſalts be waſhed out, and the water comes off nearly inſipid. The red powder which remains muſt then be waſhed over, and, being freed from the water, laid out to dry. When this is deſigned for nicer purpoſes, it ſhould again be waſhed over in baſons.

The true Indian red is a native ochreous earth of a purple colour, brought from the iſland of Ormus, in the Perſian gulf; and called, among the authors on theſe ſubjects, *terra Perſica*. At preſent it is very rarely to be found; but it is certainly very valuable (there being no other uncompounded purple colour in uſe with oil) as well for the force of its effect, as for the certainty of its ſtanding. In its genuine ſtate, it needs no other preparation than grinding or waſhing over. It may be eaſily diſtinguiſhed from any fictitious kind, by its being more bright than any other ochre which can be made ſo purple; and if it be rendered artificially purple by any addition, the fire will ſoon betray it; into which the genuine may be put without any hazard of change.

Venetian red is a native red ochre (ſee Veneta *bolus*), not much different from the common Indian red, but fouler; and may be eaſily prepared, by mixing common red ochre with the colcothar or caput mortuum taken out of the aqua fortis pots, and waſhed over. As it is generally uſed by the houſe painters in imitation of mahogany, it requires no other preparation than to be well ground with the oil with which it is uſed; but when it is uſed in miniature painting, it ſhould be carefully waſhed over.

Red, *Blown*, in the *Porcelain Manufacture*, a name given to a peculiarly coloured china ware, of a ſpangled red, or to the colour alone that ſpangles it. It is an ornament eaſily introduced into uſe in our own manufactories of porcelain ware, and is done in the following manner. The colour is to be prepared of common copperas, calcined to a red colour in a charcoal fire, in a crucible, with another luted on the top of it inverted, and with a hole in its bottom. The ſignal of the calcination being finiſhed, is, when the black clouds ceaſe to come up through the hole, and a fine white thin vapour riſes in their place. The veſſels are to be then ſuffered to cool, and the red matter in them is to be reduced to a fine powder, while the veſſels to be coloured with this

are yet wet. The operator is to provide a glaſs pipe, and covering one end of it with a piece of fine gauze, he is to dip this into the powder, and taking it carefully out, with what little is ſticking to it, he is to blow againſt the veſſel at ſome diſtance from it: thus the fineſt part of the powder only will reach the veſſel, and will be laid on in form of glittering ſpangles, very ſmall, but all diſtinct. This is ſort of colouring much eſteemed by the Chineſe themſelves, and they have a way of uſing the common blue in the ſame manner; but few of the veſſels thus painted come over to us.

Red *Clover*, in *Agriculture*, an uſeful artificial graſs for arable lands. It has this name in contradiſtinction to the white and ſome other ſorts. There were at firſt many and very great prejudices againſt and objections made to the introduction of this plant into cultivation by farmers, which were not ſurmounted without difficulty, and it prevailed for ſome length of time in particular diſtricts, as Staffordſhire and Worceſterſhire, before it was known in ſome other counties, where it is now very predominant and beneficial, as Cheſhire, Lancaſhire, and many more.

In ſome arable counties red clover is found to fail as a crop when long cultivated, dying away in the winter and ſpring, which the farmers deſignate by ſaying that the land is ſick of it. This is a ſevere inconvenience to them in many caſes; and renders ſuch variations in the courſes of cropping neceſſary, as may prevent the recurrence of it ſo frequently as has hitherto been the caſe. It is very liable to fail in every part of the county of Eſſex, but of the cauſe of which there are different opinions, ſome thinking that the land becomes ſick of the plant, while others do not aſcribe it to any ſatiety of this nature, but alter their modes of cropping that it may not take place ſo often. About the Belcamps and Boſely this is very much the caſe, ſome venturing it only once in ſeven years, and in that caſe it ſucceeds well. In all the Tendring hundred it is found to decline little on the ſtrong rich lands, but is felt on the lighter ſorts; on both the cropping is varied in regard to it. In the neighbourhood of Thorndon the lands are ſick of it. And at Audley End the land is tired of it, but more in many caſes from want of ſufficient ſeed than any thing elſe. In the vicinity of Hallingbury it is very liable to fail, if ſown oftener than once in ſeven or nine years, though the ſyſtem thereabouts is crop and fallow.

In the county of Oxford ſome ſow red clover twice in ten years, the land being new to it; of courſe it never fails. On the gravelly loamy ſoils about Henly it dies from repetition, ſo that it is alternately omitted in cropping, others being ſubſtituted, as white clover, trefoil, and peas. Nothing of this ſort was known forty years ago, but now they ſow it only once in two rounds. The loams and ſtone-braſh lands around Wood Raton are not in general tired of this plant; ſome however find it to fail on the latter ſort of ſoil. About Great Tew, where the lands have been incloſed forty years, they are not yet tired of red clover. At Atterbury, where the lands have been incloſed more years, it does not now ſucceed quite ſo well as it did fifteen or twenty years ago. In theſe failures other crops are put in, as tares and early peas drilled.

Some ſuſpect ſheep's dung to be deſtructive to the red-clover plant, but there are no proofs of the fact.

The moſt proper management of red clover as a preparation for wheat is a matter of great importance. Some think feeding it off wholly the beſt practice; others mowing and feeding; and a few mowing altogether. The method of feeding off the crops altogether, when done in a cloſe even manner, is probably the moſt advantageous in this intention, though there may be ſome immediate loſs and inconvenience; after which that of mowing the firſt crop and feeding the ſecond in a uſeful manner; the third mode, or that of mowing twice, is moſt to be feared, but upon ſome ſorts of land it may be done and anſwer well for wheat. Theſe methods are all practiſed and have their advocates in different parts of Eſſex; and ſome think that they get as good wheat after white as red clover, as well as that feeding the latter does no injury in this reſpect.

The farmers in Oxfordſhire follow nearly the ſame practices, and hold much the ſame opinions in regard to the management of this crop as a preparation for wheat. And the cuſtom of mowing and feeding off the firſt year, is thought the beſt practice in ſome other counties.

But in the county of Lancaſter, and ſome others adjoining it, they know nothing of the land being ever *ſick* or *tired* of this ſort of crop, though they grow it in more frequent ſucceſſion and in a more full manner than perhaps any where elſe in the kingdom. Aſk the farmers about this, from one end of the above county to the other, they are all of the ſame opinion, and appear much ſurpriſed at the queſtion, not ever having any conception of ſuch a circumſtance. What can be the reaſon that red clover has been as long and as frequently cultivated in theſe diſtricts, as in thoſe where it is ſo liable to fail? Does it depend upon the difference in the nature or quality of the ſoils, or the management in regard to the quantity of ſeed and other matters? The circumſtance is worthy of further and more cloſe attention and inveſtigation, in conſequence of its great importance to the farmer.

There is one particular feature of management in the cultivation of red clover in the county of Oxford, which is that of hand-ſowing over it from fourteen to fifteen buſhels of Newbury peat-aſhes, that are brought into the Thames, by the Reading canal, on the acre, about the end of February or the beginning of the following month; which has an immediate effect upon it, ſeldom failing to produce a crop, except where it naturally declines. The expence is eſtimated at about ten ſhillings the acre. Theſe aſhes do not, however, ſeem to be employed in this way to the red clover crop in the diſtrict where they are found and prepared.

Seeded red clover undergoes two ſucceſſive threſhings, the firſt, which only beats off the heads and chaffs containing the ſeed from the ſtalks, is called *cobbing* in ſome places; the parts thus ſeparated being denominated the red-clover *cobb*. The work is performed on a thick wooden plank frame for the purpoſe, and requires much labour to ſeparate the ſeed, which, when done, is cleaned and paſſed through different ſieves, being ultimately divided into two ſorts, the primary and ſecondary. The coſt of theſe operations is very great, amounting to from four to ſix ſhillings the buſhel, and ſometimes much more. It has been concluded by Mr. Middleton, that this plant grows a full crop in all the arable lands of this country, from the ſands of Norfolk to the clays of Cleveland and Suſſex. And that various ſoils that have been exhauſted by corn, and not much accuſtomed to red clover, have been ſo much reſtored by it, as to produce a good crop of wheat; but that to do this every means ſhould be uſed to ſecure a full crop, as that is an excellent preparation for corn, and ſeldom fails of enſuring a conſiderable produce, ariſing from ſhade, ſmother, and putrefaction, the natural and conſtant attendants of full-grown red clover. It is ſuppoſed adviſeable, in ſome caſes of poor land, to feed both crops off on the land by ſheep and other animals, in ſome way or other. And ſometimes to mow the firſt and feed the ſecond, or the contrary. In every point of view this is an intereſting plant to the farmer. See Clover.

Red *Gum*, an infect diſeaſe on wheat, by which the ears of the grain are deprived of their nutrition, and thereby prevented from perfecting themſelves. It is deſcribed by Mr. Middleton to be a collection of inſects, which are viſible to the unaſſiſted eye, and which, in the early part of their growth, are of a reddiſh colour, but become brown with age: the black ſpots on the ſtraw, blades, and ears of the wheat, are ſuppoſed to be the excrement of the inſects. The blighted ears are probably rendered ſo, by the inſects piercing the necks of the ſtraw immediately below them, and ſucking the ſaccharine juice, otherwiſe deſtined for filling the corn. In thoſe ears which have both perfect and imperfect grains, the inſect has perhaps inſerted its probe at the connection between the corn and the ſtraw, and by drinking up the food of the grains ſeverally, has ſtarved many of them in ſuch a manner as to cauſe their deſtruction and decay. The exact nature of the diſeaſe is not, however, yet well aſcertained.

Red *Hay*, a term uſed to ſignify ſuch as is mow-burnt, in oppoſition to ſuch as is green from a moderate heat, and *vinny* hay, or ſuch as is mouldy.

Red *Land*, a term uſed by huſbandmen to expreſs a ſandy ſoil of a reddiſh hue, interſperſed for the moſt part with pieces of ſand-ſtone of the ſame colour, or ſomewhat deeper.

It may be noticed that there are ſeveral varieties of this ſoil: one of which is almoſt entirely made up of ſand; another with an admixture of loam with the ſand, the whole making a looſe loamy earth; and a third full of fragments of a poor ſandy iron ore, and often containing ſhining ſpeculæ of ſelenite. See Soil.

In ſome of the more northern parts of the county of Oxford, there is a rich red ſandy loam, upon a red grit-ſtone rock. In ſome places this land is of a more ſandy quality than in others; and, in particular inſtances, a deep red loam, or red clay. The lands are moſtly of an excellent quality, both for arable purpoſes and thoſe of graſs; but the ſandy ſorts are better than thoſe of the clayey kinds, eſpecially for the former uſe. The red ſoiled tracts in this diſtrict are conſidered as the boaſt and glory of the county, as they are deep, ſound, friable, and yet capable of tenacity; being well ſuited to almoſt every ſort of plant which can be truſted to them, in the way of cultivation. Soils of this nature prevail more or leſs in a vaſt number of counties throughout the kingdom, even from the more ſouthern ones to thoſe far advanced towards the north.

Red *Roan*, a term ſignifying the red tinge in ripening barley, and ſometimes other ſorts of grain.

Red *Row*, a provincial term, applied to the grains of barley, when in a ripening ſtate, or ſtreaked with red. The crop is then ſaid to be in the red row.

Red *Antimony*, in *Mineralogy*, an ore of that mineral, of a cherry-red colour, containing, according to Klaproth,

67.5 antimony,
10.8 oxygen,
19.7 ſulphur.

It occurs moſt frequently in minute diverging capillary cryſtals. It melts and evaporates before the blowpipe, yielding a ſulphureous odour. See Antimony.

Red *Arſenic*. See Arsenic.

Red *Chalk*. See Reddle, and *Ores of* Iron.

Red *Cobalt*, called *cobalt cruſt*, and *cobalt bloom* or *ochre*, an ore of cobalt, of a peach bloſſom red colour. See Cobalt.

Red *Copper*, *Ruby copper*, an ore of copper, of a cochineal red colour, inclining to a lead-grey. It conſiſts, according to Klaproth, of 91 parts copper and 9 of oxygen. See Copper.

Red *Hæmatite*, *Fer oligiſte concretienne* of Haüy, an ore of iron, found in kidney-ſhaped and globular balls. The ſtructure is fibrous, and divergingly radiated, but arranged in concentric curves; the colour is a blueiſh-grey, intermixed with red. By friction, it acquires a high metallic luſtre. It yields from 60 to 70 *per cent.* of pure iron. (See Iron.) An excellent ore of this kind is procured near Ulverſtone, in the north of Lancaſhire, much valued, as producing an iron of a peculiarly ductile quality, ſuited for the purpoſes of the wire-drawers.

Red *Lead*. See Minium and Lead.

Red *Scaly Iron Ore*, *Fer oligiſte luiſant* of Haüy. It conſiſts of ſcaly particles ſlightly cohering; it has an unctuous feel, and ſtains the fingers. It paſſes into micaceous iron ore.

Red *Schorl*. See *Ores of* Titanium.

Red, or *Ruby Silver Ore*, *Argent antimonié ſulphuré* of Haüy. Werner divides this into two ſub-ſpecies, dark red ſilver ore, and light red ſilver ore, diſtinguiſhed from each other by their colour, and the ſituations in which they occur. The dark red ore is commonly accompanied by galena, antimonial ſulphuret of ſilver, quartz, calcareous ſpar, and pyrites. The colour is between cochineal red and lead-grey. It occurs maſſive, diſſeminated, and cryſtallized in equiangular ſix-ſided priſms, frequently variouſly truncated. The form of the primitive cryſtal is an obtuſe rhomboid, whoſe plain angles are 104° 28′ and 75° 32′; the inclination of the faces 109° 28′ and 70° 32′. The external luſtre is ſplendent, and in ſome ſpecimens metallic; internally it is ſhining, and ſometimes ſemi-metallic and metallic. The fracture is uneven, and in the cryſtallized varieties imperfectly ſmall conchoidal. See *Ores of* Silver.

The maſſive varieties are opaque; the cryſtallized, ſemi-pellucid and pellucid. The colour of the ſtreak is a cochineal red. This variety yields eaſily to the knife: before the blowpipe or charcoal it decrepitates, and melts with a ſlight efferveſcence, emitting a denſe ſmoke, which colours the charcoal yellow, and leaves a globule of ſilver. The ſpecific gravity is 5.563 to 5.608.

The light red ſilver ore is uſually accompanied by native arſenic, white cobalt ore, orpiment, and ſulphate of barytes. The colour paſſes from a carmine red to a medium between cochineal red and lead-grey. In moſt of its characters it agrees nearly with the dark red ſilver ore; but when fuſed, it yields an arſenical vapour. Hence ſome chemiſts have conjectured that this ore differs from the dark red ore, by the former containing antimony, and the latter arſenic. According to Klaproth, red ſilver ore contains nearly

60 of ſilver,
10.5 ſulphur,
Combined with 29.4 of antimonial kimes, or
- 20.3 antimony,
- 3.2 oxygen,
- 5.9 ſulphur.

A variety of red ſilver ore, probably the light red ore of Werner, analyſed by Prouſt, gave

74 ſulphuret of ſilver,
25 ſulphuret of arſenic.
.6 oxyd of iron.

Red ſilver ore may be diſtinguiſhed from cinnabar and red copper ore, by its ſpecific gravity, which is conſiderably leſs than the former, and greater than the latter; the ſpecific gravity of red ſilver ore being 5.6 to 5.8.
of cinnabar 7 to 7.5.
red copper 3.9

Red *Vitriol*, a ſalt found at Neuſohl, in Hungary, in the form

form of tranſparent cryſtals of a pale roſe-red colour, and more or leſs tranſparent. It was diſcovered by Klaproth to be a ſulphate of cobalt. Its ſolution affords a pale blue precipitate, with carbonate of potaſh, which tinges borax a pure blue colour.

Red *Charr*, in *Ichthyology*. See Charr.

Red *Eye*, *Erythrophthalmus*, the *cyprinus erythrophthalmus* of Linnæus, called by ſome *rothauge*, or *rootang*, which, in the German language, ſignifies the ſame. It very much reſembles the common river bream in ſhape, but that it is ſomewhat thicker. The fins are all red, and the whole body of the fiſh is ſtained with a very elegant red, but no part of it ſo much as the iris of the eyes. When the ſcales are off, the body is of a greeniſh hue; and it has a yellow ſpot under the tongue. It much reſembles the river mullet in ſome particulars, but it is of a more beautiful colour, and its eyes are more red. Its largeſt ſize ſeems a foot in length. It is a well-taſted fiſh; and ſpawns in April, under cover of the roots of trees. Ray.

This fiſh is called *rudd* by ſome Engliſh authors; it is alſo called *rutilus latior*, *rubellio fluviatilis*, and *finſcale*. It is very common in many of the rivers of Germany and England, and is in ſeaſon all the year, except in ſpawning time, when the male is ſubject to a great number of white ſpots on its head, and is more rough than at any other ſeaſon. Willughby. See Cyprinus *Erythrophthalmus*.

Red-*Breaſt*, in *Ornithology*, a well-known bird, for the characters of which, ſee Motacilla *Rubecula*.

The ſong of this bird is remarkably fine and ſoft, and continues through the greateſt part of the winter, ſpring, and ſummer. Many of the autumnal ſongſters ſeem to be the young cock red-breaſts of that year. Pennant.

Thompſon, in his Seaſons, Winter, line 246, has admirably deſcribed the annual viſits of this gueſt: and the ancient ballad of "The Babes in the Wood," recording the affection of this bird for mankind, is univerſally known.

Red *Chatterer* of Latham, *Red-bird* from Surinam of Edwards, and *Ampelis carnifex* of Gmelin, a bird of red colours, with an ocular band, and the wing and tail-feathers black at their tips. It is found in New Spain, Guiana, and Surinam.

Red *Game*, an Engliſh name of a bird, common in the mountainous parts of Yorkſhire, and ſome other of our northern counties. See Gor-*cock*, Grouse, and Tetrao *Lagopus*.

Red-*Pole*, or *Linnet*. See Fringilla and Linnet.

Red-*Pole*, *Yellow*, or *Red-headed Warbler*. See Motacilla *Petechia*.

Red-*Shank*, the name of a water bird, called by authors *gallinula erythropus*, and *callidrys*; the *ſcolopax calidris* of Linnæus. It is about the ſize of the common plover. The back is of a greyiſh or browniſh-green, uſually ſpotted with black; its neck grey, and its throat variegated with black and white; the breaſt is white, with a few looſe ſtreaks of black; the wing-feathers are variegated with black, brown, and white; the bill is two fingers breadth long, ſlender, and ſhaped like the beak of the woodcock; reddiſh at the baſe, and blackiſh lower down; its legs are of a fine beautiful red, and the hinder toe is very ſhort and ſmall. It breeds in the fens and marſhes; is found on moſt of our ſhores; conceals itſelf in winter in the gutters; and is generally found ſingle, or at moſt in pairs. When diſturbed it flies round its neſt, making a noiſe like a lapwing. It lays four eggs, of a whitiſh colour tinged with olive, and marked with irregular ſpots of black, chiefly on the thicker end. Ray and Pennant. See Scolopax.

Red-*Start*, the Engliſh name of the *ruticilla*, or *motacilla phœnicurus* of Linnæus, a very beautiful bird. The bill and legs of the male are black; the forehead white; the crown of the head, hind part of the neck, and the back, are of a deep blue-grey; the cheeks and throat black; the breaſt, rump, and ſides, are red; the two middle feathers of the tail brown, the others red; the wings brown. In the female, the top of the head and back are of a deep aſh colour; the rump and tail of a duller red than thoſe of the male; the chin white; the lower ſide of the neck cinereous; and the breaſt of a paler red.

This bird appears among us only in the ſpring and ſummer, and is obſerved to come over nearly at the ſame time with the nightingale. It is ſo ſhy, that it will forſake its neſt, formed with moſs on the outſide, and hair and feathers within, in hollow trees and the holes of buildings, if the eggs are only touched. It has a very fine ſoft note; and is remarkable for ſhaking its tail, and moving it horizontally, as a dog does when fawning. Pennant.

Red-*Start*, *Greater*. See Lanius *Infauſtus*. See alſo Turdus *Saxatilis*.

Red-*Start*, *Indian* or *Bengal*. See Lanius *Emeria*.

Red-*Start*, *Small American*. See Muscicapa *Ruticilla*.

Red-*Start*, *Grey*. See Motacilla *Gibraltarienſis* and *Erithacus*.

Red-*Stone Poll*. See Linnet.

Red-*Tail*. See Motacilla *Erithacus* and *Guianenſis*.

Red *Tanager*, and *Summer Red-bird*. See Tanagra.

Red-*Wing*, the name of a bird of the turdus, or thruſh kind, called alſo in ſome places the *wind thruſh*, or *ſwine pipe*; and by Linnæus and others the *turdus iliacus*, or *ilias*.

It is a little ſmaller than the common thruſh, and is leſs ſpotted. Its back, neck, and head, are of the ſame colour with thoſe of the common thruſh; but its ſides under the wings, and the feathers which line the wings, are of an orange colour, or duſky red; its belly and breaſt are whitiſh, and its throat yellowiſh, with brown ſpots: the wings are of a ſort of cheſnut colour, a little variegated. It feeds on inſects, as worms, and the like; and is a bird of paſſage, coming to us in large flocks about the ſame time with the fieldfare, and leaving us alſo when that bird does. When the red-wing appears on the coaſt in autumn, it is certain the woodcocks are near. It is not well known where they breed, though ſome have gueſſed it to be in the mountains of Germany and Bohemia. They have a bitteriſh taſte, and are leſs valued than the fieldfare. With us they have a diſagreeable piping note; but in Sweden, during the ſpring, they ſing very finely, perching on the top of ſome tree among the foreſts of maples. They neſt in hedges, and lay ſix blueiſh-green eggs ſpotted with black. Ray and Pennant.

Red *Water*, a diſeaſe in ſheep. It has been ſuppoſed by farmers to be cauſed by taking too much watery food, ſuch as turnips, clover, rape, eddiſh, &c., but it is not peculiar to ſheep feeding on turnips or rape, as has been believed by ſome. Its removal has been attempted by the uſe of common ſalt, a tea-ſpoonful of elixir of vitriol, and the frequent driving the animal about; and it is aſſerted, that the diſeaſe may be wholly prevented by having recourſe to the uſe of dry food, in the night time, while the ſheep are feeding upon theſe juicy kinds of food. See Sheep.

In Suſſex the ſheep are ſometimes affected with this complaint on their being firſt turned into turnips, which is ſuppoſed to be cauſed by their eating too large a portion of them in wet ſeaſons. The diſeaſe is alſo believed to originate in the ſheep being let out of the fold, when the ground

is covered with hoar froſt; and often from feeding in the oat-erſhes about the beginning of the autumn, when the young oats are ſtrong. It is thought here to be readily obviated by allowing a ſmall quantity of hay ſo as to counteract the great waterineſs of the turnip; the quantity of half a pound or even leſs in the courſe of the day is believed to be quite enough for each ſheep in this intention. It is likewiſe ſuſpected, that clover, ſtubble, and folded land, are productive of it in wet weather or moiſt ſeaſons.

Red *Weed*, in *Botany*, a name given to a plant common in the Bermudas, and ſome other places; and called by our firſt travellers to that part of the world, the *Summer Iſland red weed*. Its berry is of a fine red colour, and affords a tincture little inferior to that of cochineal, and poſſeſſing all its virtues in medicine: the only misfortune of this, and ſome other very fine vegetable colours, is, that they fade ſoon. The juice of the fruit of the opuntia, or prickly pear, is as fine a dye as can be procured from the cochineal, but it will not ſtand; the inſect feeding on this, however, we find affords a colour of the ſame nature that will ſtand. The fruit of the red weed is in the ſame manner liable to be eaten by inſects as that of the prickly pear; and it is worthy a trial, whether the colour obtained at ſecond hand from thoſe inſects, will not ſtand as well as the cochineal does, and whether the inſects may not be propagated in a ſufficient abundance to ſerve the markets in the ſame manner. Phil. Tranſ. N° 40.

Red *Weed* is alſo a provincial term, ſignifying the round ſmooth-headed poppy, a pernicious weed in cornfields. See Weeds.

Red *Worm*, in *Natural Hiſtory*, the name of an inſect very deſtructive to young corn crops. The following deſcription of this worm has been given by Mr. W. Baker: after obſerving, that he has often heard of the havoc which red worms make in young wheat, barley, and oats; and in ſome few writers upon huſbandry has read of them, but never ſaw them till May 1764; when, to his great mortification, in a few days they deſtroyed almoſt totally nine acres of his wheat, for he did not reap above half a barrel *per* acre; and that the ingenious M. de Chateauvieux ſpeaks of an inſect, which is certainly of the ſame kind, if it be not the very inſect which he has now under conſideration; and in noticing the loſs ſuſtained in wheat crops, ſays, they found in it many little white worms, which afterwards became of a cheſnut colour. They poſt themſelves between the blades, and eat the ſtems. They are uſually found between the firſt joint and the roots; every ſtalk which they attacked grew no more, but became yellow and withered. And the ſame misfortune happened to them in the year 1732. The inſects appeared about the middle of May, and made ſuch havoc, that the crops were almoſt deſtroyed; Stillingfleet, alſo, in the ſecond edition of his Miſcellaneous Tracts, ſpeaks of an inſect, which is probably the ſame as in Suffolk and in ſome parts of Norfolk, where the farmers find it their intereſt to encourage the breed of rooks, as the only means to free their grounds from the grub, from which the tree or blind-beetle comes, and which in its grub ſtate deſtroys the roots of corn and graſs to ſuch a degree, that he has ſeen a piece of paſture land where you might turn up the turf with your feet: he adds, that Mr. Matthews, a very obſerving and excellent farmer of Wargrove, in Berkſhire, told him, that the rooks one year, whilſt his men were hoeing a turnip field, ſat down in a part of it, where they were not at work, and that the crop was very fine in that part, whereas in the other part there were no turnips that year; though M. de Chateauvieux deſcribes this worm as being firſt white, and afterwards becoming of a cheſnut colour, he has carefully ſought them at different periods during the paſt year, but always found them of the ſame cheſnut colour, never varying in any particular except that of ſize, which he finds to be the caſe at all ſeaſons in which he has ſeen them; and he obſerves, that the inſect ſpoken of by Stillingfleet as a grub, which, he ſays, deſtroys corn and graſs, induces him to believe that it is the ſame inſect (though the report which he relates from Mr. Matthews ſeems to contradict it), becauſe he has obſerved that the red or cheſnut worm never appears voluntarily upon the ſurface; but when the earth is turned up, either with plough or ſpade, the rooks or crows are very bold in their approach to pick them up, a circumſtance which, he owns, has in ſome degree abated his enmity to theſe birds; he therefore never deſtroys or frightens them off his land whilſt he is ploughing it; but when he ſows, when the corn riſes, and when it is ripe, he deſtroys or baniſhes them as well as he can, becauſe the miſchief which they do at theſe times is intolerable; he has alſo obſerved his lucern to decay in its tops ſoon after it has been up; and upon examining the roots he has found the red worm which had eat them off; and that, in fact, this inſect ſeems to be every where in Ireland called the red worm, but by ſome of the Engliſh writers, who have ſpoken of an inſect which deſtroys the corn in the manner already mentioned, which he thinks undoubtedly the ſame, it is called a grub, by others the large maggot, and the rook worm, becauſe the rooks eat it.

Theſe worms are about half an inch long, and about one-tenth of an inch in diameter; they are jointed in their ſkins, and are of a very firm texture: they have many ſhort legs, two ſmall black ſpecks, which appear to be their eyes; and two ſmall points ſpringing from their heads, with which, he believes, they eat the corn, and which in that work, he apprehends, act like forceps: and all that he has ſeen of this ſpecies are of a bright cheſnut colour. For this reaſon, he ſhould conceive it would be more deſcriptive to call them the cheſnut-worms. When they are expoſed to the air, by turning up earth which is infeſted with them, they will very ſoon cover themſelves again in the ſoil, which they are very capable of doing by the ſtrength which their make gives them, although they appear to be a ſluggiſh inſect, and have not the advantage of a ſlimyneſs upon their ſkins, which the common large creeping worm has, which enables that inoffenſive worm to penetrate the earth, and get under timber and ſtones with eaſe. The red worm, immediately endeavouring to cover itſelf from the air, is certainly, he thinks, from natural inſtinct, as it will ſoon die when expoſed to the air, as will appear by the experiment, N° 10, mentioned below.

It is further ſtated, that theſe worms deſtroy wheat, barley, oats, and lucern, while in an infant ſtate, in the months of March, April, and May. Late ſown barley and oats they will deſtroy as late as June. He has not yet experienced that they deſtroy any other crops. The miſchief done by them is in dry weather. Rain ſufficient to penetrate the ground makes them deſiſt from deſtroying the corn; and he ſuppoſes every thing elſe which they at any time injure. They eat wheat off juſt above the crown of the roots; barley and oats in the ſame place, and alſo higher up, upon any part of the ſtem which is below the ſurface of the earth. And theſe worms ſeem to abound more in ground which is lightly tilled, than in ſuch as hath been well tilled; but in lay ground they ſeem to be more numerous than any where elſe: and the fields upon his farm in which he has found them, are wetter than other fields where they are not; whether that circumſtance contributes to their increaſe, he cannot ſay; but the following

lowing experiments prove that they will live longer in water than they can when expoſed to the open air.

Experiments.

N° 1. He put ten red worms into a wine glaſs with common ſalt in it. They were all dead in four hours.

N° 2. Into a glaſs with brine in it he put ten red worms. They were all dead in ſix hours.

N° 3. Into a glaſs with lime in it, which had been ſlaked for a long time, and expoſed to the weather, he put the like number. They were all dead in forty-four hours.

N° 4. Into a glaſs with the above lime, and ſome water in it, he put the like number. They were dead in twenty hours.

N° 5. Into a glaſs with lime newly ſlaked, and when cold, he put the like number. They were dead in fourteen hours.

N° 6. Into lime water, made with cold water, he put the like number. They were dead in ten hours.

N° 7. Into a glaſs with ſoot in it, he put the like number. They were dead in four hours.

N° 8. Into ſoot and water he put the like number. They were dead in four hours.

N° 9. Into pure water he put the like number. They were dead in fifty-two hours.

N° 10. Into a glaſs, without any thing in it, he put the like number. They were dead in thirty-two hours.

It is ſtated that by theſe experiments it is ſeen that all the articles uſed will kill this inſect in a ſhort time, particularly the ſalt and ſoot. He thought it neceſſary to conſider different articles, the better to ſuit different parts of the kingdom.

Where lime can be conveniently had, and that it is uſed as a manure, he is apt to believe, from the experiments, that no injury can be ſuſtained from theſe worms; but he is afraid a ſmall quantity will not effectually deſtroy them; beſides, he ſhould fear, if it were not put on before the ſowing of the corn, that it might ſinge the blades of the corn; for, from theſe experiments, it appears that lime newly ſlaked is more ſuddenly deſtructive to them than old lime, and therefore it is to be preferred.

Where lime is uſed for no other purpoſe than to deſtroy this worm, he ſhould conceive, that about eight barrels, regularly ſown by hand on an acre of ground, might be ſufficient: it muſt be firſt ſlaked and cold before a man can poſſibly caſt it upon the ground with his hand, lime being a very ſtrong cauſtic; and even when it is cold the man ſhould have a thick glove upon his hand.

Where ſalt may be uſed to deſtroy this worm, it muſt always be ſown upon the ground before the intended crop; for although corn will vegetate, and receive benefit from ſalt as a manure, when it is uſed antecedent to the ſowing of the corn, yet if it be added after the corn is growing it will certainly deſtroy it: therefore it ſhould never be uſed for this purpoſe, but before the corn is ſown, or at leaſt before it vegetates.

He conceives that where ſalt is uſed for this purpoſe only, about four hundred and a half to an acre will anſwer the purpoſe, which is a little more than one ounce to every ſquare yard.

It is ſeen by the experiments, that ſoot kills this worm as ſoon as ſalt; and as in moſt places it is to be had at a much leſs price than ſalt, he thinks there can be no doubt about preferring it; beſides which, it may be ſafely uſed after the corn is up.

He had ſome ſmall parcels of barley under experiments, which theſe worms began to deſtroy; and in order to convey the ſoot as ſoon as poſſible to the roots of the plants, he mixed a little of it in water, and poured it on the plants with a garden watering-pot: the conſequence was that he did not loſe one plant afterwards.

It will hardly be imagined that he means that the ſame method is to be purſued upon a whole farm: no; the method he would recommend to the practice of the farmer is this; to ſpread, or caſt by hand, as he ſows his corn, about ſix or eight barrels of ſoot on an acre, and let him be careful to chooſe a calm day for the work, otherwiſe the wind will carry away a great part of it: and as what remains cannot be regularly diſpoſed, let him be careful to do it early enough in the ſpring, that the rain may waſh in the ſoot and convey it to the roots of the plants before the worm begins the miſchief; if he does this, he is perſuaded his crop will be preſerved.

It is found by the experiments, that theſe worms will live longer in water, by twenty hours, than when expoſed to the open air; but at length, that is in fifty-two hours, they died in the water; perhaps this might be from the effect of drowning; but if ſo, he might have expected they would have been totally deſtroyed in his two fields in the winter of 1763 and 1764, by the immoderate rains which fell at that ſeaſon for a long continuance, which often flooded the lands. But they ſurvived that winter, as appeared by the great loſs he afterwards ſuſtained by their deſtroying his wheat; and therefore, whether water be an enemy to them or not, it ſeems not eaſy to determine: but if thoſe which died in the glaſs of water were really drowned, he thinks we may conclude that water is neceſſary to their exiſtence in the earth, and probably aids them in getting their food from it: and what ſeems to confirm this notion is, that when the land is wet, they do not touch the corn, but as ſoon as ever the land is dry, they begin their miſchief. However, this ſpeculation he muſt ſubmit to the conſideration of perſons more capable of diſcuſſing it than he is.

It is ſeen by experiment N° 10, that they cannot live in the open air, which ſeems to prove, that, where they abound in land, the oftener it is ploughed, particularly in the ſummer, when they cannot penetrate the ground ſo eaſily as when it is moiſt, they muſt be, by ſuch ploughing, greatly diminiſhed: beſides which, the frequent ploughing gives the crows more opportunities of picking them up, in which, as he has before ſaid, they are very watchful.

Frequent ploughing has been recommended by ſome writers as the only means of deſtroying this worm; and they have recommended the ploughs being ſtuck with nails, urging, that by thoſe nails the worms are cut to pieces; others have recommended walnut leaves being ſoaked in water, to ſprinkle the land, and ſteeping ſeed corn in various liquors, as infallible remedies; but ſuch methods as theſe are founded upon miſtaken principles; they only miſlead the farmer, and muſt diſappoint him.

Worlidge recommends a ſtrong ley made of fixed ſalts, but that would be impracticable. Mortimer recommends ſea-water, which he believes would anſwer very well. He ſays, he uſed ſoot once with ſucceſs, but that it did not ſucceed with him afterwards. Mr. Baker is perſuaded he did not uſe the ſoot early enough to have it waſhed into the ground by rain, or perhaps he uſed too ſmall a quantity. He concludes by obſerving, that he would not be thought to arrogate any merit to himſelf, on account of what he has here offered on this ſubject, ſince it appears that other perſons have uſed the articles which he has recommended, againſt this common enemy; but many perſons have been diſappointed in their expectations from theſe remedies,

remedies, which muſt have ariſen, he thinks, from their either having uſed too ſmall a quantity, or not having obſerved the neceſſary precautions; if thoſe which he has recommended ſhall be put in practice and found to anſwer, he ſhall think himſelf amply rewarded.

This worm undoubtedly does great injury to grain crops in many caſes, in particular ſoils and ſorts of land; but a great number of additional facts and experiments are wanting to fully prove its nature, and the ways in which its deſtructive effects on ſuch crops are produced, as well as the beſt, moſt ready, convenient, and effectual ways in which it can be deſtroyed. See WIRE-*Worm*.

RED *Deer, fiſh, ſtar, ſtorax, tartar*. See the ſubſtantives.

RED *Ink*. See INK and PRINTING.

RED *Notes*, in old *Muſic*, before the invention of printing, were uſed for diminution. In the MS. at Paris of the Latin and French poems of Gullaume Machau ſet to muſic, chiefly motets for a ſingle voice, ſome are written in black and red notes, with this inſtruction to the ſingers; "nigræ ſunt perfectæ, et rubræ imperfectæ;" an admonition worth remembering by thoſe who wiſh to decypher muſic of the fourteenth and fifteenth centuries, in which red notes frequently occur. It was an eaſy expedient of diminution till the invention of the preſs, when the uſe of different coloured inks on the ſame page occaſioned the trouble and expence of double printing. See MACHAU.

In the Pepyſian collection at Cambridge, there are examples of the uſe of red notes for diminution in fragments of muſic by Joſeph Gwinneth and Robert Davie, who flouriſhed in the time of Edward IV. Morley has given ſome examples of the uſe of red notes in his annotations.

RED *Bank*, in *Geography*, a fort of the United States, on the S.E. ſide of Delaware river, in the town of Woodbury, Glouceſter county, New Jerſey; ſeven miles S. of Philadelphia.

RED *Bay*, a bay on the N. coaſt of Spitzbergen. N. lat. 79° 44′. E. long. 10° 42′.—Alſo, a bay on the S.E. coaſt of Labrador. N. lat. 51° 50′. W. long. 56° 10′.—Alſo, a bay on the N. part of Buffaloe's bay, on the S. coaſt of Maſſachuſetts, in America.

RED *Crab Iſland*, a ſmall iſland in the Eaſt Indian ſea, near the coaſt of Arracan. N. lat. 21° 30′. E. long. 91° 50′.

RED *Deer Lake*, a lake of North America. N. lat. 55° 10′. W. long. 112°.

RED *Flaggy Bay*, a bay on the N. coaſt of the iſland of St. Chriſtopher, E. of Ragged Point.

RED *Haven*, a bay of Scotland, on the N. coaſt of the county of Banff; three miles E. of Cullen. N. lat. 57° 39′. W. long. 2° 38′.

RED *Head*, a cape of Scotland, on the E. coaſt of the county of Angus; ſix miles S. of Montroſe. N. lat. 56° 33′. W. long. 2° 26′.—Alſo, the N. point of the iſland of Eda. N. lat. 59° 6′. W. long. 2° 40′.

RED *Hills*, rocks in the German ſea, near the coaſt of Northumberland. N. lat. 55° 26′. W. long. 1° 17′.

RED *Hook*, a town of America, in the townſhip of Rhynebeck, and Dutcheſs county, New York, on the E. bank of Hudſon's river; 21 miles S. of Hudſon.

RED *Horſe, Vale of*, a diſtrict of England, in the county of Warwick, which owes its name to a horſe cut in a hill, the ſoil of which is reddiſh.

RED *Iſland*, an iſland near the E. coaſt of Labrador. N. lat. 43° 55′. W. long. 55° 50′.—Alſo, an iſland near the W. coaſt of Newfoundland. N. lat. 48° 35′. W. long. 59° 10′.

RED *Lake*, a comparatively ſmall lake of North America, at the head of a branch of the Bourbon river, ſometimes called "Red river;" its form is nearly round, and its extent is about 60 miles in circumference. It has on one ſide an iſland, cloſe by which a river enters. It lies almoſt S.E. both from lake Winnepeck, and from the lake of the Woods. N. lat. 51° 5′. W. long. 94° 10′.—Alſo, a lake of North America, in N. lat. 47° 40′. W. long. 95° 15′.

RED *Lick*, a ſalt ſpring of the ſtate of Kentucky; 32 miles E. of Stamford.

RED *Point*, a cape on the E. coaſt of New Holland. N. lat. 34° 29′. W. long. 208° 45′.

RED *River*, a river of Louiſiana, which riſes in about N. lat. 35°, and W. long. 96°, and runs into the Miſſiſippi, N. lat. 37° 15′. W. long. 91° 48′.—Alſo, a river of Upper Canada, which runs into lake Superior. N. lat. 47° 51′. W. long. 85° 48′.—Alſo, a river of Tenneſſee, which runs into Cumberland river, about two miles N.W. of Clarkſville. N. lat. 36° 18′. W. long. 87° 46′.—Alſo, a river of Kentucky, which runs into Kentucky river, about nine miles above Boonſborough, N. lat. 37° 45′. W. long. 84° 18′. It is 60 yards wide at the mouth.—Alſo, a river of North America, which riſes from Red lake, in N. lat. 47° 40′, and runs into Winnipeg lake.—Alſo, a river of Canada, which runs into the Utwas; 60 miles W. of Montreal. See alſo NATCHITOCHES.

RED *Sea*, called by the ancients the "Arabian gulph," forms the grand natural diviſion between Aſia and Africa, and extends about 21° or 1470 Britiſh miles from the ſtraits of Babelmandeb to Suez; it terminates in two branches, the weſtern being extenſive, and the eaſtern aſcending a little beyond the parallel of mount Sinai.

This ſea is called, in the Old Teſtament, the ſea of Suph or Zuph, the ſea of weeds, on account of the great quantity of algæ and fuci, and perhaps the madrepores and coralline ſubſtances, anciently ſuppoſed to be of vegetable origin, found at its bottom, and near the ſhores. In ſcripture language it is alſo denominated "the tongue of the Egyptian ſea;" in the Greek and Latin geography, it was called the gulph of Heroopolis; and by the Arabian geographers, the weſtern arm of the ſea of Kolzum, (al Kolzum, with the article,) which ſeems to have ſome affinity with "Cluſma," another name by which this gulph was formerly known; Kolzum in Arabic, and Cluſma in Greek, ſignifying deſtruction, in reference, as it is ſuppoſed, to the deſtruction of Pharaoh's hoſt. Don John de Caſtro, viceroy of the Indies for the king of Portugal, conjectures that it was called the Red ſea from the great quantity of coral that is found in it. Pliny ſays that it obtained this name, in Greek "Erythrea," from a king called Erythros, who reigned in Arabia, and whoſe tomb was ſeen in the iſland Tyrine or Agyris. Several learned men believe, that this king Erythros is no other than Eſau, or Edom; Edom, in Hebrew, ſignifying red or ruddy, as Erythros does in Greek. But Calmet is of opinion, that Edom never dwelt, either on the ſhore of the Red ſea, or the Perſian gulph, which has been ſometimes alſo called the Red ſea. His habitation was eaſt of the land of Canaan, towards Bozra; and he inclines to believe, that the name of the Red ſea was not given to this gulph till after the Idumeans, deſcended from Edom, had ſpread themſelves from eaſt to weſt as far as the Red ſea. At that time it might receive the name of the ſea of Edom, which the Greeks rendered by the Red ſea, or "thalaſſa erythrea."

The famous miracle of the paſſage of the Red ſea by 600,000 Iſraelites, beſides old men, women, and children, recorded in the ſacred writings, is well known. Thoſe who have been deſirous of explaining this paſſage, with-

out admitting the miraculous part of the hiſtory, have had recourſe to a variety of conjectures; both as to the place and the manner in which this paſſage was effected. As to the place of the paſſage, there has been a difference of opinion even among thoſe who have not heſitated to acknowledge that it was miraculous. Till of late years it has been generally believed, that the paſſage of the Iſraelites was at Baideah, or Bedca, which, according to Niebuhr, is about ſix German miles from Suez, and where the ſea, ſays Bruce, is ſomething leſs than four leagues broad, by 50 feet deep. In ſupport of this hypotheſis, Dr. Shaw has traced the march of the Iſraelites to their third encampment before Pihahhiroth. Whilſt they were removing from the edge of the wilderneſs of Etham towards this ſtation, they had left the open country and were marching through a narrow paſs, betwixt the mountains of Gewoubee and Attackah. In theſe circumſtances the Egyptians might well imagine, that they could have no poſſible way of eſcape, as the mountains of Gewoubee would obſtruct their progreſs towards the ſouth, and thoſe of Attackah would impede their advancing towards the land of the Philiſtines: the Red ſea lay before them to the eaſt; whilſt Pharaoh cloſed up the valley behind them, with his chariots and horſemen. This valley terminates at the ſea, in a ſmall bay, made by the eaſtern extremities of the mountains above-mentioned; and is called "Tiah Beni Iſrael," *i. e.* the road of the Iſraelites, from a tradition ſtill exiſting among the Arabs of their having paſſed through it; and it is alſo called "Baideah," from the *new* and unheard-of *miracle* that was wrought near it, by dividing the Red ſea, and deſtroying in it, Pharaoh, his chariots and his horſemen. The encampment of the Iſraelites, according to Dr. Shaw, was at this bay, before Pihahhiroth, betwixt Migdol and the ſea, over-againſt Baal-tzephon, Exod. xiv. 2. Baal-tzephon, as this learned geographer ſuggeſts, might have relation to the northern ſituation of the place itſelf, or to ſome watch-tower, or idol-temple that was erected upon it; or it may be taken for the extremity of the mountains of Suez, or Attackah, the moſt conſpicuous of theſe deſerts, as it overlooks a great part of the Lower Thebais, as well as the wilderneſs that reaches towards, or rather which makes part of, the land of the Philiſtines. Migdol might lie to the ſouth, as Baal-tzephon did to the north of Pihahhiroth. The marches of the Iſraelites, from the edge of the wilderneſs, being towards the ſea, *i. e.* towards the S.E., their encampment betwixt Migdol and the ſea, or before Migdol, could not well have any other ſituation. Pihahhiroth, or the mouth of Hhiroth, or a narrow gullet or defile, may denote the mouth, or the moſt advanced part of this valley towards the E., or towards the Red ſea. But as the Iſraelites were delivered at this place from their captivity and fear of the Egyptians (Exod. xiv. 13.) we may ſuppoſe that Hhiroth denotes the place where they gained their *liberty*, *horar* and *hhiroth* being words of the like import in the Chaldee. It may be further urged in favour of this explication, and alſo of the tradition ſtill preſerved, of the Iſraelites having paſſed through this valley, that the eaſtern extremity of the mountain, ſuppoſed to be Baal-tzephon, is called, even to this day, by the inhabitants of theſe deſerts, "Jibbel Attakah," or the mountain of deliverance; which appellation, together with thoſe of Baideah and Tiah Beni Iſrael, could never have been given or impoſed upon theſe inhabitants at firſt, or preſerved by them afterwards, without ſome faithful tradition, that ſuch places had been once the actual ſcene of theſe remarkable tranſactions. The ſea likewiſe of Kolzum, *i. e.* deſtruction, as the correſpondent part of the Red ſea is called in the Arabian geography, is a further confirmation of this tradition. Moreover, the Ichthyophagi, who lived in this very neighbourhood, are reported by Diodorus Siculus (l. iii.) to have preſerved the like traditionary account from their forefathers, of this miraculous diviſion of the Red ſea. There are likewiſe other circumſtances that tend to prove, that the Iſraelites took their departure from this valley, in their paſſage through the Red ſea; for an account of which we refer to Shaw's Travels, ch. v.

This hypotheſis, however, ſays Geddes, (Crit. Remarks on Exod. xiv.) has been fairly given up by our beſt modern critics; and the "Sinus Heroopolitanus," or gulph of Suez, pitched upon as the ſcene of action. The idea was firſt ſuggeſted by Le Clerc, and ſince adopted and defended by Michaelis, Niebuhr, and almoſt all the German commentators. But Mr. Bryant ſtill contends for Bedea (Baideah), and calls the arguments of Niebuhr "prejudice and miſconception." Dr. Geddes, whoſe ſentiments concerning Moſes and his whole hiſtory are ſingular, denies that there was any thing miraculous in the event; and ſtrenuouſly maintains, that Suez or its vicinity was the place of paſſage; for here, he ſays, at this day, are ſhallows fordable at low water, and which might, in former times, have been frequently dry. We all know what changes happen in the bed of ſeas as well as that of rivers, eſpecially where that bed is ſand, which is the caſe with that of the gulph of Suez. The occurrence is thus deſcribed by Dr. Geddes. When Moſes ſaw that the Egyptians had found out that the Iſraelites meant not to return, and were about to purſue him with a force which he could not reſiſt, he wiſely took the only courſe that was moſt likely to afford him an eſcape. Acquainted, as he muſt have been, during his long ſtay in Midian, with the nature of the Red ſea, and its ebbs and flows, he deemed it better to take his chance of paſſing over ſome ſhallow which he knew to be fordable at low water, than to expoſe himſelf to be overtaken in a deſert, where no ſtratagem could ſave him. If he got the ſtart of the Egyptians but for a ſingle day, he would have time to watch the tide, and begin his march as ſoon as the paſſage was fordable; and in the ſpace of a few hours might be ſafe on the other ſide. The width of the ſea at Suez is at preſent, according to Niebuhr's meaſurement, 757 double paces, or 3450 feet. It is common for the Arabs to paſs on foot over this paſſage, although not always without danger, as the ſea ſometimes flows back unexpectedly. At Suez, according to Niebuhr, it is low water, at the full of the moon, at half paſt ſix; but as the paſſage of the Iſraelites muſt have happened ſome days after the full of the moon, the ebb and flow muſt have been conſiderably later, and the former muſt have occurred in the night-time, during which the Iſraelites are ſaid to have paſſed. Michaelis was of opinion, that, as a ſtrong wind is ſaid to have accompanied this event, it might have cauſed a double ebb, as it ſometimes does on the coaſt of Holland and North Germany; but Niebuhr thinks that no ſuch thing is likely to happen in the Red ſea. Be this as it will, the wind might certainly have prolonged the ebb; and, if it happened at the time of the paſſage, might well be conſidered as a providential interference, and readily conſtrued into a miracle. Joſephus, in recording this tranſaction, puts a formal ſpeech into the mouth of Moſes to his terrified and diſcontented people, and a prayer to God before he ſtrikes the ſea with his rod; yet he tells us that all this he has related as he found it in the ſacred books. But he ſeems not ſure, whether to conſider it as a miracle or a natural effect. "Let no one," ſays he, "wonder at this account of a way of ſafety being opened to thoſe old-world innocent folks, even through the ſea, whether by the will of God or naturally; ſince, of later days, the Pamphylian ſea opened a

way

way for Alexander's army, when God through him had decreed to overturn the Perſian empire." (Antiq. l. ii. c. 16. n. 5.) For this he appeals to all Alexander's hiſtorians; and, indeed, both Appian and Arrian, who relate the event, ſeemed to have conſidered it as a ſort of divine interpoſition; but honeſt Strabo tells us, that Alexander only took the advantage of low water; and, truſting to his good fortune, paſſed through the ſtreight with his army; but not on dry land; for the water came up to the navel. (Strab. l. xiv.) The ſame was the caſe with Scipio's ſoldiers, who ſurpriſed New Carthage by taking the advantage of an ebb; although they waded ſometimes up to the knee, at other times up to the navel, in water. (Liv. l. xxvi.) Here, ſays Geddes, the ſame two natural cauſes, the tide and a ſtrong wind, concurred to make a paſſage through the water, as concurred at the paſſage of the Red ſea; and in both caſes they were converted into a miracle. Joſephus concludes his narrative with theſe words. "Of ſuch things, let every one think as he pleaſes;" and the author now cited adopts his language. It has been ſaid, and thus the prieſts of Memphis explained the hiſtory (ſee Euſeb. Præp. l. iv. c. 17.), that Moſes taking advantage of the time of the ebb, led the Hebrews over in ſafety; but the Egyptians, not knowing the nature of the ſea, and eaſily entering it juſt before the return of the tide, were all ſwallowed up and drowned.

In oppoſition to all conjectures for explaining this hiſtory, without having recourſe to miracle, we ſhall content ourſelves with appealing to the hiſtory itſelf, Exod. xiv. 16, 17, &c. from which it appears that the Hebrews traverſed the ſea from ſhore to ſhore, on a large ſpace of dry ground, which was left by the retiring waters; and that they were driven back to overwhelm the purſuing hoſt of Pharaoh. See alſo Iſaiah, lxiii. 11, &c. Habbakuk, iii. 15. Wiſdom of Sol. xix. 7, 8. x. 17, 18..

It is thought, ſays Calmet, after Euſebius, that the place where the Hebrews paſſed the Red ſea, is two or three leagues below its northern point, at the place called Kolſum, or Cly ſma. Niebuhr informs us that, every where on the coaſt of Arabia, we meet with indications, that the waters are withdrawn; *e. gr.* Muſa, which ancient authors mention as a port of Arabia, is now at many leagues diſtance from the ſea; near Loheia, and Gidda, we ſee great hills filled with the ſame kind of ſhells and corals, as are now found living in the ſea; near Suez, are petrifications of all theſe things. From theſe and ſimilar circumſtances he infers, that ſome thouſand years ago this Arabian gulf was much larger, and extended much farther north, eſpecially that arm of it near Suez, for the ſhore of this extremity of the gulf is very low. The breadth of the arm of the ſea at Suez, he adds, is about 3450 or 3500 feet (in its preſent ſtate). Although it would much ſhorten the diſtance of their way, no caravan now croſſes this arm, nor could the Iſraelites have croſſed it, without a miracle. The attempt muſt have been much more difficult to the Iſraelites, ſome thouſand years ago, the gulf being then probably larger, deeper, and longer toward the north, at the loweſt time of the tide. Niebuhr croſſed, when returning from mount Sinai, that arm of the ſea, over to Kolſoum, upon his camel; and the Arabs, who accompanied him, were only immerſed to their thighs in water. The banks of the Red ſea are pure ſand from Suez to Girondel; but lower to the ſouth are banks of coral. If the Iſraelites had croſſed the ſea upon ſuch banks, they muſt have been greatly incommoded by them.

The Red ſea, notwithſtanding the difficulty and danger, and alſo the tedioufneſs of its navigation, was, for many ages before the diſcovery of the paſſage by the Cape of Good Hope, the channel of communication between Egypt and other countries, bordering on the Mediterranean, and India. Accordingly, Dr. Robertſon obſerves, in his "Hiſtorical Diſquiſition concerning Ancient India," that navigation made its firſt efforts in the Mediterranean and the Arabian gulf, and that in them the firſt active operations of commerce were carried on. Nor are the accounts of the earlieſt hiſtorians in this reſpect at all improbable, if we conſider the poſition and form of theſe two great inland ſeas. They lay open the continents of Europe, Aſia, and Africa, and ſpreading to a great extent along the coaſts of the moſt fertile and moſt early civilized countries in each, ſeem to have been deſtined by nature to facilitate their communication with one another. We find, accordingly, that the firſt voyages of the Egyptians and Phœnicians, the moſt ancient navigators mentioned in hiſtory, were made in the Mediterranean, and, moreover, by acquiring early poſſeſſion of ports on the Arabian gulf, they extended the ſphere of their commerce, and are repreſented as the firſt people of the weſt who opened a communication by ſea with India. Seſoſtris, in the courſe of his reign (if we may give credit to ſome hiſtorians), was able to fit out a fleet of 400 ſhips in the Arabian gulf, which conquered all the countries ſtretching along the Erythrean ſea to India. The Phœnicians, who, by their ſituation on the Mediterranean, and the imperfect ſtate of navigation, could not attempt to open a direct communication with India by ſea, were prompted by the enterpriſing ſpirit of commerce to wreſt from the Idumeans ſome commodious harbours towards the bottom of the Arabian gulf. From theſe they held a regular intercourſe with India on the one hand, and with the eaſtern and ſouthern coaſts of Africa on the other. The diſtance, however, from the Arabian gulf to Tyre was ſo conſiderable, that it became neceſſary for them to take poſſeſſion of Rhinocolura, the neareſt port in the Mediterranean to the Arabian gulf. Thither all the commodities brought from India were conveyed over land by a route much ſhorter, and more practicable, than that by which the productions of the Eaſt were carried at a ſubſequent period from the oppoſite ſhore of the Arabian gulf to the Nile. At Rhinocolura they were reſhipped and tranſported by an eaſy navigation to Tyre, and diſtributed through the world. For an account of the trade which the Jews carried on by the Red ſea, we refer to the articles Ophir and Tyre. For the manner in which the Egyptians carried on their trade with India by means of this gulf, ſee Alexandria and Berenice.

All the commercial tranſactions of the ancients with the Eaſt were confined to the ports on the Malabar coaſt, or at the fartheſt extended to the iſland of Ceylon. To theſe ſtaples, the natives of all the different regions in the eaſtern parts of Aſia brought the commodities which were the growth of their ſeveral countries, or the product of their ingenuity, in their own veſſels, and with them the ſhips from Tyre and from Egypt completed their inveſtments. While the operations of their Indian trade were carried on within a ſphere ſo circumſcribed, the conveyance of a cargo by the Arabian gulf, notwithſtanding the expence of land-carriage, either from Elath to Rhinocolura, or acroſs the deſart to the Nile, was ſo ſafe and commodious, that the merchants of Tyre and Alexandria had little reaſon to be ſolicitous for the diſcovery of any other. During the period in which this mode of carrying on commerce ſubſiſted, the price of goods imported from India into Europe was very much enhanced by the various operations to which the conveyance of them was ſubject. In Ceylon, or the ports on the Malabar coaſt to which they were brought from the various countries of Aſia by the natives, they were put

put on board the ſhips which arrived from the Arabian gulf. At Berenice they were landed, and carried by camels 258 miles to the banks of the Nile. There they were again embarked, and conveyed down the river to Alexandria, whence they were diſpatched to different markets. But, after the paſſage to India by the Cape of Good Hope was diſcovered by Vaſco de Gama, at the cloſe of the fifteenth century, its various commodities were purchaſed at firſt hand in the countries of which they were the growth or manufacture; and as the carriage of mercantile goods by water is much leſs expenſive than by any other mode of conveyance, the Portugueſe, as ſoon as they could import the productions of India in ſufficient quantities to ſupply the demands of Europe, were able to afford them at ſuch a reduced price, that the competition of the Genoeſe and the Venetians, who had been actively engaged in this commerce, ceaſed almoſt entirely; and the full ſtream of commerce took its natural direction towards the cheapeſt market. The conſequence was, that early in the ſixteenth century, the ſubjects of the Portugueſe monarchs became poſſeſſed of a monopoly of the trade with India, founded upon the only equitable title, that of furniſhing its productions in greater abundance, and at a more moderate price. From the era of the diſcovery now mentioned, the Arabian gulf or Red ſea loſt its importance as a channel of communication between the weſtern and eaſtern parts of the globe; and from this time both its navigation, and the commerce connected with it, have been partial and reſtricted. An account of its principal ports will be found under their reſpective articles.

REDA, a town of Turkiſh Armenia, in the government of Erzerum; 36 miles N. of Iſpira.

REDANS, or REDANT See REDENS.

REDARIDES, in *Geography*, a town of France, in the department of the Mouths of the Rhone; 16 miles S.S.E. of Orangi.

RED-BOOK *of the Exchequer* (*liber rubeus ſcaccarii*) is an ancient record, in which are regiſtered the names of thoſe that held lands *per baroniam* in king Henry II's. time. It is a manuſcript volume of ſeveral miſcellaneous treatiſes, in the keeping of the king's remembrancer, in his office in the exchequer; and hath ſome things (as the number of the hides of land in many of our counties, &c.) relating to the times before the Conqueſt. There is likewiſe an exact collection of the eſcuages under king Henry I., Richard II., and king John; and the ceremonies uſed at the coronation of queen Eleanor, wife to king Henry III. &c.

REDDAT. *Precipe quod Reddat.* See PRECIPE.

REDDENDIS CHARTIS. See CHARTIS.

REDDENDUM, in *Law*, a clauſe in a leaſe, &c. by which a rent is reſerved to the leſſor; which anciently conſiſted of corn, fleſh, fiſh, and other victuals. 2 Rep. 71.

REDDIDIT SE, is where a man procures bail for himſelf to an action in any court at law; if the party bailed at any time before the return of the ſecond *ſcire facias* againſt the bail, renders himſelf in diſcharge of his bail, they are thereby diſcharged. 2 Lill. Abr. 430. See BAIL.

REDDITARIUM, an ancient law term for a tarrier, roll, or rental, in which the rents and ſervices of a manor are ſet down.

REDDITION, REDDITIO, a ſurrendering or reſtoring. In *Law*, it alſo denotes a judicial acknowledgment that a thing in queſtion belongs to the demandant, and not to the perſons ſo ſurrendering.

REDDITUS ASSISUS, a ſet or ſtanding rent. See ASSISUS.

REDDLE, *Red Ochre*, or *Red Chalk*, in *Mineralogy*, the red oxyd of iron intermixed with earthy matter. It is uſed for crayons, either in its natural ſtate, or pounded and waſhed, and afterwards mixed with gum, and caſt into moulds. The colour of reddle varies from a blood-red to a brown-red; its fracture is earthy; it is ſoft, friable, and ſtains the fingers. See *Ores of* IRON.

This is the common Engliſh name for the ſubſtance called in Latin *rubrica*, and uſed in painting, and for marking ſheep, &c. There are two kinds of it, a harder and a ſofter.

The firſt, or harder kind, is but little in uſe, except among the turners in wood, as it does not mark ſo eaſily, requiring to be firſt wetted, and then preſſed hard upon the ſubſtance to be marked. This is dug in Lincolnſhire, Hampſhire, and Suſſex; and is a hard and dry earth, of a ſomewhat pale red, like the common pale red bricks, and is of a very regular and cloſe texture, and always compoſed of a number of thin laminæ, lying cloſely and evenly on one another. It is of a rough uneven ſurface, adheres firmly to the tongue, is not eaſily broken between the fingers, and ſtains the hands a little; it is of a very aſtringent taſte, and melts pretty readily in the mouth. It is very readily diffuſible in water, mouldering to powder, ſoon after being thrown into it; and makes no effervеſcence with acids.

The ſecond, or ſofter kind, is very common, and put to a number of different uſes. It makes ſimply a very good pale red for the painters, and is very ſerviceable to them in their mixed colours. It is in conſtant uſe in many parts of the kingdom for the marking of ſheep; and when waſhed and ſeparated from its ſandy particles, is, by ſome of our modern druggiſts, ſold under the name of bole armenic.

It is found in many parts of the world: the beſt in England is that from ſeveral parts of Derbyſhire, from whence the colour-ſhops and druggiſts of London are ſupplied; many of the latter thinking this a ſhorter method than the common one of our bole armenic makers, of preparing it from a mixture of tobacco-pipe clay, and the red ochre called Spaniſh brown.

This ſoft, or common reddle, is a looſe ponderous earth, of a lax texture, and very friable; and of a pale, but tolerably bright red, of a ſomewhat ſmooth and gloſſy ſurface, ſoft to the touch, adhering firmly to the tongue, eaſily broken between the fingers, and ſtaining the hands. It is of a rough auſtere taſte, very readily breaks, and falls to powder in water, and makes no effervеſcence with aqua fortis. Hill.

Some call reddle, *lapis hæmatites;* but the real hæmatites is another thing.

REDEEMABLES, in *Law*, are lands, funds, &c. ſold with a reſervation of the equity of redemption.

Crown lands are redeemable for ever; others only for a certain time.

RE-DELIVERY, an yielding or delivery back of a thing: if a perſon has committed a robbery, and ſtolen the goods of another, he cannot afterwards purge the offence by any re-delivery. Co. Litt. 69. H. P. C. 72.

RE-DEMISE. See DEMISE.

REDEMPTION, REDEMPTIO, a faculty or right of re-entering upon lands, &c. that have been ſold, and aſſigned; upon reimburſing the purchaſe-money, with legal coſts.

Bargains in which the *faculty*, or, as ſome call it, the *equity of redemption*, is reſerved, are only a kind of pignorative contracts.

A certain time is limited, within which the faculty of redemption ſhall be exerciſed; and beyond which it ſhall not extend.

REDEMPTION, in *Theology*, denotes the recovery of mankind

kind from ſin and death, by the obedience and ſacrifice of Chriſt, who on this account is called the *Redeemer* of the world. See COVENANT.

REDEMPTIONS, *Redemptiones*, in our old *Law Writers*, denote grievous mulcts impoſed by way of commutation for the head or life of the delinquent.

REDEMPTION *of the National Debt*. See FUND.

REDEN, or REDZYN, in *Geography*, a town of Pruſſia, in the territory of Culm; 20 miles N.E. of Culm.

REDENS, REDANS, or *Redant*, in *Fortification*, a kind of work indented in form of the teeth of a ſaw, with ſaliant and re-entering angles; to the end that one part may flank or defend another.

It is alſo called *ſaw-work*, and *indented work*. The faces in this flank one another.

Redens are frequently uſed in the fortifying of walls, where it is not neceſſary to be at the expence of building baſtions; as when they ſtand on the ſide of a river, a marſh, the ſea, &c. But the fault of ſuch fortification is, that the beſiegers from one battery may ruin both the ſides of the tenaille or front of a place, and make an aſſault without fear of being enfiladed, ſince the defences are mined.

The parapet of the corridor alſo is frequently redented, or carried on by way of redens.

REDES, in *Geography*, a river of South America, which runs into the gulf of Darien, N. lat. 7° 37′. W. long. 76° 40′.

REDHIBITION, REDHIBITIO, in the *Civil Law*, an action allowed a buyer, by which to annul the ſale of ſome moveable, and oblige the buyer to take it back again, upon the buyer's finding it damaged, or that there was ſome perſonal cheat, &c.

The redhibition, or redhibitory action, has a place in ſeveral caſes, in the body of the civil law. If a horſe was ſold that had the glanders, were broken-winded, or foundered, it was a redhibitory caſe; and the ſeller might be obliged to take him again within nine days.

REDI, FRANCIS, in *Biography*, an Italian phyſician, was deſcended from a noble family, and born at Arezzo, in Tuſcany, in the year 1626. He commenced his ſtudies at Florence, and then removed to Piſa, for the proſecution of his philoſophical and medical purſuits, where he received the degree of doctor in both theſe ſciences. He had acquired great reputation both in ſcience and literature, and was induced to ſettle at Florence, where he at length gained the favour of the court, and was appointed firſt phyſician to Ferdinand II. duke of Tuſcany, and ſubſequently to Coſmo III. Theſe appointments and his conſtant profeſſional employment did not, however, prevent him from cultivating his favourite ſtudy of the belles lettres. He devoted much of his time to the language of his country, and contributed not a little to the perfection of the dictionary of the academy of La Cruſca, of which, and of ſeveral other learned bodies, he was a member. Totally free from preſumption, and attached to every cultivator of learning and ſcience, he was always ready to give his aſſiſtance to them in every way he could, and was univerſally eſteemed and beloved. He diſplayed both in his practice, and in the proſecution of his inquiries in natural hiſtory, a ſingular acuteneſs of obſervation, and a complete incredulity as to the marvellous, which was ſo prevalent in his time; and he cautioned his friends and pupils againſt the popular errors in this reſpect. Although he was afflicted with epileptic fits in his latter years, yet he appears neither to have abandoned his ſtudies, nor his profeſſional buſineſs, until his death, which took place in 1697, in his 71ſt year.

Redi was the author of ſeveral Italian poems, which are held in much eſtimation. His other works were all written in Italian, and his ſtyle was deemed ſo pure and elegant, that the authors of the dictionary of La Cruſca have often cited it as a ſtandard. Moſt of his writings on natural hiſtory have been tranſlated into Latin; eſpecially his "Experimenta circa Generationem Inſectorum, cum Figuris Æncis;" his "Obſervationes de Viperis;" his "Experimenta circa diverſas Res naturales, ſpeciatim illas quæ ex Indiis adferuntur;" and his "Obſervationes de Animalibus viventibus, quæ intra Animalia viventia reperiuntur." He alſo publiſhed a letter on the Uſe of Spectacles, and an Eſſay on Styptics. Eloy Dict. Hiſt. de la Med.

Redi, in the notes to his "Bacco in Torcano," a dithyrambic poem, publiſhed in 1685, has given many curious etymologies and explanations of the muſical terms uſed by the Italians in early times.

REDIGOODEM, in *Geography*, a town of Hindooſtan, in the circar of Ellore; 25 miles W. of Ellore.

REDIMICULUM, among the Romans, a girdle, which going about the neck, divided on the breaſt, and paſſing down each ſide, went round, and kept the robe tight to the body.

REDINKA, in *Geography*, a town of Portugal, in the province of Beira; 14 miles S. of Coimbra.

REDINTEGRATED MEDALS. See MEDAL.

REDINTEGRATION, REDINTEGRATIO, in the *Civil Law*, the act of reſtoring a perſon to the enjoyment of a thing, of which he had been illegally diſpoſſeſſed.

In France, where a perſon is deſpoiled of his property, he claims it again by redintegrand, or action of reſtitution. But the redintegrand muſt be demanded within a year and a day, otherwiſe it is precluded.

REDINTEGRATION, in *Chemiſtry*, the reſtoring of any mixed body, or matter, whoſe form has been deſtroyed by calcination, corroſion, ſublimation, or the like, to its former nature and conſtitution.

The redintegration of mercury is properly called *reviviſication*. Mr. Boyle has an expreſs treatiſe on the redintegration of ſaltpetre; where he ſhews, that after reducing it by fluxion into fixed nitre, which is next of kin to ſalt of tartar in all its properties, he could preſently redintegrate it, by pouring a ſufficient quantity of ſpirit of nitre on it; *i. e.* he could re-produce true cryſtals of the uſual form and virtue of ſaltpetre.

It is a ſtrong objection againſt the chemical principles, that we cannot redintegrate the body they were procured from, by re-mixing them.

This ſeems to argue, that the body did not properly conſiſt of ſuch elements, or that they were not originally contained in it, but were rather produced by the fire.

REDIPATAM, in *Geography*, a town of Hindooſtan, in Marawar; 18 miles N. of Ramadnaporum.

REDIRE *ad Pacem*, in *Law*, is applied to a perſon, whoſe outlawry is reverſed, and who is reſtored to the king's peace.

REDISSEISIN, a diſſeiſin made by him who once before was found and adjudged to have diſſeiſed the ſame man of his lands or tenements; for which there lies a ſpecial writ, called a *writ of redi ſſeiſin*. See ASSISE *of Novel Diſſeiſin*, DISSEISIN, and POST-*Diſſeiſin*.

REDMANS, or RADMANS, in Doomſday and other ancient books, are probably the ſame with rod, or rad-knights; *viz.* men who, by the tenure or cuſtom of their lands, were to ride with, or for, the lord of the manor, about his buſineſs.

REDNITZ, in *Geography*, a river of Germany, formed by the union of the Upper and Unter Reſtat, about 5 miles S. of Roth, in Franconia. After receiving in its courſe

ſeveral ſtreams, it diſcharges itſelf into the Maine, a little below Bamberg.

REDOLESCO, a town of Italy, in the department of the Mincio; 14 miles W.S.W. of Mantua.

REDON, a town of France, and principal place of a diſtrict, in the department of the Ille and Vilaine; 32 miles S.S.W. of Rennes. The place contains 3783, and the canton 11,620 inhabitants, on a territory of 187½ kiliometres, in 5 communes. N. lat. 47° 39′. W. long. 2°.

REDONDA, an iſland in the Weſt Indies, about 10 miles in circumference, without ports, rivers, or towns. N. lat. 16° 55′. W. long. 62° 20′.

REDONDELA, or REDONDILLO, a town of Spain, in the province of Galicia, near the weſt coaſt, defended by a ſtrong caſtle; 32 miles W.S.W. of Orenſa.

REDONDO, a rock, about three miles in circumference, between the iſlands of Montſerrat and Nevis, in the Weſt Indies. N. lat. 17° 6′. W. long 61° 35′.

REDONDO *Novo*, a town of Benguela. S. lat. 11° 22′. E. long. 13° 45′.

REDONDO, *O*, a town of Portugal, in Alentejo; 14 miles E.N.E. of Evora. N. lat. 38° 33′. W. long. 7° 22′.

REDONDOS, a town of Portugal, in the province of Beira; 17 miles S. of Coimbra.

REDOUBLE′, Fr., in *Muſic*, a doubled interval in the octave above a ſingle interval. The octave of the octave, with us, is called the 15th. See INTERVAL.

REDOUBT, or REDOUTE, *Reductus*, in *Fortification*, a ſmall ſquare fort, without any defence but in front, uſed in trenches, lines of circumvallation, contravallation, and approach; as alſo for the lodging of corps de garde, and to defend paſſages. See FORT.

They are uſually figures of three, four, five, or ſix ſides, encompaſſed with a ditch, and a bank of earth, which conſiſts of two parts, called rampart and parapet.

In marſhy grounds, redoubts are often made of ſtone-work, for the ſecurity of the neighbourhood; their face conſiſts of from ten to fifteen fathoms; the ditch round them from eight to nine feet broad and deep; and their parapets, which are cut into embraſures and merlons, have the ſame thickneſs. See REDUCT.

The inner ſides of ſquare redoubts are uſually between the limits of twelve and thirty-two yards; and when they are to be defended by muſketry, the number of men neceſſary to the defence may be thus determined: half the ſide ſquared gives the number of troops; and twice the ſquare root of a given number of men, ſhews the length in yards of the ſide of a ſquare redoubt proper to contain them.

To conſtruct a ſquare redoubt. — Mark out a ſquare, whoſe ſide is adapted to the number of troops allotted for the defence, as A B (*Plate* VII. *Fortification*, *fig.* 5.) for the inſide of the rampart. About this ſquare, at the diſtance of ten or twelve feet, deſcribe another ſquare, whoſe ſide, C D, is the inner boundary of the parapet; make a parapet of about nine or ten feet thick, whoſe outline is the line E F; leave a berm about three or four feet broad, whoſe ſide is G H; and dig a ditch about ſixteen feet wide, and about ſix or ſeven feet deep, which ſhould be rounded before the angles of the redoubt. Make the rampart from four feet to nine or ten feet high; let the parapet be ſix or ſeven feet higher, and let the foot-bank be four feet and a half lower than the crown of the parapet. On that ſide moſt ſecure from the enemy, make a bridge acroſs the ditch, and a paſſage through the rampart, about four or five feet broad when the defence is muſketry, about nine or ten feet broad when cannon are to be uſed; and ſhut up the paſſage by a ſtrong gate. If the redoubt is to be defended by cannon, both the rampart and parapet ſhould be at leaſt five or ſix feet thicker. In order to make the fire pretty nearly equal on all ſides, and ſufficient for defending the angles of the work, M. Clairac has contrived to cut the inſide of the parapet into notches, whoſe two ſides, of a yard each, are at right angles to one another, and make half-right angles with the ſides of the work; the manner of which, and its defence, are plainly ſhewn in the figure, where the lines with dots at the ends repreſent the fire three different ways from the ſame ſide.

For the method of conſtructing flanked redoubts, ſee FORT.

A *detached* redoubt is a kind of work reſembling a ravelin, with flanks, placed beyond the glacis; ſuch as B (*Plate* V. *Fortification*, *fig.* 6.) They are made in order to occupy ſome ſpot of ground which might be advantageous to the beſiegers; and likewiſe to oblige the enemy to open their trenches farther off than they would otherwiſe do. Their diſtance from the covert-way ought not to exceed a hundred and twenty toiſes, that they may be defended by muſket-ſhot from thence. The gorge, *a b*, is forty toiſes; the flanks, *a c*, *b f*, which are perpendicular to the gorge, ten; and the faces, *e d*, *f d*, thirty: the ditch before it is ſix toiſes, ending in ſlopes at both ends; the covert-way, four; the branches of the covert-way about forty-two toiſes long; the faces of the places of arms, *y*, *y*, which are perpendicular to the branches, ten; and the other, which is parallel to them, fourteen. The communication from the covert-way to the redoubt is five or ſix toiſes wide; and there is a traverſe made juſt at the entrance, and another in the middle when it is pretty long. The parapets of this communication terminate in a ſlope or glacis. Robertſon's Marine Fortif. p. 20, &c. Muller's Fort. p. 43, &c. See ARROW.

Redoubts are alſo ſmall works of the ſame form made in a ravelin.

REDOUBT, *Caſtle* or *Donjon*. See REDUCT.

REDOUBTS *en Cremaillere*, differ from other redoubts by having the inſide line of the parapet broken, ſo as to reſemble a pot-hook, or the teeth of a ſaw; by which a greater fire can be brought to bear upon the defile than if only a ſimple face was oppoſed to it, and conſequently the paſſage is rendered more difficult.

REDOUTES *de Terre*, Fr. redoubts that are haſtily thrown up, and made with earth, for the purpoſe of ſecuring entrenchments, circumvallations, paſſages of rivers, &c.

REDOUTES *de Maconnerie*, Fr. redoubts made of maſon-work; generally conſtructed in places where an enemy might derive advantage from eſtabliſhing himſelf; they are likewiſe built upon the ſaliant angles of the glacis.

REDOUTES *Caſematées*, Fr. caſemated redoubts, or ſuch as are arched over and made bomb-proof. Thoſe conſtructed for the defence of Gibraltar, and for the ſecurity of Dover caſtle, are of this deſcription.

REDOUTES *à Machicoulis*, Fr. are thoſe which are made of brick or ſtone-work ſeveral ſtories high. The higheſt ſtory juts out about one foot beyond the wall that ſurrounds or fronts the redoubt.

REDRESSING, the rectifying or ſetting any thing ſtraight again.

Trees and other plants have a natural faculty of redreſſing themſelves, when, by any external cauſe, they are forced out of the perpendicular.

In the moral ſenſe, to redreſs grievances, is to reform or remove them. The redreſs of injuries is the object with a view to which courts of juſtice are inſtituted in every civilized ſociety; in order to protect the weak from the inſults of the ſtronger, by expounding and enforcing thoſe laws, which define rights and prohibit wrongs. This remedy is,

therefore, to be fought for by application to theſe courts; that is, by civil ſuit or action.

To redreſs a ſtag, among hunters, is to put him off his changes.

REDRILL, *To*, in *Military Language*, is to put a ſoldier through the firſt elements of military training. Every ſoldier, after his return from long abſence, muſt be redrilled before he is permitted to act in the ranks of a company.

REDRUTH, in *Geography*, a conſiderable market-town in the eaſt diviſion of the hundred of Penwith, and county of Cornwall, England, is ſituated on the road from Launceſton to the Land's-End, at the diſtance of 262 miles S.W. from London. It occupies the declivity of an eminence in the very centre of the mining diſtrict, and derives its ſupport entirely from the mines. Dr. Pryce ſuppoſes it to have been a town in Saxon times; but if ſo, the records of its hiſtory during that period have been entirely loſt. It is firſt mentioned in the year 1332, when William Baſſet, the then proprietor of the manor, obtained for the inhabitants the privilege of fairs and markets. In 1502 a ſimilar grant was made in favour of John Baſſet, eſq.; and in Oliver Cromwell's time, Mr. Buller of Morrall procured a charter for a market on Fridays, which was confirmed by king Charles II. At preſent there are two weekly markets, held on Wedneſday and Friday; and three annual fairs, chiefly for cattle and ozier manufactures. The tolls of two of theſe fairs and the markets belong to the Buller family; and the other fair to lord de Dunſtanville, the deſcendant of the Baſſets. The increaſe of this town, ſince the commencement of the copper mines in the laſt century, has been as ſix to one, as appears by the average of baptiſms. According to the population return of 1801, it contained 664 houſes, and 4924 inhabitants; but in 1811 the houſes were returned as amounting to 879, and the inhabitants to 5903 in number.

Redruth conſiſts chiefly of one long ſtreet. The church, the living of which is a rectory, was built, in 1770, by lord de Dunſtanville, in the ſtead of a more ancient one. This building is ſituated about half a mile from the town. Here are the remains of a chapel of eaſe, dedicated to St. Rumon, which has been unroofed for many years. In Redruth are meeting-houſes for Quakers and Anabaptiſts, beſides two for Methodiſts in the town, and a third in the north part of the pariſh. In 1803, a large ſchool-houſe was built here by ſubſcription, and a maſter placed in it by the ſame means; but the ſubſcription having been diſcontinued, the ſchool is now kept open by the maſter on his own account.

Among the numerous mines in Redruth and the contiguous pariſhes of Gwennap, Kenwyn, and St. Agnes, thoſe denominated the *Gwennap mines* are conſidered to be the principal. Theſe lie to the ſouth-eaſt of Redruth, in a part of the county where the tin and copper lodes are peculiarly rich, and in ſome places interſect each other. The country of the united mines Huel-Virgin, Poldice, and Huel-Unity, is ſchiſtus; that of Huel-Jewell, Huel-Gorland, and Treſavan, is granite; and it has been remarked, that the metallic veins moſtly obey the courſe of the granite mountains, and run very nearly parallel with them. The united mines employ about 600 men, of whom 400 work under ground. The water is drawn off by four immenſe ſteam-engines, one of the cylinders of which is nearly ſeven feet in diameter. The Huel-Virgin mine is 160 fathoms deep, and is extremely productive; but the Huel-Unity and Poldice mines are ſtill more rich, and are wrought to ſuch advantage, that the proprietors uſually ſhare from 16,000*l.* to 20,000*l. per annum*. The depth of the Poldice mine is 170 fathoms; but at preſent it is not worked at a lower depth than 140. This is one of the oldeſt mines in the county, and yields a yellowiſh copper ore, a roſin tin, and a few ſtones of galena. The Huel-Gorland mine is 120 fathoms below the ſurface, and is wrought at the expence of about 1000*l.* a month. The North Down mines, nine in number, occupy an extent of two miles in length, and one in breadth, and have their ſurplus water carried away by the ſame long adit which runs through the Gwennap mines to the Carnon-Stream works.

Beſides the mines, there are ſeveral other objects in the vicinity of Redruth not undeſerving of notice. Portreath, about four miles to the north, is a ſmall ſea-port for the importation of coals and lime, and the exportation of copper ore to the works in Wales. It is defended by a fort, mounting four guns, and was erected by lord de Dunſtanville in the year 1782, and is maintained at his expence. Tehidy park, the ancient ſeat of the Dunſtanville family, adjoins Portreath on the ſouth-weſt. This manor is firſt mentioned as being in their poſſeſſion as early as the year 1100, about thirty years before the marriage of Cecilia de Dunſtanville with William Baſſet, who carried the Dunſtanville eſtates to the Baſſets. The preſent manor-houſe is of modern erection, conſiſting of a centre, and four detached pavilions at the angles, the whole conſtructed chiefly of Corniſh free-ſtone. The principal rooms are decorated with ſome good portraits by Vandyke, Kneller, and ſir Joſhua Reynolds; and alſo with a few pieces by Rubens, Carlo Dolci, Bononi de Ferrari, Rembrandt, Borgognone, and others of leſs note. The park and pleaſure grounds attached to this manſion are very extenſive; containing about ſeven hundred acres, finely varied by wood and lawn, and appearing like a well-cultivated garden in the midſt of a deſert.

Weſtward from Redruth, about a mile and a half, is Carn-breh hill, which Dr. Borlaſe and others contend ought to be regarded as the grand centre of Druidical worſhip in this county, almoſt every kind of monument commonly attributed to the Druids being found, as they allege, upon that eminence. How far this opinion is correct, we ſhall not pretend to decide; but we may obſerve, that ſeveral late writers maintain, that a part of the ſuppoſed monuments of religion, *viz.* the caves, are in fact the reſult of natural convulſion. No doubt, however, ſome of them are artificial, and probably belonged to the Druids; and what ſeems to corroborate this idea is, the circumſtance of Redruth being a corruption for Dre-Druith, which ſignifies the Druids' town. On the ſummit of this hill is a circular fortification, called the Old Caſtle, which appears to have been formerly ſurrounded by a ſtrong wall; and about 300 yards to the eaſtward, on a ledge of ſuccumbent rocks, ſtands Carn-breh caſtle, part of which lays claim to a very high antiquity; but the remainder is of comparatively modern date. The rocks upon which this ſtructure is erected not lying at all contiguous to each other, are connected by maſſive circular arches thrown over the cavities.

On the ſouth-weſt ſide of Carn-breh hill is Pendarves, the ſeat of John Stackhouſe, eſq. It is a large handſome building, ſituated on an eminence commanding extenſive views over the weſtern parts of the county. In a field contiguous is a large cromlech, compoſed of three upright ſtones, and an impoſt. Clowance, ſituated about three miles further to the ſouth-weſt, has been for ſeveral centuries a ſeat of the family of St. Aubin. The houſe is deeply emboſomed in wood; and contains, beſides ſeveral pictures of curioſity and value, a large collection of rare and choice prints, accumulated in the portfolios of its preſent poſſeſſor. Lyſons's Magna Britannia, vol. iii. London, 1814, 4to.

Beauties

Bauties of England and Wales, vol. ii. by John Britton and E. W. Brayley.

REDSEAR. See IRON.

REDSTONE, in *Geography*, a town of Pennſylvania, on the Monongahela; 55 miles N.W. of Pittſburg.

REDUBBORS, thoſe who buy ſtolen clothes, &c. and, to the end they may not be known, turn them into ſome other faſhion, &c. See FRIPPERY, and REGRATOR.

REDUCE, in *Chemiſtry*. See REDUCT.

To REDUCE *a Place*, in *Military Language*, is to oblige the governor to ſurrender it to the beſiegers by capitulation.

To REDUCE *the Circle*, is to reſtore or bring back a battalion or company which has been formed in circle to its original poſition in line.

To REDUCE *the Square*, is to reſtore a battalion or battalions which have been formed in a hollow or oblong ſquare to their natural ſituation in line or column.

REDUCED CHART. See CHART.

To be REDUCED, in *Military Language*, is to be taken off the eſtabliſhment, or ceaſe to receive pay as ſoldiers. When a regiment is reduced, the officers are generally ſent upon half pay. Sometimes, as at the cloſe of a war, the corps are reduced, and the officers remain upon full pay. Hence are derived the expreſſions *in* and *out* of the break. *In the break* denotes the liability of being reduced: *out of the break* ſignifies the certainty of being kept upon the eſtabliſhment.

To be REDUCED *to the Ranks*, is to be taken from a ſuperior appointment in a regiment, and to be ordered to the duty of a common ſoldier. This ſometimes happens by way of puniſhment, when a ſerjeant or corporal miſbehaves. A ſerjeant, however, cannot, at preſent, be reduced, except by ſentence of a regimental court-martial.

REDUCING SCALE, is a thin broad piece of box, with ſeveral lines and ſcales of equal parts upon it; for turning chains and links into acres and rods, by inſpection.

It is uſed by ſurveyors to reduce maps and draughts from one dimenſion to another; it is ſometimes alſo called a *ſurveying ſcale*.

REDUCT, REDUIT, or *Redoubt*, a military term, ſignifying an advantageous piece of ground, intrenched and ſeparated from the reſt of the place, camp, &c. for an army, garriſon, &c. to retire to, in caſe of a ſurpriſe. Reduits have been ſometimes made for the purpoſe of ſecuring different poſts in a town independent of its citadel. They were propoſed by the celebrated Vauban. See DONJON.

REDUCT, in *Building*, a kind of receſs, or little place, taken out of a larger, to make it more uniform and regular; or for ſome other convenience, as for a little cabinet aſide of a chimney, for alcoves, &c.

REDUCT, or *Redux*, among *Chemiſts*, is a powder by which calcined metals and minerals are reduced again to their regulus, or pure ſubſtance.

REDUCTION, REDUCTIO, in the *Schools*, a manner of bringing a term or propoſition, which before was oppoſite to ſome other, to be equivalent to it.

Reduction is effected by the addition or retrenchment of a negative particle. Thus, to reduce this propoſition, *no man is an animal*, to be equivalent to its oppoſite, *every man is an animal*, I drop the negative, and ſay, *man is an animal*. After the like manner might the term *every man* be reduced, by adding the negative and ſaying, *there is no man*.

REDUCTION *of Propoſitions* is uſed in a more general ſenſe, for any expreſſion of one propoſition, by another propoſition equivalent to it.

To a reduction, therefore, there are two propoſitions required, the *reduced*, and the *reducing*; which are conſidered as the extremes of it, and to be connected in the reduction by means of the particle *that is*; which here has the effect of a copula.

As here, *only animals think; that is, animals think, and nothing beſides animals thinks*. Where the propoſition preceding the particle is reduced, and the ſubject of the reduction; that following the particle reduces, and has the effect of the predicate of the reduction, and the particle *that is* acts as a copula, importing, not barely that the propoſition is expreſſed by another, but by another equivalent one, or, as it were, the ſame.

REDUCTION *of Syllogiſms*, is a regular changing or tranſforming of an imperfect ſyllogiſm into a perfect one. Or, it is a change of a ſyllogiſm in reſpect of form, by which the neceſſity of the illation, or inference, is made more evident.

Reduction obtains in ſyllogiſms of the ſecond and third figure; as alſo in the indirect modes of the firſt. By it theſe are all brought to the firſt.

There are two kinds of this reduction; the one *direct*, or *oſtenſive*, performed merely by a converſion of one or both the premiſes, or by a tranſpoſition of them; as when *cameſtres* is reduced to *celarent*: the other *indirect*, called *per impoſſibile*, or *ad abſurdum*; by which the perſon who denies the goodneſs and legitimacy of an imperfect ſyllogiſm, is reduced to aſſert or grant ſomething abſurd and impoſſible, or contradictory to ſome other thing maintained by him.

Suppoſe, *e. gr.* a perſon granting the premiſes of the following ſyllogiſm, denies the concluſion: *All fraud is prohibited; but ſome trading is not prohibited; therefore ſome trading is not fraud*. We thus proceed againſt him if the ſyllogiſm be not good, the antecedent is juſt, but the conſequent falſe; and, therefore, the contrary of the concluſion muſt be true: now I take the contrary of the concluſion, which you thus give, *viz. all trading is fraud*; and of that, with the other premiſe of the former ſyllogiſm, *viz.* the major, which you likewiſe grant, make a new ſyllogiſm; thus, *All fraud is prohibited; all trading is fraud: therefore all trading is prohibited*. But this propoſition, *all trading is prohibited*, and the other, *ſome trading is prohibited*, which you granted me in the firſt ſyllogiſm, are contradictories.

REDUCTION, in *Arithmetic*, is the converting of monies, weights, or meaſures, into the ſame value in other denominations; *e. gr.* pounds into ſhillings and pence; or ſhillings and pence into pounds.

The reductions of the principal monies, coins, weights, and meaſures, ancient and modern, foreign and domeſtic, are found under COIN, WEIGHT, MEASURE, POUND, FOOT, &c.

Reduction is of two kinds: 1. *Deſcending*, when a quantity is to be brought from a higher denomination to a lower.

This is done by conſidering how many of the next leſs denomination are contained in the next greater before, and by that number multiplying the greater.

Thus pounds are reduced into ſhillings, by multiplying by 20; ſhillings into pence, by multiplying by 12; and pence into farthings, by multiplying by 4.

Troy pounds are reduced into grains, by multiplying by 12, 20, and 24: and avoirdupois hundreds into ounces, by 4, 28, and 16.

2. *Aſcending*, when a lower denomination is to be reduced to a higher.

In order to this, the buſineſs is to divide the leaſt by ſo many of its denomination as are contained in the next greater: thus, 24,720 pence, divided by 12, and the quotient by 20, gives 103 pounds.

If there remain any thing in each diviſion, it is reſpectively

ively either odd pence, or ſhillings: thus, 6713 pence reduced, give 27*l.* 19*s.* 5*d.* cut off the laſt, the reſt are the pounds required.

To expedite the practice, ſeveral compendious ways of reduction have been invented. See PRACTICE.

Thus, yards are turned into ells by ſubtracting a fifth; and into ells Flemiſh by adding a fifth. Ells Flemiſh are reduced into yards by ſubtracting a quarter. Ells Flemiſh reduced to ells Engliſh by multiplying by 6, and cutting off the right-hand figure.

Great pounds of ſilk of twenty-four ounces are reduced to pounds of ſixteen ounces by adding one-half; and pounds of ſixteen ounces into pounds of twenty-four by ſubtracting one-third.

REDUCTION *of Decimals*. See DECIMALS.

REDUCTION *of Fractions*. See FRACTIONS.

REDUCTION *of Ratios*. See RATIOS, *Reduction of*.

REDUCTION *of Surds*. See SURDS.

REDUCTION *of Equations*. Various algebraical operations are claſſed under this head by different authors; ſome conſidering it to be the ſame as is otherwiſe, and more properly, called the *ſolution* of equations, or the finding of their roots: ſome define it to be the taking away or exterminating all the unknown quantities except one, otherwiſe called *elimination*: others again, under this head, treat of what is more uſually termed the *transformation* of equations; and others again apply it to the depreſſing of an equation, or the reduction of it to another of lower dimenſions, which latter ſeems to us the only operation that can properly be treated of under the above deſignation. See RESOLUTION, and TRANSFORMATION.

There are but few caſes in which the reduction of an equation can be effected, *viz.* only when a known relation has place amongſt any of its roots, in which caſe the equation will admit of being reduced as many degrees lower, as there are independent conditions known to have place. So that if the relation be only between two roots, which is one condition, the equation may be reduced two degrees; if the relation extend to three roots, it may be reduced three degrees; and ſo on.

The conditions or relations more commonly conſidered, are thoſe in which the roots of an equation form an arithmetical or geometrical progreſſion, and when an equation has any number of equal roots. The two former relations ſeem rather objects of curioſity than utility, as it is not probable that an equation ſhould have ſuch relations obtain between its roots; but with regard to equal roots they may frequently ariſe in the ſolution of various problems. When any geometrical or phyſical problem is propoſed, the number of its poſſible ſolutions is generally limited, and therefore the ultimate reſult ariſing out of ſuch inveſtigation ought to be an equation, the number of whoſe roots agree with the limited number of ſolutions. But it may happen that the analyſt, by not purſuing the beſt mode of operation, is led to an equation of higher dimenſions than is requiſite, in which caſes, upon inveſtigation, it will always be found that his reſulting equation has ſome number of equal roots, which being taken away, will reduce the equation to one of lower dimenſions, which gives the proper number of ſolutions to the original problem. As to the caſes in which the roots of an equation form a geometrical progreſſion, they occur almoſt excluſively in the ſolution of binomial equations, having prime indices, a property which M. Gauſs has turned to a good account in the ſolution of theſe equations. See POLYGON, and RECIPROCAL *Equations*.

Nearly all other relations between the roots of equations are feigned for the purpoſes of framing queſtions, and exerciſing the ingenuity of authors and their ſtudents.

1. To aſcertain whether a propoſed equation has any equal roots.

Let $x^m + \alpha x^{m-1} + \beta x^{m-2} + \gamma x^{m-3} + \&c. = 0$, be any equation whoſe roots are a, b, c, d, &c. then from the known theory of equations we have

$$x^m + \alpha x^{m-1} + \beta x^{m-2} + \gamma x^{m-3} + \&c. = (x-a)\ (x-b)\ (x-c)\ (x-d),\ \&c.$$

And it may be ſhewn alſo, that the equation $m x^{m-1} + (m-1)\,\alpha x^{m-2} + (m-2)\,\beta x^{m-3} + \&c. =$

$$\begin{array}{l}(x-a)\ (x-b)\ (x-c)\ \&c. + \\ (x-a)\ (x-b)\ (x-d)\ \&c. + \\ (x-a)\ (x-c)\ (x-d)\ \&c. + \\ (x-b)\ (x-c)\ (x-d)\ \&c.;\end{array}$$

that is, it is equal to the ſum of all the m equations that can be formed by the different combinations of the m firſt roots, taking $m-1$ at a time. (See Waring's Meditationes Algebraicæ, cap. 3.) Now if we ſuppoſe the firſt equation to have two equal roots, as, for example, $a = b$, the above products will become

$$x^m + \alpha x^{m-1} + \beta x^{m-2} + \gamma x^{m-3} + \&c. = (x-a)\ (x-a)\ (x-c)\ (x-d)\ \&c.$$ and

$$m x^{m-1} + (m-1)\,\alpha x^{m-2} + (m-2)\,\beta x^{m-3} + \&c. =$$

$$\begin{array}{l}(x-a)\ (x-a)\ (x-c)\ \&c. + \\ (x-a)\ (x-a)\ (x-d)\ \&c. + \\ (x-a)\ (x-c)\ (x-d)\ \&c. + \\ (x-a)\ (x-c)\ (x-d)\ \&c.;\end{array}$$

where it is obvious that both the one and the other of theſe equations have the ſame factor, *viz.* $(x-a)$.

If the equation had three equal roots, it is equally obvious that both equations would have the common factor $(x-a)^2$; and generally, if the equation had p equal roots, they would both have the common factor $(x-a)^{p-1}$.

Therefore, when it is propoſed to find whether a given equation have equal roots, we muſt from the propoſed equation draw the *derived* equation as above, (which, it will be obſerved, is the ſame as would ariſe from taking the fluxion of the firſt, leaving out of courſe the $\dot{x}$'s,) and find by the uſual methods, whether theſe two functions have any common meaſure; which, if they have, will furniſh us with the equal root ſought; and conſequently the original equation may then be reduced by diviſion to another of two degrees lower dimenſion for two equal roots; of three degrees lower for three, and ſo on.

Exam. 1.—It is required to find the equal roots of the equation $x^3 - 48x - 128 = 0$.

Here the derived equation is $3x^2 - 48 = 0$, and the common meaſure of theſe two functions is $x + 4$; whence -4 and -4 are the equal roots; the third root being $+8$.

Exam. 2.—It is required to aſcertain whether the equation

$$x^4 + 3x^3 - 14x^2 - 12x + 40 = 0$$

have equal roots, and what they are.

Here the derived equation is

$$4x^3 + 9x^2 - 28x - 12 = 0;$$

and the common diviſor of the two is $x - 2$; whence $x = 2, 2$, which are two of the equal roots. Divide now the original equation by $x^2 - 4x + 4$, and we have

$$x^2 + 7x + 10 = 0,$$

whoſe

whoſe roots are -2, and -5; therefore, the four roots of the propoſed equation are $2, 2, -2, -5$.

If the roots of an equation be equal, but with contrary ſigns, the operation is more ſimple. For, in this caſe, we have only to change the ſigns of the roots in the propoſed equation, by changing the alternate ſigns of its co-efficient; and we ſhall thus have two equations, having neceſſarily a common quadratic factor of the form $x - a^2$, which may be found, and the equation depreſſed as before.

Exam. 3.—Required the roots of the equation $x^4 + 3x^3 - 7x^2 - 27x - 18 = 0$, two of which are equal, but with contrary ſigns.

By changing the ſigns of the alternate terms, we have $x^4 - 3x^3 - 7x^2 + 27x - 18 = 0$, the common quadratic diviſor of which is $x^2 - 9 = 0$; whence the equal roots with contrary ſigns are $+3$, and -3. Now dividing the propoſed equation by $x^2 - 9$, we have $x^2 + 3x + 2 = 0$; whence $x = \frac{-3}{2} \pm \sqrt{\frac{1}{4}} = -2$, and -1, which are the other two roots.

On this ſubject the reader ſhould conſult Waring's Meditationes Algebraicæ, cap. 3. See alſo Bonnycaſtle's Algebra, vols. i. and ii.

REDUCTION *of Intereſt of the public Debt.* See FUND.

REDUCTION *of Curves.* See CURVE.

REDUCTION *of a Figure, Deſign,* or *Draught,* is the making a copy of it, either larger or ſmaller than the original, ſtill preſerving the form and proportion.

The great uſe of the proportional compaſſes is in the reduction of figures, &c. whence they are alſo called *compaſſes of reduction.*

There are various methods of reducing figures, &c.; the moſt eaſy is by means of the *pentagraph* (which ſee), or parallelogram: but this has its defects. The beſt and moſt uſual methods of reduction are as follow:

To reduce a figure, as A B C D E (*Plate* XII. *Geometry, fig.* 5.) *into a leſs compaſs.*—About the middle of the figure, as *z*, pitch on a point; and from this point draw lines to its ſeveral angles, A, B, C, &c. then drawing the line *a b* parallel to A B, *b c* parallel to B C, &c. you will have the figure *a b c d e* ſimilar to A B C D E.

If the figure *a b c d e* had been required to be enlarged, there needed nothing but to produce the lines from the point beyond the angles, as *z* D, *z* C, &c. and to draw lines, *viz.* D C, C B, &c. parallel to the ſides *d c, c b,* &c.

To reduce a figure by the angle of proportion.—Suppoſe the figure A B C D E (*fig.* 6.) required to be diminiſhed in the proportion of the line A B to *a b* (*fig.* 7.): draw the indefinite line G H (*fig.* 8.), and, from G to H, ſet off the line A B; on G deſcribe the arc H I; ſet off the line *a b* as a chord on H I, and draw G I. Then with the angle I G H you have all the meaſures of the figure to be drawn. Thus to lay down the point *c*, take the interval B C, and upon the point G deſcribe the arc K L; alſo on the point G deſcribe M N; and upon *a*, with the diſtance M N, deſcribe an arc cutting the preceding one in *c*, which will determine the ſide *b c*. And after the ſame manner are all the other ſides and angles to be deſcribed. The ſame proceſs will alſo ſerve to enlarge the figure.

To reduce a figure by a ſcale.—Meaſure all the ſides of the figure, *e. gr.* A B C D E, by a ſcale, and lay down the ſame meaſures reſpectively, from a ſmaller ſcale in the proportion required.

To reduce a map, deſign, or figure, by ſquares.—Divide the original into little ſquares, and divide a freſh paper of the dimenſions required, into the ſame number of ſquares; which are to be larger or leſs than the former, as the map is to be enlarged or diminiſhed.

This done, in every ſquare of the ſecond figure, draw what you find in its correſpondent one in the firſt.

REDUCTION *to the Ecliptic,* in *Aſtronomy,* is the difference between the argument of latitude, as N P (*Plate* XIX. *Aſtronomy, fig.* 10.) and an arc of the ecliptic N R, intercepted between the place of a planet and the node N.

To find the reduction.—The angle of inclination P N R, and the argument of latitude N P, being given, find, by the doctrine of ſpherics, the arc N R; ſubtract N R and N P from each other, the remainder is the reduction.

REDUCTION *into firſt Matter,* is a term which alchemiſts formerly uſed, when they found their ſubſtances putrefy, and grow black.

REDUCTION was more particularly uſed for the converſion of a dry matter into a liquid, particularly into water; which by the alchemiſts was held the principle of all things.

The reduction of metals into their firſt matter, or principles, according to theſe philoſophers, can only be effected by mercury; nothing elſe being able to looſen the fixed ſulphur of metallic bodies, which binds them together.

REDUCTION, in *Metallurgy,* is the decompoſition of a metallic oxyd, ſo as to leave the metal in a ſtate of greater or leſs purity, and exhibiting the luſtre which is ſo eminently characteriſtic of metallic bodies.

Reduction is, for the moſt part, effected by charcoal and a high temperature, either with or without the aſſiſtance of fluxes. For the various modes of reduction in actual practice, ſee the articles of the different metals.

REDUCTION, in *Surgery,* denotes an operation by which a diſlocated, luxated, or fractured bone is reſtored to its former place. Reduction, or *repoſition,* is always to be performed before any remedy be applied.

REDUIT, in *Military Affairs.* See REDUCT.

REDUNDANCY, or REDUNDANCE, a fault in diſcourſe, conſiſting in the uſe of a ſuperfluity of words.

Words perfectly ſynonimous are redundant, and ought to be retrenched. Redundancy neceſſarily makes the ſtyle weak and languid. See PLEONASM.

REDUNDANT HYPERBOLA, in *Geometry,* is a curve of the higher kind, thus called, becauſe it exceeds the conic ſection of that name in the number of its hyperbolic legs; being a triple hyperbola, with ſix hyperbolical legs.

REDUNDANT *Interval,* in *Muſic,* is uſed for an interval exceeding the truth by a comma.

Some apply redundant to an interval exceeding a diatonic interval by a ſemitone minor; but this is more uſually called a ſuperfluous interval. See INTERVAL and SECOND.

REDUPLICATION, in *Rhetoric,* a figure by which a verſe begins with the ſame word as the preceding one ends with. See ANADIPLOSIS.

REDUPLICATION, in *Logic,* is a kind of condition expreſſed in a propoſition, indicating or aſſigning the manner in which the predicate is attributed to the ſubject.

The uſual reduplicative words are *quatenus, as, ſo far as, conſidered as, inaſmuch as,* &c. Hence,

REDUPLICATIVE PROPOSITIONS, are ſuch in which the ſubject is repeated, with ſome circumſtances or condition. Thus, *Men, as men, are rational; kings, as kings, are ſubject to none but God.*

REDUTEA, in *Botany,* ſo called by the late M. Ventenat, in honour of his friend M. P. J. Redouté, one of the moſt accurate and intelligent botanical draughtſmen, and perhaps the fineſt botanical painter, ever known. He is the author of a ſplendid coloured work in folio, on the Liliaceous

liaceous tribe, including ſome other beautiful plants allied thereto, which has already extended to the ſeventh volume; and it is to his pencil that the perfection of moſt botanical works that have appeared in France, for near thirty years paſt, particularly the publications of L'Heritier and Ventenat, is owing.—Venten. Jard. de Cels, 11. Poiret in Lamarck Dict. v. 4. 87.—Claſs and order, *Monadelphia Polyandria*. Nat. Ord. *Columniferæ*, Linn. *Malvaceæ*, Juſſ.

Gen. Ch. *Cal.* Perianth inferior, double, permanent: the outer of many minute leaflets: inner much larger, of one leaf, in five very deep ſegments. *Cor.* Petals five, roundiſh kidney-ſhaped, imbricated obliquely, united at the baſe to each other, and to the column of the ſtamens. *Stam.* Filaments numerous, united below into a conical tube, ſubdivided and branched above; anthers kidney-ſhaped. *Piſt.* Germen ſuperior, ovate, ſimple; ſtyle thread-ſhaped, ſwelling upwards, about as long as the ſtamens; ſtigmas three, obtuſe. *Peric.* Capſule ovate, of three cells and three valves, the partitions from the middle of each valve. *Receptacles* of the ſeeds three, inſerted into the baſe of the capſule, alternate with the valves, and nearly equal to them in length, linear, bearing ſeeds on each edge. *Seeds* ſix or eight in each cell, obovate, minutely ſtalked, inſerted in two rows on the receptacle, each clothed with denſe wool.

Eſſ. Ch. Calyx double; the outer of many minute leaves; inner in five deep ſegments. Stigmas three. Capſule of three cells and three valves. Seeds enveloped in wool. Receptacles three, linear, unconnected with the valves.

Obſ. Ventenat conſiders the three diſtinct receptacles, as affording the moſt eſſential diſtinction, between this and every other malvaceous genus. The woolly ſeeds, moreover, diſtinguiſh it from all except *Goſſypium*, whoſe large three-leaved outer calyx is abundantly different from *Redutea*.

The only known ſpecies is

1. R. *heterophylla*. Various-leaved Redutea. Vent. Jard. de Cels, t. 11.—Diſcovered by Riedlé in the iſland of St. Thomas, and raiſed in M. Cels's garden at Paris. The plant is herbaceous and annual, and M. Ventenat ſeemed to think it might ſerve to decorate our flower-borders, like other annuals of very hot climates, in the open air, being, we preſume, raiſed on a hot-bed in the ſpring. Every part of the herbage is beſprinkled with ſmall, whitiſh, fringed ſcales, readily ſeen with a magnifying glaſs. The *root* is ſpindle-ſhaped, yellowiſh. *Stem* erect, twelve or fifteen inches high, about the ſize of a gooſe-quill, angular, pithy, branched, leafy, dark green, many-flowered. *Leaves* alternate, on longiſh ſtalks, ſpreading widely, ovate, undivided or three-lobed, entire, an inch or inch and half long; paler beneath. *Stipulas* minute, awl-ſhaped, deciduous. *Flowers* large, handſome, ſulphur-coloured, with a dark purple radiating ſpot at the baſe of each petal, ſolitary, erect, on long, ſimple, axillary ſtalks. Segments of the inner *calyx* nearly linear, half as long as the petals. *Style* hairy. *Capſule* the ſize of a filberd. Wool of the *ſeeds* of a dirty grey. —We have not heard of this plant in any Engliſh collection.

REDUVIA, in *Surgery*, a word uſed by ſome for a whitlow, and by others for a painful crack, or other diſorder about the nails, either of the fingers or toes.

REDUX, in *Chemiſtry*. See REDUCT.

REDWAETH BAY, or *Traeth Coch*, in *Geography*, a bay on the N. coaſt of the iſland of Angleſey. N. lat. 53° 17′. W. long. 4° 25′.

REDWITZ, a town of Bavaria, in the biſhopric of Bamberg; 4 miles N.N.W. of Kunſtadt.

REDWITZ, a town of Germany, in the principality of Culmbach; 4 miles N. of Bayreuth.

REDWOOD RIVER, a river of America, which runs into the Wabaſh, N. lat. 40° 16′. W. long. 87° 5′.

REE, or RE, in *Commerce*. See REES.

REE, *Lough*, in *Geography*, an expanſion of the waters of the river Shannon, in Ireland, between the county of Roſcommon and the counties of Longford and Weſtmeath, reaching from Laneſborough nearly to Athlone, with ſeveral iſlands, and in ſome places three miles broad.

REED, in *Botany*. See ARUNDO.

The root of the *arundo donax* of Dioſcorides, attracts any matter lodged in wounds, if powdered and applied to them with wine; or if it is taken freſh and reduced to powder with an onion, or mixed with honey. (Oribas de Morb. Cur. lib. iii. cap. 32.) It alſo removes pains ariſing from diſlocation of limbs, and carries off pains in the hips. The green leaves cut and applied, are ſaid to cure the eryſipelas. Poor people boil the flowers in water or in beer, which they mix with honey, and drink, after being filtrated, to cure coughs, oppreſſions of the breaſt, and conſumptions. The ancients made flutes and other muſical inſtruments of the reed. James's Med. Dict.

REED, *Barr*. See SPARGANIUM.

REED, *Indian flowering*. See CANNA.

REED *Mace*. See TYPHA.

REED, in *Agriculture*, the name of an aquatic plant, infeſting boggy lowlands or meadows on the ſides of rivers.

The beſt method of deſtroying reeds, is by draining the land; for if the drains be cut deeper than their roots it will take away their nouriſhment, and, conſequently, deſtroy them. Aſhes, or ſoot, will likewiſe ſometimes kill them; and ſo will ploughing up the land, and laying it in high ridges. They always indicate a deep good moiſt ſoil, as a bad one will not nouriſh or ſupport them. There are many different ſorts of reeds, but thoſe of the more ſtrong and tall kinds are often of much uſe in thatching the different ſorts of farm buildings, where other better kinds of coverings are ſcarce, and theſe abundant. There is alſo a ſort of reed found in Huntingdonſhire, and ſome of the adjoining counties, that is very valuable for the purpoſe of laying plaſter floors with. In other ſituations, reeds of the other kinds may be met with, that may be found uſeful for different purpoſes either of the farmer or in the arts. In ſuch ſituations they may be cultivated with advantage as an article of profit: and it may often be more beneficial than to have them deſtroyed, eſpecially where they are of a valuable nature, and where the land is of too moiſt and boggy a quality to be ever fully reclaimed and brought into either the ſtate of good arable or meadow ground. Slips on the ſides of large rivers or brooks are likewiſe, frequently, the moſt advantageouſly, conveniently, and profitably kept under reed crops, as the overflow of the waters prevent their being uſefully managed in any other manner. There are other ſituations, as thoſe about the borders of large ponds, lakes, and other waters, where they may be preſerved with far greater propriety than having them deſtroyed, provided even that can be accompliſhed without difficulty, as not any thing more valuable can in general be raiſed in ſuch places. They are, however, by no means to be continued wherever any better crop will grow and ſucceed.

REED is alſo a term applied to ſuch ſtraw of the wheat or rye kinds as has not been bruiſed by threſhing or in any other way.

REED *Hedge*, in *Gardening*, that ſort of hedge fence which is formed from reeds. They are a ſort of temporary internal fences made with theſe dried materials which may be had cheap, and be expeditiouſly formed into hedges by the aſſiſt-

ance of poſt and railing, being of great utility for occaſional uſe in gardens, to incloſe particular internal ſpaces of ground, ſo as to afford ſhelter to certain ſeedling plants, both in nurſeries and large kitchen gardens; and in ſome nurſeries, to form places of ſhelter for many ſorts of ſeedling trees and ſhrubs, &c., which being tender whilſt young, require the ſhelter of a fence in winter to break off ſevere or cutting blaſts two or three years, till they gradually gather ſtrength and a greater degree of hardineſs. They are alſo uſeful in training ſeveral ſorts of wall-fruit-trees againſt, to form them for rows, or what are called trained trees; admitting of planting trees againſt each ſide of them, ſix, eight, or ten feet aſunder. See NURSERY.

And in large open kitchen-gardens they are occaſionally made uſe of to incloſe the melonary, or place for raiſing early melons and cucumbers in, and often as croſs internal fences, under which to form warm borders for the purpoſe of raiſing various early crops of eſculents.

The proper ſort of reeds for theſe fences are the dried ſtems of the common marſh reed, which grows in great plenty by river ſides, and in lakes, and marſhy places, furniſhing a crop of ſtems annually fit to cut in autumn, when they ſhould be bound in bundles, and ſtacked up, or houſed, to remain for uſe.

Theſe fences are ſometimes erected in fixed ranges, and ſometimes formed into moveable pannels. In the firſt mode, ſome ſtout poſts ſhould be placed ſix or eight feet aſunder, and five or ſix high, and from poſt to poſt carry two or three ranges of flat thin railing, one range near the bottom, another near the top, and a third in the middle; againſt this railing, the reeds muſt be placed about two inches thick, having other railing fixed directly oppoſite; ſo that the reeds being all along between the double railing, the bottoms reſting either upon a plate of wood, or let into the ground, but the former is preferable; and as ſoon as one pannel is formed, the railing ſhould be nailed as cloſe as poſſible, driving ſome long ſpike-nails through each double railing, or binding them with ſtrong withy bands, or tar rope-yarn, but nailing is the beſt, in order to bring them as cloſe as may be, to ſecure the reeds firmly in the proper poſition; the top ſhould be cut even afterwards.

In the better method, a frame-work of railing ſhould be prepared as above, each pannel ſix or eight feet long, and the reeds fixed therein as before directed; then, where they are intended to be placed, poſts muſt be ranged ſix or eight feet diſtant to ſupport the different pannels. Or ſometimes the pannels may be placed inclining againſt the wall or other fence, in time of ſevere weather, when the borders are narrow. Theſe ſorts of fences are now however in much leſs uſe in gardening than formerly.

REED *Ronds*, in *Rural Economy*, a provincial word, ſignifying plots or beds of reed, or the ſwamps in which they grow.

REED, *Ezekiel's*. See EZEKIEL'*s Reed*.

REED, *Calamus*, likewiſe denotes a Jewiſh meaſure, otherwiſe called canna.

REED, in the *Manufactory of Tapeſtry*. See TAPESTRY.

REED *Sparrow*, in *Ornithology*. See EMBERIZA *Schoeniculus*.

REED *Point*, in *Geography*, a cape on the W. coaſt of the iſland of Antigua. N. lat. 17° 12′. W. long 61° 36′.

REEDHAM. See REEPHAM.

REEDS, in a *Fire-ſhip*, are made up in ſmall bundles of about twelve inches in circumference, cut even at both ends, and tied each with two bands. There are two kinds of them; the long, which are four feet; and the ſhort, which are two feet five inches in length. Some of them are ſingly dipped, *i. e.* at one end, the reſt are dipped at both ends, in a kettle of melted compoſition. After being immerſed about ſeven or eight inches in this preparation, and then drained, they are ſprinkled over with pulverized ſulphur upon a tanned hide. See FIRE-*ſhip*.

REEDSBOROUGH, in *Geography*. See READSBOROUGH.

REEDSTOWN. See STRONG.

REEDY CREEK, a river of New Jerſey, which runs into the Atlantic, N. lat. 39° 55′. W. long. 74° 16′.

REEDY *Iſland*, an iſland of America, in the Delaware river, 50 miles below Philadelphia, and 20 miles from Bombay Hook, about three miles long and not more than one-fourth of a mile wide. This iſland was formerly banked in, but is now under cultivation, and overflowed in high tides. It is the rendezvous of outward-bound ſhips in autumn and ſpring, waiting for a fair wind. Here is a ſecure harbour at Port Penn, where piers have been erected by the ſtate of Pennſylvania. On each ſide of the iſland is a channel; but veſſels, eſpecially of the larger kind, chooſe to keep the eaſtern ſide.

REEDY *River*. See SALUDA.

REEDY *River Shoal*, a poſt-town of America, in Greenfield county, South Carolina.

REEF (*reef*, Dutch), in *Navigation*, denotes a certain portion of a ſail, comprehended between the top or bottom, and a row of eyelet-holes parallel to it. The intention of the reef is to reduce the ſurface of the ſail in proportion to the increaſe of the wind; for which purpoſe there are ſeveral reefs parallel to each other in the ſuperior ſails, by which they may be ſtill farther diminiſhed, in order to correſpond with the ſeveral degrees of the gale. The top-ſails of ſhips are uſually furniſhed with four reefs, parallel to the yard; and there are always three or four reefs parallel to the foot of thoſe main-ſails and fore-ſails which are extended upon booms; a circumſtance common to many of the ſmall veſſels. Falconer.

A *bag-reef* is the fourth, or lower, reef of a top-ſail. A *balance-reef* croſſes boom-main-ſails diagonally, from the nock to the end of the upper reef-band on the after-larch. This is uſed to contract the ſails in a ſtorm.

REEF alſo denotes a chain of rocks, lying near the ſurface of the water.

REEF-*Band*, in *Sea Language*, a piece of canvas, ſewed acroſs the ſail, to ſtrengthen it in the place where the eyelet-holes of the reefs are formed.

REEF-*Hanks*, ſhort pieces of log-line or other ſmall line, faſtened at certain diſtances to form the reefs of boom-ſails.

REEF-*Tackle*, is a rope which paſſes from the deck to a block at the top-maſt head, and thence to another block at the topſail-yard-arm, where it communicates with another rope, called its *pendant*, that runs downwards through a hole in the yard, and is afterwards attached to a cringle, a little below the loweſt reef. It is uſed to pull the ſkirts of the reefs cloſe up to the extremities of the top-ſail yards, in order to lighten the ſail, the weight of which would otherwiſe render it very difficult to perform this operation. Falconer.

REEF *Iſland*, in *Geography*, a ſmall iſland in the Eaſt Indian ſea, about 50 miles from the W. coaſt of Sumatra. S. lat. 4°. E. long. 101° 3′.—Alſo, a ſmall iſland in the Eaſt Indian ſea, near the N. coaſt of the iſland of Celebes. N. lat. 0° 8′. E. long. 122° 48′.

REEFING, in *Sea Language*, the operation of reducing a ſail, by taking in one or more of the reefs, which is performed by lines, points, or knittles. The top-ſails are always

always, and the courſes generally, reefed with points, which are flat-braided pieces of cordage, whoſe lengths are nearly double the circumference of the yard. Theſe, being inſerted in the eyelet-holes, are fixed in the ſail by means of two knots in the middle, one of which is before, and the other behind the reef-band. In order to reef the top-ſails with greater facility and expedition, they are lowered down, and made to ſhiver in the wind, which conſiderably relaxes their tenſion. The extremities of the reef are then drawn up to the yard-arms by an aſſembly of pullies communicating with the deck, termed the *reef-tackle;* and they are ſecurely faſtened to the yard-arms by ſmall cords, called *earings*. The ſpace of ſail, comprehended in the reef, is then laid ſmoothly over the yard, in ſeveral folds or doubles; and the whole is completed by tying the points above the yard, ſo as to bind the reef cloſe up to it. The courſes of large ſhips are reefed either with points or ſmall cords, which are thence called *reef-lines*. In the latter caſe, the line is paſſed ſpirally through the eyelet-holes of the reef, and over the head of the ſail alternately, and afterwards ſtrained as tight as poſſible. It muſt be obſerved, however, that the reef-line is ſometimes paſſed round the yard, and ſometimes only round the head of the ſail; and each of theſe methods has its advocates. But if it ſhould appear eſſential to prevent the friction by which a ſail is galled between the line and the yard, and as the rope-bands are ſufficient to ſuſtain the effort of the ſail, it is better to paſs the line only round the ſail, provided that the turns are inſerted through the roband legs; a circumſtance carefully practiſed by every ſkilful ſailor. The ſame reaſon may be alleged in favour of tying the points of the courſes in the ſame manner; *i. e.* the after-end of the point ſhould be thruſt forward between the head of the ſail and the yard; and the fore-end of the ſaid point ſhould come aft over the head of the ſail and alſo under the yard; and thus croſſed over the head of the ſail, the point ſhould be extended, and the two ends brought over the yard; and tied on the upper ſide of it as ſtraight as poſſible.

When a ſail is reefed at the bottom, it is done by knittles, which, being thruſt through the eyelet-holes of it, are tied firmly about the ſpace of canvas of which the reef is compoſed, and knotted on the lower ſide of the bolt-rope. Theſe knittles are accordingly removed as ſoon as the reef is let out. Falconer.

REEK, in *Rural Economy*, a term provincially uſed for ſtack. See STACK and RICK.

REEK-*Stavel*, a term applied to a frame of wood placed on ſtone, on which the mow or ſtack is raiſed. It is ſometimes written *Reek Staffold*.

REEL, in the *Manufactories*, a machine ſerving for the office of reeling.

There are various kinds of reels; ſome very ſimple, others very complex. Of the former kinds, thoſe moſt in uſe are,

1. A little reel, held in the hand, conſiſting of three pieces of wood, the biggeſt and longeſt whereof (which does not exceed a foot and a half in length, and a quarter of an inch in diameter,) is traverſed by two other pieces diſpoſed different ways.

2. The common reel, or windlace, which turns upon a pivot, and has four flights, traverſed by long pins, or ſticks, on which the ſkain to be reeled is put; and which are drawn cloſer or opened wider, according to the ſkain.

Other reels uſed in particular arts, are explained under their particular articles; as the reel uſed in milling of ſilk, under the article MILLING; and that in the reeling or winding of ſilks, under the article of SILK, &c.

REELS, to reel ropes on from a ſix-thread ratline to a two-inch rope, have four ribs fixed at each end in a flat circular piece of wood; and round the edges are blades, or handles, to turn them: one of the circular pieces is called the *head*, and is made to ſlide off for taking the coil away. They turn on an iron ſpindle, and are from ten to thirty-ſix inches long, and from twelve to eighteen inches diameter. The *Bench-reel* uſed by ſail-makers is ſimilar to a ſpinning-wheel, and is uſed to expedite winding the twine from the ſkains to the twine-reel. *Log-reels* have ſeveral ribs fixed in a circular piece of board at each end, and turn or run upon a ſpindle, having a handle at one end. (See LOG.) *Twine-reels*, uſed by ſail-makers, are ſhort cylindrical pieces of wood, hollowed in the middle to receive the twine, with a hole through the middle for the ſpindle. Thoſe uſed by rope-makers have four oak bars, about eighteen inches long, framed together at the ends on a wooden ſpindle; one of the bars ſlides, for the conveniency of taking off the twine. The *Yarn-reel* conſiſts of a circular board faſtened horizontally on the middle of a piece of oak four inches ſquare, and ſixteen long, with a hole through its middle to receive a bolt, on which it turns as its axis, and is uſed to wind ſpun-yarn off the coil. The *Hand-reel* is a narrow board, with three or four holes at each end, in which pegs are fixed for reeling marline and other lines.

REELFOOT, in *Geography*, a ſmall navigable river of America, in Tenneſſee, which diſcharges itſelf into the river Miſſiſippi, about 35 miles S. of the Ohio. It is 30 yards wide ſeven miles from its mouth. One of its branches riſes on the borders of Kentucky.

REELING, in the *Manufactories*, the winding of thread, ſilk, cotton, or the like, into a ſkain, or upon a bottom, to prevent its entangling.

It is alſo uſed for the charging or diſcharging of bobbins, or quills, to uſe them in the manufacture of different ſtuffs, as thread, ſilk, cotton, &c.

Reeling is performed different ways, and by different engines.

REEM, in *Zoology*. See RHINOCEROS *Unicornis*.

REEMING, a term uſed by caulkers for opening the ſeams of the planks with reeming-irons, that the oakum may be more readily admitted. To make any hole larger is alſo termed reeming.

REEMING-*Irons*, are the largeſt irons uſed by caulkers in opening the ſeams.

REEMSTOWN, or REAMSTOWN, in *Geography*, a ſmall poſt-town of America, in Lancaſter county, Pennſylvania, ſituated on a ſtream which runs into Calico creek, a water of Coneſtoga, which falls into the Suſquehannah; 26 miles N.E. of Lancaſter.

REEN, a river of Norway, in the province of Drontheim, which runs into the Glomme; 20 miles N. of Opſal.

REEN *Moſſa*, a name uſed by ſome for the mountain coralloides, or rein-deer moſs.

REENBERG, THEOCARUS, in *Biography*, a celebrated Daniſh poet, was born at Viborg in 1656, where he was educated. In 1680 he ſet out on his travels into foreign countries, after having undergone an examination by the theological faculty, and he returned to Denmark in 1682. In 1703 he was appointed fourth judge in Jutland. In 1730 he became counſellor of juſtice, and he died in 1742. His poetical works were publiſhed at Copenhagen in 1769, by his grandſon Tielmann, with a preface by Kofod Anker, and annotations by Luxdorph. Gen. Biog.

REENSKLOSSER, in *Geography*, a town of Norway; 12 miles N.N.W. of Drontheim.

RE-ENTER-

RE-ENTERING Angle, in *Fortification*. See Angle, and Construction, *according to M. Vauban's firſt method*.

RE-ENTRY, in *Law*, the reſuming or retaking that poſſeſſion which any one had lately forgone.

As, if I make a leaſe of land or tenement, I do thereby forego the poſſeſſion: and if I condition with the leſſee, that for non-payment of rent at the day, it ſhall be lawful for me to re-enter; this is as much as if I conditioned to take again the lands, &c. into my own hands, and to recover the poſſeſſion by my own act, without the aſſiſtance of judge or other proceſs. But words in a deed give no re-entry, if a clauſe of re-entry be not added. (Wood's Inſt. 140.) All perſons who would re-enter on their tenants for non-payment of rent, are to make a demand of the rent; and, to prevent the re-entry, tenants are to tender their rent, &c. (1 Inſt. 201.) If there is a leaſe for years, rendering rent, with condition, that if the leſſee aſſigns his term, the leſſor may re-enter; and the leſſee aſſigneth, and the leſſor receiveth the rent of the aſſignee, not knowing or hearing of the aſſignment, he may re-enter, notwithſtanding the acceptance of the rent. (3 Rep. 65. Cro. Eliz. 553.) See Rent. A feoffment may be made upon condition, that if the feoffor pay to the feoffee, &c. a certain ſum of money at a day to come, then the feoffor to re-enter, &c. Litt. § 322. See Entry and Use.

REEPHAM, in *Geography*. See Repham.

REER County. See Rire.

REERSOE, in *Geography*, a ſmall iſland of Denmark, in the Great Belt, near the coaſt of Zealand. N. lat. 55° 32′. E. long. 11° 7′.

REES, Reis, or *Reas*, in *Commerce*, monies of account in Portugal, 1000 of which make a milreis or milree. In the notation of accounts, the milrees are ſeparated from the rees by a croſſed cypher, called "Cifraon," and the milrees from the millions by a colon; thus Rs. 2 : 700 ⊕ 500, means 2700 mil. and 500 rees. The cruſado of exchange, or old cruſado, is 400 rees; the new cruſado, 480 rees; the teſtoon, 100; the vintin or vintem, 20 rees. Thus the milree is $2\frac{1}{2}$ old cruſados, $2\frac{1}{17}$ new ditto, 10 teſtoons, or 50 vintins. The gold pieces, coined before 1722, are now 20 *per cent.* higher than their original value; ſo that the old dobras, coined at 20,000 rees, are worth 24,000; the liſbonnoines or moidores, coined at 4000 rees, are worth 4800; and the halves and quarters in proportion: but few of theſe coins are now in circulation. The gold coins, ſtruck ſince 1722, are the dobra of 12,800 rees; the meia dobra, Joaneſe, or Portugal piece of 6400 rees; the half Joaneſe, of 3200; the dezeſeis teſtoons, of 1600; the quatindo, of 1200; the oito teſtoons, of 800; the old cruſado, of 400, now very ſcarce; and the new cruſado, of 480 rees. The ſilver coins are new cruſados, of 480 rees; halves, quarters, and eighths, or pieces of 240, 120, and 60 rees; teſtoons of 100, and halves of 50; and vintins of 20 rees. There are alſo copper pieces of 10, 5, 3, and $1\frac{1}{2}$ rees. The pieces coined in Brazil, called patacas, of 600 and 640 rees, are current only in that country, and their intrinſic value is 10 *per cent.* leſs than that of the Portugal coins. There is, beſides, a gold milree, ſtruck for the Portugueſe poſſeſſions in Africa, and alſo a ſilver coin, of the value of 12 macutas, or 600 rees; the macuta being a money of account, worth 50 rees. The Spaniſh patacas, or dollar, are reckoned at Liſbon at 830 rees, more or leſs.

Portugueſe gold coins are 22 carats (the mark fine being 24 carats), wrought gold is $20\frac{1}{2}$ carats, and gold duſt from $21\frac{3}{4}$ to 22 carats fine. The fineneſs of ſilver is expreſſed in dinheiros and grains, the mark fine being 12 dinheiros, and the dinheiro ſubdivided into 24 grains. Silver coins are 10 dinheiros 19 grains fine, and wrought ſilver $10\frac{1}{4}$ fine. The rate of coinage of gold and ſilver coins is as follows: 8 dobras of 12,800 rees, 16 Joaneſes of 6400 rees, 32 half Joaneſes of 3200 rees, 64 dezeſeis teſtoons, 128 oito teſtoons, or 256 old cruſados, are to weigh a Portugueſe mark of gold, 22 carats fine. Hence (the mark being $3542\frac{2}{5}$ Engliſh grains) the dobra contains $442\frac{1}{2}$ grains; the piece of 6400 rees $221\frac{1}{5}$ grains of Engliſh ſtandard gold, and the other pieces in proportion. Theſe coins, moreover, are not, in general, exactly 22 carats fine; but there is a remedy which amounts from $\frac{1}{32}$ to $\frac{3}{32}$ of a carat; and the new cruſados are found to be only $21\frac{7}{32}$ carats fine. The ſilver coin is 10 din. 19 gr. as above; and the mark is coined into $13\frac{1}{3}$ new cruſados; hence the new cruſado weighs $345\frac{3}{5}$ Portugueſe grains, or $265\frac{3}{5}$ Engliſh grains; halves, quarters, and eighths, in proportion. It, therefore, contains $258\frac{1}{2}$ grains of Engliſh ſtandard ſilver. The gold piece of 6400 rees is worth 35*s.* 11*d.* ſterling; and the old cruſado, 2*s.* 3*d.*; and thus the milree, valued in gold, is worth $67\frac{1}{4}d.$ ſterling. The new ſilver cruſado is worth about 2*s.* 9*d.* ſterling; and, therefore, the milree, valued in ſilver, is worth $68\frac{3}{4}d.$ ſterling. Gold is to ſilver as 16 to 1.

At Bombay each quarter of a rupee is divided into 100 rees. See Rupee.

Rees, in *Geography*, a town of the duchy of Cleves; 8 miles E. of Cleves. N. lat. 51° 47′. E. long. 6° 20′.

Rees *ul Ain*, or *Reſaina*, a town of Aſiatic Turkey, in the province of Diarbekir; 80 miles S. of Diarbekir.

REETZ, a town of the New Mark of Brandenburg; 50 miles N.E. of Cuſtrin. N. lat. 53° 18′. E. long. 15° 56′.

REEVE, in *Ornithology*, the name of a bird which is the female of the *avis pugnax*; the male of which, from the long feathers round his neck, is called the *ruff*. See Tringa *Pugnax*.

Reeve *of a Church*, is the guardian of it, or the churchwarden.

So *ſhire-reef* is the ſheriff, or guardian of a county; and *port-reeve*, the warden of a port or haven.

REEVE-LAND. See Reveland.

REEVING, in the *Sea Language*, is the putting a rope through any hole, as the channel of a block, &c. Hence, to pull a rope out of a block, is called *unreeving*.

RE-EXCHANGE, in *Commerce*, a ſecond payment of the price of exchange, or rather the price of a new exchange, due upon a bill of exchange that comes to be proteſted; and to be refunded the bearer, by the drawer or indorſer. See Exchange.

The occaſion of re-exchage is, when the bearer of a bill of exchange, after proteſting it, for want either of acceptance, or of payment, borrows money on his own promiſe, bond, or the like; or draws a bill of exchange in the place where the payment was to be made, on the perſon who furniſhed the firſt for which he pays a ſecond exchange; which, being added to the firſt already paid, the drawer of the firſt bill is anſwerable for two exchanges, properly called *exchange* and *re-exchange*.

The bearer of a proteſted bill has a right to recover both the one and the other on the drawer. Yet the ſimple proteſtation which the bearer makes in the act of proteſt, that he will take up a like ſum at re-exchange, for want of his bill being accepted or paid, is not ſufficient to entitle him to demand the reimburſement of his re-exchange, unleſs he make it appear, that he has actually taken up money in the place on which the bill was drawn.

Otherwiſe the re-exchange will only amount to the reſtitution of the firſt exchange, with intereſt, the expences of proteſting, and thoſe of the journey, if there have been any.

If a bill of exchange, payable to the bearer or order, come to be proteſted, the re-exchange is only due upon the drawer for the place where the remittance was made, not for thoſe places where it may have been negociated; at leaſt the drawer has a right to be refunded his re-exchange for thoſe places by the indorſer.

Indeed, the re-exchange is due from the drawer upon all places where a power of negociation is given by the bill; and upon all others, if the power of negociating be indefinite.

Laſtly, the intereſt of the re-exchange, of the expences of the proteſt, and the journey, are only due from the day of the demand.

It is ſuppoſed to be the Gibelins driven out of Italy by the faction of the Guelphs, and ſheltered at Amſterdam, who firſt eſtabliſhed the cuſtom of re-exchange, on pretence of the intereſts, damages, and expences they underwent, when the bills given them for the effects they had been obliged to abandon, were not accepted, but came to be proteſted.

RE-EXTENT, in *Law*, a ſecond extent made upon lands or tenements, on complaint that the former extent was partially made. See EXTENT.

REFAH, in *Geography*, a town of Egypt, on the coaſt of the Mediterranean, anciently called "Raphia," (which ſee); 18 miles N.E. of El Ariſh.

REFECTION, REFECTIO, among *Monks* and *Eccleſiaſtics*, a ſpare meal or repaſt, juſt ſufficing for the ſupport of life.

REFECTION is alſo uſed, in *Ancient Authors*, for a duty or ſervice incumbent on any perſon to provide meals for eccleſiaſtics, or even for princes.

REFECTORY, or REFECTUARY, *Refectorium*, a ſpacious hall in convents, and other communities, where the monks, nuns, &c. take their refections or meals in common.

The refectory of the Benedictines of St. George at Venice, deſigned by Palladio, is one of the fineſt in the world. Daviler.

REFERENCE, in *Writing*, *&c.* a mark relative to another ſimilar one in the margin, or at the bottom of the page, where ſomething, omitted in the text, is added; and which is to be inſerted either in reading or copying. A copyiſt muſt be very expert at taking references.

References are alſo uſed in books, where things being but imperfectly handled, the reader is directed to ſome other part or place where they are more amply explained.

Dictionaries are full of references, denoted by *ſee* or *vide*.

By means of theſe references the dictionary writer ſettles a correſpondence between the ſeveral parts of his work, and may give his dictionary moſt of the advantages of a continued treatiſe.

Indices or tables are only references to the ſeveral parts of the work where the ſeveral matters are handled.

REFERENCE, in *Law*, denotes the ſending of any matter by the court of chancery to a maſter; and by the courts at law to a prothonotary, or ſecondary, to examine and report to the court. (2 Lil. Abr. 432.) If a matter in difference be referred to the ſecondary, and one of the parties will not attend at the time appointed, after notice given, to hear the buſineſs referred; the other party may proceed in the reference alone, and get the ſecondary to make his report without hearing of the party not attending. (2 Lill. 342.) If a queſtion of mere law ariſes in the courſe of a cauſe in chancery, as whether, by the words of a will, an eſtate for life or in tail is created, or whether a future intereſt deviſed by a teſtator ſhall operate as a remainder on an executory deviſe; it is the practice of that court to refer it to the opinion of the judges of the court of king's bench, or common pleas, upon a caſe ſtated for that purpoſe, in which all the material facts are admitted, and the point of law is ſubmitted to their deciſion; who thereupon have it ſolemnly argued by counſel on both ſides, and certify their opinion to the chancellor: and on ſuch a certificate the decree is uſually founded. It ſeems that the maſter of the rolls, ſitting for the chancellor, may make ſuch reference; but not when ſitting at the rolls. 2 Bro. C. C. 88.

The court of exchequer is both a court of law and of equity: therefore, if a queſtion of mere law ariſes in the courſe of the exerciſe of its equitable juriſdiction, the barons will decide upon it in that ſuit, without referring it to another juriſdiction. Bl. Comm. iii.

REFERENDARY, REFERENDARIUS, in *Ancient Cuſtoms*, an officer who exhibited the petitions of the people to the king, and acquainted the judges with his commands.

An officer of this kind, Spelman obſerves, we had in England, in the time of the Saxons. The like office was afterwards diſcharged by others, called maſters of requeſts.

REFINING, in *Metallurgy* and *Aſſaying*. In the former it ſignifies the means of obtaining metals from their ores, and from any other impurities, natural or artificial: for which ſee the metals under their reſpective heads. In the latter it is employed for aſcertaining the quantity of the noble metals in the different alloys: for which ſee CUPEL; where the methods of refining in the furnace are fully treated. And for the humid proceſs called *parting*, ſee GOLD.

It may be proper here to obſerve, that although the proceſs of parting by nitric acid is ſtill practiſed, we are inclined to recommend the method propoſed by Bergmann, which conſiſts in diſſolving the alloy of gold and ſilver in nitro-muriatic acid. The ſilver falls to the bottom in the ſtate of muriate of ſilver, and the gold is precipitated by the green ſulphate of iron. The gold, by this means, is obtained perfectly pure, which is ſeldom the caſe in the proceſs of parting. The trouble of teſting to know what ſilver to add to the alloy, to make the gold equal to one-fourth of the ſilver, will be ſaved, and, with heat, the nitro-muriatic acid diſſolves the gold quite as ſoon as the ſilver is diſſolved in the common method. The muriate of ſilver, which is eaſily ſeparated by waſhing, may be readily reduced by heating it with ſoda in an iron crucible. The ſoda combines with the muriatic acid, and is ſublimed in white fumes.

REFINING *of Sugar*. This operation is begun by ſeveral ſtrong lixiviums or leys of lime-water and eggs, ſhells and all, mixed and beaten together.

The firſt refining is performed in the Caribbees, and other places, where the ſugar-canes are cultivated; and only ſerves to make the brown or coarſe ſugars.

When theſe are imported into Europe, the ſugar-bakers take them up, and refine them farther, by a ſecond operation, or rather a repetition of the firſt.

To render the ſugar very fine, fit for confections, &c. they give it a third refining; in which they only uſe the whites of eggs and their ſhells beaten together, and thrown into the melted ſugar; which is called *clarifying the ſugar*. See SUGAR.

REFINING *of Salt-petre*. The ſalt being put into an earthen or iron veſſel, as much ſpring-water is poured on it as ſuffices to diſſolve it. The veſſel is then put over a gentle fire; and as ſoon as the water begins to boil, alum powder is thrown into it: the proportion is, one pound of alum to one hundred and twenty-eight pounds of ſalt-petre; and a little vinegar is added. As it boils, the ſcum is to be taken off; and it is to be evaporated till a pellicle appears on it, and then ſet to ſhoot.

For

For the refining of other matters, as camphor, cinnabar, ſulphur, ſalt, borax, &c. ſee CAMPHOR, CINNABAR, SULPHUR, SALT, &c.

REFIRTH VOE, in *Geography*, a bay on the E. coaſt of the iſland of Yell. N. lat. 60° 58′. W. long. 1° 25′.

REFITTING, in *Sea Language*, denotes the repairing of any damages which a ſhip may have ſuſtained in her ſails and rigging, by battle or tempeſtuous weather.

REFLECTED RAY. See RAY.

REFLECTED *Viſion*. See REFLEX and VISION.

REFLECTING, or REFLECTIVE *Dial*, is a ſort of dial, which ſhews the hour by means of a thin piece of looking-glaſs plate, duly placed to caſt the ſun's rays to the top of a ceiling, on which the hour-lines are drawn.

REFLECTING *Microſcope*. See MICROSCOPE.

REFLECTING *Level*. See LEVEL.

REFLECTING *Teleſcope*. See TELESCOPE.

REFLECTION, or REFLEXION, in *Mechanics*, the return, or regreſſive motion of a moveable, occaſioned by the reſiſtance of a body, which hindered its purſuing its former direction.

It is controverted whether there be any moment's reſt or interval between the incidence and the reflection. For the affirmative ſtand the Peripatetics, and all who conceive the reflected motion to be different from the incident one of the ſame body. The motion of incidence, according to theſe authors, is wholly loſt, and deſtroyed, by the reſiſtance of the obſtacle ſtruck againſt; and the moveable is thus rendered abſolutely quieſcent in the point of contact, till a new motion of reflection is produced in it, from a contrary cauſe.

The Carteſians aſſert the negative; abſolutely denying any reſt at all between the incidence and reflection: urging, that if the motion were once deſtroyed, though but for a moment, there would be nothing to excite it again; but the body would perſevere in that new ſtate, as much as if it had been at reſt a thouſand years.

Accordingly Rohault, and others, define reflection to be no other than a change of determination; or a continuation of the former motion in a new direction.

As, ſay they, a pendulum, when arrived at its greateſt ſweep, does not ſtop; ſo a hard body, by ſtriking on another hard one, does not reſt, but purſues its motion the contrary way, according to the eſtabliſhed law of nature; and this from the immediate influence or impulſe of the cauſe that firſt moved it. But this doctrine is now generally ſet aſide.

Reflection is conceived, by the lateſt and beſt authors, as a motion peculiar to elaſtic bodies, whereby, after ſtriking on others which they cannot remove, they recede, or turn back by their elaſtic power.

On this principle, it is aſſerted, that there may be, and is, a period of reſt between the incidence and the reflection; ſince the reflected motion is not a continuation of the other, but a new motion, ariſing from a new cauſe or principle, *viz.* the power of elaſticity.

It is one of the great laws of reflection, that the angle a reflected body makes with the plane of a reflecting obſtacle, is equal to that in which it ſtruck on that obſtacle. For the ſeveral laws of motion obſerved in the reflections of bodies, ſee PERCUSSION.

REFLECTION *of the rays of light*, in *Optics*, is a motion of the rays, by which, after impinging on the ſolid parts of bodies, or rather, after a very near approach to them, they recede, or are driven from them.

When rays of light arrive at a ſurface, which is the boundary of two mediums not homogeneous, they continue their progreſs without deviating from thoſe planes in which their former paths lay, and which are perpendicular to the ſurface of the mediums, but they no longer retain the ſame direction, a part of them, and ſometimes nearly the whole, being reflected back from the ſurface, while the remaining part is tranſmitted and refracted, or bent. No inſtance occurs of the abrupt change of the denſity of a medium, without a partial reflection of the light paſſing either into the denſer, or into the rarer medium; and the more obliquely the light falls on the ſurface, the greater, in general, is the reflected portion. No body is ſo black as to reflect no light at all, and to be perfectly inviſible in a ſtrong light; although at the ſurface ſeparating two very rare bodies, as two kinds of gas, the reflection is too faint to be perceptible; but in this caſe the ſeparation is ſeldom perfectly abrupt. The quantity of light reflected, when other circumſtances are equal, appears to be always greateſt when the difference of the optical or refractive denſity of the two ſubſtances is the greateſt. Thus, the reflection from the common ſurface of glaſs and water is much weaker than from a ſurface of glaſs expoſed to the air. Metals, in general, reflect a great proportion of the light falling on them; and even the reflection from the common ſurface of glaſs and mercury appears to be but little weaker than the reflection from the ſurface of mercury immediately expoſed to the air, ſo that the optical denſity of the metals muſt be exceedingly great. It appears, alſo, that a portion of the light falling on a reflecting ſurface, is always tranſmitted to a certain depth, notwithſtanding the apparent opacity of any large maſſes of the ſubſtance. Thus, if we cover a ſmall hole of a window-ſhutter with the thinneſt leaf-gold, we ſhall find that it tranſmits a greeniſh light, which muſt have paſſed the reflecting ſurface, but which, if the gold had been but one ten-thouſandth of an inch in thickneſs, would have been wholly interrupted, and probably in the ſame manner as by paſſing through 700 feet of water. See LIGHT and REFRACTION.

The reflection of the rays of light from the ſurfaces of bodies, is the means by which bodies become viſible.

And the diſpoſition of bodies to reflect this or that kind of rays moſt copiouſly, is the cauſe of their being of this or that colour.

The reflection of light from the ſurfaces of mirrors, makes the ſubject of *catoptrics*; which ſee. See alſo MIRROR.

The reflection of light, ſir Iſaac Newton has ſhewn, is not effected by the rays ſtriking on the very parts of the bodies; but by ſome power of the body equally diffuſed throughout its whole ſurface, by which it acts upon the ray, attracting or impelling it without any immediate contact.

This power he ſhews to be the ſame, by which, in other circumſtances, the rays are refracted; and by which they are at firſt emitted from the lucid body. See REFRACTION.

The arguments he produces to prove this are as follow: 1. Becauſe the ſurfaces of poliſhed glaſſes, which to the eye appear ſmooth, are yet, in reality, very rugged and uneven (poliſhing being nothing but the grating, ſcratching, and breaking off the coarſer protuberances, by means of ſand, glaſs, putty, tripoli). If the rays of light, therefore, were reflected by ſtriking on the ſolid parts of the glaſs, the reflections would never be ſo accurate as we find they are, but the rays would even be as much ſcattered by the moſt poliſhed glaſs, as by the rougheſt. It remains, therefore, a problem how glaſs, poliſhed by fretting ſubſtances, can reflect light ſo regularly as it does; which problem is ſcarcely otherwiſe to be ſolved, than by ſaying, that the reflection of a ray is effected, not by a ſingle point of the

reflecting body, but by ſome power of the whole body, evenly diffuſed all over its ſurface, and by which it acts on a ray without immediate contact; for that the parts of bodies do act upon light at a diſtance, is already ſhewn under the articles INFLECTION and LIGHT.

2. If the colours, ſeparated by a priſm placed at the entrance of a beam of light into a darkened room, be ſucceſſively caſt on a ſecond priſm placed at a greater diſtance from the former, in ſuch manner as that they all fall alike, or with an equal obliquity, upon it; the ſecond priſm may be ſo inclined to the incident rays, that thoſe which are of a blue colour ſhall be all reflected by it; and yet thoſe of a red colour pretty copiouſly tranſmitted. Now, if the reflection were cauſed by the parts of the air or glaſs, we would aſk, why, at the ſame obliquity of incidence, the blue ſhould wholly impinge on thoſe parts ſo as to be all reflected; and yet, the red find pores enough to be, in a great meaſure, tranſmitted.

3. Where two glaſſes touch one another, there is no ſenſible reflection; and yet we ſee no reaſon why the rays ſhould not impinge on the parts of the glaſs, as much when contiguous to other glaſs, as when contiguous to air.

4. When the top of a water bubble, by the continual ſubſiding and exhaling of the water, grows very thin, there is ſuch a little, and almoſt inſenſible quantity of light reflected from it, that it appears intenſely black; whereas round about that black ſpot, where the water is thicker, the reflection is ſo ſtrong, as to make the water ſeem very white. Nor is it only at the leaſt thickneſs of thin plates or bubbles, that there is no manifeſt reflection, but at many other thickneſſes, gradually greater and greater. For, in one of our author's obſervations, the rays of the ſame colour were, by turns, tranſmitted at one thickneſs, and reflected at another thickneſs, for an intermediate number of ſucceſſions: and yet, in the ſuperficies of the thinned body, where it is of one thickneſs, there are as many other parts for rays to impinge on, as where it is of any other thickneſs.

5. If the red and blue rays, ſeparated by a priſm, fall ſucceſſively on a thin plate of any pellucid matter, whoſe thickneſs increaſes in continual proportion, (ſuch as a plate of air between two glaſſes, the one plane, and the other a little convex,) the ſame plate will, in the ſame part, reflect all the rays of one colour, and tranſmit all thoſe of the other; but, in different parts, will reflect the rays of one and the ſame colour at one thickneſs, and tranſmit them at another; and thus alternately, and *in infinitum*. Now, it can never be imagined that at one place the rays, which, for inſtance, exhibit a blue colour, ſhould happen to ſtrike on the ſolid parts, and thoſe which exhibit a red, to hit on the void parts of the body; and at another place, where the body is either a little thicker, or a little thinner, that, on the contrary, the blue ſhould hit on the pores, and the red upon the ſolid parts.

6. In the paſſage of light out of glaſs into air, there is a reflection as ſtrong as in its paſſage out of air into glaſs, or rather a little ſtronger, and by many degrees ſtronger than in its paſſage out of glaſs into water. Now, it ſeems improbable, that air ſhould have more reflecting parts than water or glaſs: but if that ſhould be ſuppoſed, yet it will avail nothing; for the reflection is as ſtrong, or ſtronger, when the air is drawn from the glaſs by the air-pump, as when it is adjacent to it. If any ſhould here object, on Deſcartes's hypotheſis, that, though the air be drawn away, there is a ſubtle matter remaining to ſupply its place, which, being of a denſer kind, is better fitted for the reflection of light than any other body; beſides that we have elſewhere ſhewn ſuch ſubtle matter to be fictitious, and that, ſuppoſing its exiſtence, and its reflecting power, no light could ever have been propagated, but muſt have been all reflected back to the lucid body, immediately after it was firſt emitted, the following experiment does evidently convict it of falſity.

7. If light, in its paſſage out of glaſs into air, ſtrike more obliquely than at an angle of forty or forty-one degrees, it is then wholly reflected: if leſs obliquely, it is in great meaſure tranſmitted. Now, it is not to be imagined, that light at one degree of obliquity ſhould meet with pores enough in the air to tranſmit the greater part of it, and at another degree ſhould meet with nothing but parts to reflect it wholly; eſpecially conſidering, that, in its paſſage out of air into glaſs, how oblique ſoever be its incidence, it finds pores enough in the glaſs to tranſmit a great part of it. If any ſuppoſe, that it is not reflected by the air, but by the utmoſt ſuperficial parts of the glaſs, there is ſtill the ſame difficulty: beſides, that ſuch a ſuppoſition is unintelligible, and will alſo appear to be falſe, by applying water behind ſome part of the glaſs, inſtead of air; for ſo in a convenient obliquity of the rays, ſuppoſe of forty-five or forty-ſix degrees, at which they are all reflected, where the air is adjacent to the glaſs, they ſhall be in great meaſure tranſmitted where the water is adjacent to it; which argues, that their reflection or tranſmiſſion depends on the conſtitution of the air and water behind the glaſs, and not on the ſtriking of the rays upon the parts of the glaſs, the rays not being reflected until they have reached the laſt part of the ſurface, and have begun to go out. For if, in going out, they fall upon a ſurface of oil and water, they proceed, the attraction of the glaſs being balanced by an equal force the contrary way, and prevented from having its effect by the attraction of the liquor adhering to it: but if the rays, in paſſing out of this laſt ſurface, fall into a vacuum, which has no attraction, or into air, which has but little, not enough to counterbalance the effect of the glaſs in this caſe, the attraction of the glaſs draws them back, and reflects them.

This will appear ſtill more evident by laying two glaſs priſms, or the object-glaſſes of two teleſcopes, the one plane, and the other a little convex, upon each other, ſo as they may neither touch, nor yet be too far apart; for that light which falls on the hinder ſurface of the firſt glaſs, where the glaſſes are not above $\frac{1}{1000000}$th part of an inch apart, will be tranſmitted through the ſurface, and through the air or vacuum between the glaſſes, and will paſs into the ſecond glaſs; but if the ſecond glaſs be taken away, then the light paſſing out of the ſecond ſurface of the firſt glaſs into the air or vacuum, will not proceed, but will return into the firſt glaſs, and be reflected.

Whence it follows, that the rays are drawn back again by ſome force in the firſt glaſs, there being nothing elſe to occaſion their return. And hence too it follows, that the reflection is not effected by means of any ſubtle matter contiguous to the hinder ſurface, according to the principles of Deſcartes; ſince that matter ought to reflect them when the glaſſes were nearly contiguous, as well as when the ſecond glaſs is quite removed.

Laſtly, if it be aſked, how ſome of the rays come to be reflected, and others tranſmitted; and why they are not all alike reflected, ſuppoſing the reflection owing to the action of the whole ſurface? the ſame great author ſhews, that there are, both in the rays of light, and in the bodies themſelves, certain vibrations (or ſome ſuch property) impreſſed on the rays, by the action either of the luminary that emits them, or of the bodies that reflect them; by means of which it happens that thoſe rays, in that part of their vibration

which conſpires with the motion of the parts of the body, enter the body, are refracted and tranſmitted; but thoſe in a contrary part of their vibration are reflected.

Add, that every ray of light, in its paſſage through any refracting ſurface, is put into a certain tranſient conſtitution or ſtate, which, in the progreſs of the ray, returns at equal intervals, and diſpoſes the ray, at each return, to be eaſily tranſmitted through the next refracting ſurface; and between each return, to be eaſily reflected by it.

Theſe alternate diſpoſitions, which ſir Iſaac Newton calls *fits of eaſy reflection*, and of *eaſy tranſmiſſion*, he accounts for by ſuppoſing, that they are occaſioned by the vibrations of a ſubtle fluid, in which the ray paſſes, which happening to move faſter than the rays, when a ray is in that part of the vibration which conſpires with its motion, it paſſes through; but when in the contrary part of the vibration, it is beat back again: whence every ray is ſucceſſively diſpoſed to be eaſily reflected, or eaſily tranſmitted, by every vibration which overtakes it.

He alſo thought that theſe vibrations might be excited by the mutual action and re-action of light, of bodies and of this medium, at the inſtant of reflection or refraction; ſo that, in fact, he ſuppoſes two cauſes of this diſpoſition to be reflected or tranſmitted, when rays of light arrive at any new ſurface. One of them is the regular vibration of the etherial medium, affecting them through the whole of their progreſs from the luminous body; and the other the tremulous motion, or irregular vibration of the ſame medium at the ſurfaces of bodies, occaſioned by the action and reaction between light and them: for this laſt cauſe can hardly be ſuppoſed to affect the whole etherial medium equally, and produce the regular returns of theſe fits in every ray.

M. Boſcovich ſuppoſes with Newton, that the fits of reflection or tranſmiſſion affect the rays themſelves, in the whole of their paſſage from the luminous body, but that they ariſe from an alteration in their form, by means of the elaſticity of their component parts, having been originally driven from the luminous body by a force which acted more ſtrongly on the hinder parts than on the reſt of the maſs, and thereby put them into a vibratory motion. He alſo ſuppoſes, that the intervals of the fits of eaſy reflection and tranſmiſſion may be different in different rays, on the three following accounts. 1. The rays that are differently refrangible have different velocities, at leaſt after refraction; ſo that, though the fits ſhould return at equal intervals, it will affect different rays in different parts of their progreſs. 2. The unequal action between the points that compoſe the ſame particle of light may make a difference in their oſcillations, at the time of changing their medium. And laſtly, rays coming in different inclinations to the new ſurface, the internal motions of theſe points will be in different directions with reſpect to the ſurface, and conſequently the whole maſs of the medium will act upon all the points differently. Boſcov. Theoria, p. 232.

Upon the whole, ſays Dr. Prieſtley, is it not more probable that the rays of light are tranſmitted from the ſun, with an uniform diſpoſition to be reflected or refracted, according to the circumſtances of the bodies on which they impinge; and that the tranſmiſſion of ſome of the rays under the ſame circumſtances, apparently, with others that are reflected, is owing to the minute vibrations of the ſmall parts of the ſurfaces of the mediums through which the rays paſs; vibrations that are independent of action and re-action between the bodies and the particles of light at the time of their impinging, though probably excited by the action of preceding rays. As to the tranſmiſſion or reflection of certain kinds of light only, producing colours in thin plates, the cauſe may be this; *viz.* that every particle of the medium has a great number of equal alternate intervals of attraction and repulſion, relatively to the particles of light; but that theſe intervals are of different magnitudes, according as the particles of light are of different colours. Now if the thickneſs of any tranſparent medium in which the particles of matter are uniformly placed is ſuch, that the attracting intervals of the extreme particles, as well as the repelling intervals, coincide with one another, *i. e.* attracting with attracting, and repelling with repelling, in regard to any one kind of rays, *e. g.* the red; by the united force of theſe extremes, (all the intermediate particles of the medium mutually deſtroying each other's effects,) theſe rays will be reflected. But where the plate is of an intermediate thickneſs between this and the next thickneſs, where the attracting intervals coincide, attracting with attracting, and repelling with repelling, the attracting intervals will coincide with the repelling ones, and the repelling ones with the attracting ones, and theſe mutually deſtroying one another's effects, theſe rays will paſs on freely, and be tranſmitted. But as the intervals of attraction and repulſion are different for differently coloured rays, the thickneſs of the plates at which theſe coincidences will or will not happen, in the differently coloured rays, will be different. So that it appears probable, ſays Dr. Prieſtley, in conformity to a doctrine firſt ſuggeſted to him by Mr. Michell, that the whole myſtery of coloured plates depends upon the attractions and repulſions of the particles of the bodies that compoſe them, affecting different rays in a different manner, according to their thickneſs. Hiſt. &c. of Light and Colours, p. 309, &c. See COLOURS *of thin Laminæ*, &c. and RINGS *of Colours*.

Sir Iſaac Newton concludes his account of the reflection of light with obſerving, that if light be reflected not by impinging on the ſolid parts of bodies, but by ſome other principle, it is probable that as many of its rays as impinge on the ſolid parts of bodies are not reflected, but ſtifled and loſt in the bodies. Otherwiſe, he ſays, we muſt ſuppoſe two kinds of reflection; for ſhould all the rays be reflected which impinge on the internal parts of clear water or cryſtal, thoſe ſubſtances would rather have a cloudy colour than a clear tranſparency. To make bodies look black, it is neceſſary that many rays be ſtopped, retained, and loſt in them; and it does not ſeem probable, that any rays can be ſtopped and ſtifled in them, which do not impinge on their parts: and hence, he ſays, we may underſtand, that bodies are much more rare and porous than is commonly believed. However, M. Bouguer diſputes the fact of light being ſtifled or loſt by impinging on the ſolid parts of bodies. See ABSORBING.

For other facts and obſervations relating to the ſubject of this article, ſee LIGHT. See alſo RAYS *of Light*, and RAYS *of Heat*.

REFLECTION, in *Catoptrics*, is the return of a ray of light from the poliſhed ſurface of a ſpeculum or mirror, as driven thence by ſome power reſiding in it.

The ray, thus returned, is called a *reflex*, or *reflected ray*, or a *ray of reflection*; and the point of the ſpeculum, whence the return commences, is called the *point of reflection*.

Thus the ray AB (*Plate* I. *Optics*, *fig.* 3.) proceeding from the radiant A, and ſtriking on the point of the ſpeculum B, being returned thence to C, BC repreſents the *reflected ray*, and B the *point of reflection*; in reſpect of which AB repreſents the *incident ray*, or *ray of incidence*, and B the *point of incidence*.

Again, a line CG drawn from any point, as C, of the reflected

reflected ray B C, perpendicular to the ſpeculum, is called the *cathetus of reflection*, or *cathetus of the eye:* as a line A F, drawn from the radiant perpendicular to the ſpeculum, is called the *incidence*.

Of the two angles which the reflected ray B C makes with the mirror, the ſmalleſt, C B E, is called the *angle of reflection:* as of the two angles the incident ray makes with the ſpeculum, the ſmalleſt, A B D, is called the *angle of incidence*.

If the mirror be either concave or convex, the ſmalleſt angles the ray makes with the tangent to the point of reflection and incidence, are the angles of reflection and incidence.

The angle C B H, which the reflected ray makes with a perpendicular to the point of reflection, is called the *inclination of the reflected ray:* as the angle A B H is called the *inclination of the incident ray*.

REFLECTION, *general laws of.*—I. *If a ray of light be reflected from a ſpeculum of any form, the angle of incidence is ever equal to the angle of reflection.* This law obtains in percuſſions of all kinds of bodies; and conſequently muſt do ſo in thoſe of light. See *Laws of* PERCUSSION; ſee alſo ANGLE.

It might therefore be here aſſumed as an axiom: but it is of that importance, and its demonſtration ſo beautiful, that we cannot omit it. Suppoſe, then, D C (*Plate* XVII. *Optics, fig.* 14.) an incident ray, propagated from the radiant D: here, though the motion of the ray be ſimple, yet its determination in the line D C, being oblique with reſpect to the obſtacle, is really compounded of two determinations; the one along D E, the other along D G.

The force along D C, therefore, is equal to the two forces along D G and D H. But the obſtacle G F only oppoſes one of the determinations: *viz.* that along D G (for it cannot oppoſe a determination parallel to itſelf, as D E): therefore, only the force along D G will be loſt by the ſtroke, that along D H or G C remaining entire. But a body perfectly elaſtic (ſuch as we ſuppoſe the ray of light) will recover by its elaſticity the force it loſt by the ſhock.

The ray, therefore, will recover the force D G or C H: thus, retaining both its forces, and both its former determinations H C and C F, after percuſſion, it will be impelled along C F and C H by the ſame forces as before along D H and D G. By its compound motion, therefore, it will deſcribe the right line C E, and that in the ſame time as D C; and H E and D H will be equal, as being deſcribed by the ſame force. Now, the two triangles D C H and C H E are equal, and conſequently their ſimilar angles are equal. Since then H C A = H C F; D C A, the angle of incidence, is equal to E C F, the angle of reflection. Q. E. D.

This law is confirmed in light by an eaſy experiment. For a ray of the ſun falling on a mirror, in a dark room, through a little hole, you will have the pleaſure to ſee it rebound, ſo as to make the angle of reflection equal to that of incidence. See CAMERA *Obſcura*.

The ſame may be ſhewn various other ways: thus, *e. gr.* placing a ſemicircle F *i* G, (*Plate* I. *Optics, fig.* 3.) on a mirror D E, its centre on B, and its limb perpendicular to the ſpeculum; and aſſuming equal arcs, F *a* and G *e*, place an object in A, and the eye in C: then will the object be ſeen by a ray reflected from the point B. And if B be covered, the object will ceaſe to be ſeen.

For the concluſions drawn from this general doctrine of reflection, ſee *the doctrine of* MIRRORS, &c.

II. *Each point of a ſpeculum reflects rays falling on it, from each part of an object.* See *the doctrine of* MIRRORS, &c.

III. *If the eye* C, *and the radiant point* A, *change places, the point will continue to radiate upon the eye, in the ſame courſe or path as before.*

For if the object be removed from A to C, it will ſtill radiate on its former point of reflection, B; but there can be but one right line drawn between the two points G and D; and the rays are right lines. Therefore, that which was before the ray of reflection, will now be the ray of incidence; and ſince it will be reflected under the ſame angle as that under which it fell, that which was before the ray of incidence, will now be the ray of reflection. So that the object removed to C, will radiate on the eye placed in A, by the right lines C B and B A. Q. E. D.

Hence, an object is ſeen by the reflected ray A B, with the eye placed in A, the ſame as if the eye were in C, and the object in A.

The truth of this theorem is ſo eaſily confirmed by experiment, that ſome, with Euclid, aſſume it as a principle, and demonſtrate the great law of reflection from it. Thus: ſuppoſe the angle of incidence a little greater than the angle of reflection, then will the angle A B F be greater than C B E. Wherefore, changing the places of the eye and the object, the angle C B E will become the angle of incidence; and therefore C B E greater than A B F by the ſuppoſition. So that the ſame angle A B F will be both greater and ſmaller than the other, C B E; which being abſurd, A B F cannot be greater than C B E. The ſame abſurdity will follow, if you ſuppoſe the angle of incidence leſs than the angle of reflection. Since then the angle of incidence can neither be greater nor leſs than that of reflection, it muſt be equal to it.

IV. *The plane of reflection, that is, the plane in which the incident and reflected rays, and alſo the angles of incidence and of reflection, are found, is perpendicular to the ſurface of the ſpeculum; and in ſpherical ſpecula, it paſſes through the centre.*

Hence the cathetus, both of incidence and reflection, is in the plane of reflection.

That the *plane of reflection is perpendicular to the ſpeculum*, is aſſumed by Euclid, Alhazen, and others, as a principle, without any demonſtration; as being evident from all obſervation and experiment.

V. *The image of an object ſeen in a mirror is in the cathetus of incidence.* This the ancients aſſumed as a principle; and hence, ſince the image is certainly in the reflected ray, they inferred, it muſt appear in the point of concourſe of the reflected ray, with the cathetus of incidence; which indeed holds univerſally in plane and ſpherical mirrors, and uſually alſo in concave ones, a few caſes only excepted, as is ſhewn by Kepler.

For the particular laws of reflection, ariſing from the circumſtances of the ſeveral kinds of ſpecula, or mirrors, plane, concave, convex, &c. ſee them laid down under the article MIRROR.

REFLECTION, *Cauſtic by.* See *Cauſtic* CURVE.

REFLECTION *of Heat.* See HEAT, and RAYS *of Heat.*

REFLECTION *of Cold.* See COLD.

REFLECTION *of Sound.* See SOUND.

REFLECTION *of the Moon*, is a term uſed by ſome authors for what we otherwiſe call her *variation*, being the third inequality in her motion, by which her true place out of the quadratures differs from her place twice equated. See MOON and VARIATION.

REFLECTION is alſo uſed, in the Copernican ſyſtem, for the diſtance of the pole from the horizon of the diſc; which

which is the ſame thing as the ſun's declination in the Ptolemaic ſyſtem.

Reflection is alſo uſed figuratively for an operation of the mind, by which, turning as it were back upon itſelf, it makes itſelf, and its own operation, its object; and conſiders or contemplates the manner, order, and laws, which it obſerves in perceiving, reaſoning, willing, judging, doubting, believing, &c. and frames itſelf new ideas of the relations diſcovered in them.

REFLECTOIRE Curve. See Curve *Reflectoire*.

REFLECTOR *for Light-houſes*, a combination of a number of ſquare plane glaſs mirrors, reſembling thoſe with which Archimedes is ſaid to have burnt the Roman fleet at the ſiege of Syracuſe. (See Burning-*Glaſs*.) Each of theſe mirrors is about an inch ſquare; and they are all arranged cloſe to each other in the concave of a parabolic ſegment formed of ſtucco, which has been found to anſwer the purpoſe beſt. The idea of thus illuminating light-houſes, inſtead of uſing coal-fires, in this country, without any previous knowledge of a ſimilar method practiſed in France, was firſt ſuggeſted by Mr. Ezekiel Walker, of Lynn Regis, who made, and fixed up reflectors under his direction, in a light-houſe on the coaſt of Norfolk, in the year 1779. Accordingly, in the year 1787, at the requeſt of the truſtees appointed by act of parliament for erecting four light-houſes in the northern parts of Great Britain, he inſtructed Mr. Thomas Smith, tin-plate worker, of Edinburgh, to whom the original invention is erroneouſly aſcribed in the ſupplement to the Encyclopædia Britannica, in this mode of conſtructing light-houſes. His parabolic moulds are from three to five or ſix feet in diameter; and in the centre or apex of each is placed a long ſhallow lamp of tin-plate, filled with whale-oil. In each lamp are ſix cotton-wicks, almoſt contiguous to one another, ſo diſpoſed as to burn without trimming for ſix hours. The light of theſe is reflected from each mirror ſpread over the concave ſurface, and is thus multiplied, as it were, by the number of mirrors. The ſtucco moulding is covered on the back with tin-plate, from which a tube, immediately over the lamp, proceeds to the roof of the light-room, and ſerves as a funnel, through which the ſmoke eſcapes without ſullying the faces of the mirrors. The light room is a cupola or lantern of from eight to twelve ſides, compoſed entirely of glaſs, fixed in caſt iron frames or ſaſhes, and roofed with copper. On circular branches paſſing round the inſide of this lantern, at about 18 inches from the glaſs frames, are placed the reflectors with their lamps, ſo as that the concave ſurfaces of two or three of the reflectors front every point of the compaſs, and throw a blaze of light in all directions. In the roof, immediately over the centre of the room, is a hole, through which paſs all the funnels already mentioned, and which ſerves likewiſe to admit freſh air to the lamps. This light-room is firmly fixed on the top of a round tower, ſo as to be immoveable by the weather; and the number of the reflectors, and the height of the tower, are leſs or greater according as it is intended that the light ſhould be ſeen at a leſs or a greater diſtance. Experience, it is ſaid, has obviated ſeveral objections to which light-houſes of this kind were thought to be liable; and it has been found that light-houſes, with lamps and reflectors, are, in every point of view, preferable to thoſe with fires burning in the air. They are ſupported at a much leſs expence; their light is more brilliant, and ſeen at a greater diſtance, whilſt it can never be obſcured by ſmoke, or beaten down, on the lee-ſide, by a violent guſt of wind; and they may be ſo variouſly placed, that one light-houſe cannot be miſtaken for another. Beſides, the lamps do not need trimming ſo often as open fires require fuel, and the man who attends them is never expoſed either to cold or wet in the performance of his duty, ſo that they are leſs likely to be neglected in ſtormy weather than thoſe with open fires.

It has been propoſed to make the concave ſurface of the parabola one ſpeculum of metal, inſtead of covering it over with a number of plain glaſs mirrors; or to diminiſh the ſize of each mirror, if it be thought beſt to retain them inſtead of introducing the ſpeculum. To this propoſed alteration it has been objected, that the brighteſt metal does not reflect ſuch a quantity of light as well foliated clear glaſs; and by diminiſhing the ſize of the mirrors, the number of joinings would be increaſed, in each of which ſome light is loſt, not merely in the ſeam, but from its being almoſt impoſſible to foliate glaſs perfectly at its edge.

REFLEX, Reflect, in *Painting*, is underſtood of thoſe places in a picture which are ſuppoſed to be illuminated by a light reflected from ſome other body repreſented in the ſame piece.

Or, reflexes may be defined thoſe places which, beſide the general light that illumines the whole piece, receive ſome particular light from their ſituation with reſpect to ſome more illuminated poliſhed body, that reflects part of the rays it receives upon them.

Reflexes are ſcarcely ſenſible, except in the ſhadowed parts. The management of the reflexes requires great accuracy and ſkill. All reflected light is ſuppoſed to carry with it part of the colour of the body which reflects it; ſo that thoſe places which receive this light, muſt have their colour mixed or tinged with that colour. But the ſame place may receive reflexes from different objects, differently coloured, and thoſe again receive reflexes from others. The painter, therefore, muſt have a view to every circumſtance of the colour, light, and poſition of each figure; he muſt conſider what effect each has on others, and purſue nature through all the variety of mixtures. See Clair-obscure, and Light.

Reflex *Viſion*, or Reflected *viſion*, is that performed by means of rays reflected from the poliſhed ſurfaces of objects to the eye.

Reflex viſion is the ſubject of catoptrics. Under reflex viſion come all the phenomena of ſpecula or mirrors of all kinds.

REFLEXIBILITY *of the Rays of Light*, is that property by which they are diſpoſed to be reflected. See Reflection.

Or, it is their diſpoſition to be turned back into the ſame medium, from any other medium on whoſe ſurface they fall; hence thoſe rays are ſaid to be more or leſs reflexible, which are returned back more or leſs eaſily under the ſame incidence.

Thus, if light paſs out of glaſs into air, and by being inclined more and more to the common ſurface of the glaſs and air, begins at length to be totally reflected by that ſurface, thoſe ſorts of rays which at like incidences are reflected moſt copiouſly, or the rays which, by being inclined, begin ſooneſt to be totally reflected, are the moſt reflexible rays.

That rays of light are of different colours, and endued with different degrees of reflexibility, was firſt diſcovered by ſir Iſaac Newton; and is ſhewn by the following experiment. Applying a priſm D F E (*Plate* XVII. *Optics*, *fig.* 15.), whoſe angles are each 45°, to the aperture C of a darkened room, in ſuch manner as that the light is reflected from the baſe in G; the violet rays are ſeen firſt reflected into H G; the other rays continuing ſtill refracted in I K. After the violet the blue are all refracted, the green, &c.

(See COLOUR.) Hence it appears, that the differently coloured rays differ in degree of reflexibility.

From the other experiments it appears, that thoſe rays which are moſt reflexible, are alſo moſt refrangible. See REFRANGIBILITY.

REFLEXION. See REFLECTION.

REFLEXITY, a term employed by Mr. Brougham to denote a property of light, which cauſes the different rays to be acted upon by bodies, and to begin to be refracted, reflected, inflected, and deflected, at different diſtances. This property obſerves the ſame law with the other optical properties of light; the red ray having moſt reflexity, and the violet the leaſt. (See Phil. Tranſ. for 1797, p. 360.) Mr. Brougham has expreſſed this property by the three words, "refrangity," "reflexity," and "flexity;" but the power being the ſame, if ſuch a property exiſt, different names ſeem to be unneceſſary.

REFLUX *of the Sea*, the ebbing of the water; or its return from the ſhore. It is thus called, as being the oppoſite motion to the flood, or flux. See TIDE.

REFORM, a re-eſtabliſhment, or revival of former neglected diſcipline; or a correction of ſome reigning abuſes in it.

The term is much uſed in a monaſtic ſenſe, for the reducing an order or congregation of religious to the ancient ſeverity of the rule from which it had gradually ſwerved; or even for the improving on the ancient rule and inſtitution itſelf, and voluntarily making it more ſevere.

In this ſenſe the order of St. Bernard is ſaid to be only a reform of that of St. Benedict.

To REFORM, in a *Military Senſe*, is, after ſome evolution or manœuvre, to bring a line to its natural order, by aligning it on ſome given point. See BATTALION.

To REFORM, is alſo to reduce a company, regiment, or other body of men, either by diſbanding the whole, or only breaking a part, and retaining the reſt; or ſometimes by incorporating them with other regiments. Hence,

REFORMADO, or REFORMED *officer*, one whoſe troop or company is ſuppreſſed in a reform, whilſt he is continued either in whole or half-pay, doing duty in the regiment. A reformed captain of foot follows the company, and aſſiſts the ſtanding officer as a ſecond; but he ſtill maintains his degree and precedence.

REFORMATION, REFORMATIO, the act of reforming, or correcting an error, or abuſe, in religion, diſcipline, or the like.

The reformation of religion, called, by way of eminence, *the Reformation*, was begun by the elector of Saxony, at the ſolicitation of Luther, about the beginning of the ſixteenth century. See LUTHER and LUTHERANISM.

There were many circumſtances which concurred at this time to bring about that happy reformation in religion, which reſcued one part of Europe from the papal yoke, mitigated its rigour in the other, and produced a revolution in the ſentiments of mankind, the greateſt as well as the moſt beneficial that has happened ſince the publication of Chriſtianity. How far the ſale of indulgences, publiſhed by Leo X., contributed to this event, we have already ſhewn under the article LUTHER. We ſhall here obſerve, that the ſame corruptions in the church of Rome which Luther condemned, had been attacked long before his appearance, and the ſame opinions which he propagated had been publiſhed in different places, and ſupported by the ſame arguments. Waldus in the 12th century, Wickliffe in the 14th, and Huſs in the 15th, had inveighed againſt the errors of Popery with great boldneſs, and confuted them with more ingenuity and learning than could have been expected in thoſe illiterate ages in which they flouriſhed. But all theſe premature attempts towards a reformation proved abortive. Many powerful cauſes contributed to facilitate Luther's progreſs, which either did not exiſt, or did not operate with full force in their days: the principal of theſe we ſhall here enumerate. The long and ſcandalous ſchiſm which divided the church, during the latter part of the 14th, and the beginning of the 15th centuries, had a great effect in diminiſhing the veneration with which the world had been accuſtomed to view the papal dignity. The proceedings of the councils of Conſtance and Baſil ſpread this diſreſpect for the Romiſh ſee ſtill wider, and by their bold exertion of authority in depoſing and electing popes, taught the world that there was in the church a juriſdiction ſuperior even to the papal power, which they had long believed to be ſupreme. The wound given on that occaſion to the papal authority was ſcarcely healed, when the pontificates of Alexander VI. and Julius II. both able princes, but deteſtable eccleſiaſtics, raiſed new ſcandal in Chriſtendom. Beſides, many of the dignified clergy, ſecular as well as regular, neglected the duties of their office, and indulged themſelves, without reſerve, in all the vices to which great wealth and idleneſs naturally give birth; and groſs ignorance and low debauchery rendered the inferior clergy as contemptible as the others were odious. So that we find, long before the 16th century, that many authors of reputation give ſuch deſcription of the diſſolute morals of the clergy, as ſeems almoſt incredible in the preſent age. The ſcandal of thoſe crimes, which very generally prevailed, was greatly increaſed by the facility with which ſuch as committed them obtained pardon. The exorbitant wealth of the church, the vaſt perſonal immunities of eccleſiaſtics, and their encroachments on the juriſdiction of the laity, and their various devices to ſecure their uſurpations, created much diſſatisfaction among the people, and diſpoſed them to pay particular attention to the invectives of Luther. Beſides theſe cauſes of his rapid progreſs, we may alſo reckon the invention of the art of printing, about half a century before his time, the revival of learning at the ſame period, and the bold ſpirit of inquiry which it excited in Europe; ſo that many were prepared to embrace his doctrines, who did not really wiſh ſucceſs to his undertaking. In the writings of Reuchlin, Hutten, and the other revivers of learning in Germany, the corruptions of the church of Rome are cenſured with an acrimony of ſtyle little inferior to that of Luther himſelf. The raillery and oblique cenſures of Eraſmus in particular, upon the errors of the church, as well as upon the ignorance and vices of the clergy, prepared the way for Luther's invectives and more direct attacks. To all which we may add, that the theological doctrines of Popery were ſo repugnant to the ſpirit of Chriſtianity, and ſo deſtitute of any foundation in reaſon, in the word of God, or in the practice of the church, that this circumſtance combined in favouring the progreſs of Luther's opinions, and in weakening the reſiſtance of his adverſaries.

The riſe of the reformation in Switzerland was at leaſt as early as in Germany; for Ulric Zuingle had, in the year 1516, begun to explain the ſcriptures to the people, and to cenſure, though with great prudence and moderation, the errors of a corrupt church. He had very noble and extenſive ideas of a general reformation, at the time when Luther retained almoſt the whole ſyſtem of Popery, indulgences excepted; and he had actually called in queſtion the authority and ſupremacy of the pope, before the name of Luther was known in that country. In the year 1524, Nuremberg, Francfort, Hamburgh, and ſeveral other cities in Germany, of the firſt rank, openly embraced the reformed religion, and by the authority of their magiſtrates aboliſhed the

the maſs, and the other ſuperſtitious rites of Popery. The elector of Brandenburgh, Saxony, the marquis of the landgrave of Heſſe, the dukes of Brunſwick and Lunenburgh, and prince of Anhalt, became avowed patrons of Luther's opinions, and countenanced the preaching of them among their ſubjects. The reformers derived great advantage from the tranſactions of the diet at Nuremberg, which preſented to the pope a catalogue of a hundred grievances, which the empire imputed to the iniquitous dominion of the papal ſee. The progreſs of the reformation in Germany was likewiſe promoted by the proceedings of the diet held at Spire in the years 1526 and 1529. See LUTHER and PROTESTANTS.

During theſe tranſactions in Germany, the dawn of truth aroſe upon other nations. The light of the reformation ſpread itſelf far and wide; and almoſt all the European ſtates welcomed its ſalutary beams, and exulted in the proſpect of an approaching deliverance from the yoke of ſuperſtition and ſpiritual deſpotiſm. Some of the moſt conſiderable provinces of Europe had already broke their chains, and openly withdrawn themſelves from the diſcipline of Rome and the juriſdiction of its pontiff. The reformed religion was propagated in Sweden, ſoon after Luther's rupture with Rome, by Olaus Petri, one of his diſciples, who was countenanced and encouraged by the valiant and public-ſpirited prince Guſtavus Vaſa Ericſon, to whoſe firmneſs and magnanimity it was owing, that from the year 1527 the papal empire in Sweden was entirely overturned, and Guſtavus declared head of the church. The light of the reformation was alſo received in Denmark ſo early as the year 1521, in conſequence of the ardent deſire diſcovered by Chriſtian or Chriſtiern II., for purpoſes of mere ambition, of having his diſciples inſtructed in the doctrines of Luther. His ſucceſſor Frederic, duke of Holſtein and Sileſia, contributed greatly to the progreſs of the reformation, by his ſucceſsful attempts in favour of religious liberty, at the aſſembly of ſtates that was held at Odenſee, in the year 1527, when he procured the publication of the famous edict which declared every ſubject of Denmark free, either to adhere to the tenets of the church of Rome, or to embrace the doctrine of Luther; that no perſon ſhould be moleſted on account of his religion; that a royal protection ſhould be granted to the Lutherans; and that eccleſiaſtics of every order ſhould be allowed to marry. But the honour of accompliſhing this glorious work was reſerved for Chriſtiern III. a prince equally diſtinguiſhed by his piety and prudence. The religious doctrine, diſcipline, and worſhip of this kingdom, were ſettled according to a plan laid down by Bugenhagius. And the aſſembly of the ſtates at Odenſee, in 1539, gave a ſolemn ſanction to all theſe tranſactions, and thus the work of reformation was brought to perfection in Denmark.

In the ſame year the reformation was eſtabliſhed in every part of Saxony. Upon the death of George, duke of Saxony, who was an inveterate enemy to the reformation, the ſucceſſion fell to his brother Henry, whoſe attachment to the Proteſtant religion ſurpaſſed, if poſſible, that of his predeceſſor to Popery. Henry invited ſome Proteſtant divines, and among them Luther himſelf, to Leipſic; and by their advice and aſſiſtance, he learned, in a few weeks, the whole ſyſtem of ancient rites, eſtabliſhing the full exerciſe of the Proteſtant religion, with the univerſal applauſe of his ſubjects, who had long wiſhed for this change, which the obſtinacy of their former duke had alone prevented. This revolution delivered the Proteſtants from the danger to which they were expoſed by having an inveterate enemy ſettled in the middle of their territories; and their dominions now extended in a great and almoſt unbroken line from the ſhore of the Baltic to the banks of the Rhine

In France, the auſpicious patronage of Margaret, queen of Navarre, ſiſter to Francis I., encouraged ſeveral pious and learned men, whoſe religious ſentiments were the ſame with her own, to propagate the principles of the reformation, and even to erect ſeveral Proteſtant churches in that kingdom. It appears, that, ſo early as the year 1523, there were many, and even perſons of rank, and ſome of the epiſcopal order, who had conceived the utmoſt averſion both againſt the doctrine and tyranny of Rome. But the wavering and inconſiſtent conduct of Francis I. rendered the ſituation of the Proteſtants in this country always precarious, often diſtreſſed. Upon the whole, we may obſerve, that, before the diet of Augſburg, the doctrine of Luther had made conſiderable, though perhaps a ſecret, progreſs in Spain, Hungary, Bohemia, Britain, Poland, and the Netherlands, and had, in all theſe countries, many friends, of whom ſeveral repaired to Wittemberg to improve their knowledge, and enlarge their views under ſuch an eminent maſter. At this diet, held in 1530, the Augſburg or Auguſtine confeſſion was preſented to the emperor Charles V. and after many debates between the friends of liberty and the votaries of Rome, the latter prevailed; and the diet, in compliance with the opinion and remonſtrances of Campeggio, the papal nuncio, iſſued a decree, condemning moſt of the peculiar tenets held by the Proteſtants; forbidding any perſon to protect or tolerate thoſe who taught them; enjoining a ſtrict obſervance of the eſtabliſhed rites; and prohibiting any farther innovation, under ſevere penalties. Thoſe who refuſed to obey this decree were declared incapable of acting as judges, or of appearing as parties in the imperial chamber, the ſupreme court of judicature in the empire. The Proteſtants, alarmed at the ſeverity of the decree, aſſembled at Smalcald, and concluded a league of mutual defence againſt all aggreſſors, by which they formed the Proteſtant ſtates of the empire into one regular body: and they reſolved to apply to the kings of England, France, and Denmark, to implore them to aſſiſt and patronize this new confederacy. After various negociations between the emperor and the Proteſtant princes, terms of pacification were agreed upon at Nuremberg, and ratified ſolemnly in the diet of Ratiſbon, in the year 1532. In this treaty it was ſtipulated, that univerſal peace be eſtabliſhed in Germany, until the meeting of a general council, the convocation of which, within ſix months, the emperor ſhall endeavour to procure; that no perſon be moleſted on account of religion; that a ſtop be put to all proceſſes begun by the imperial chamber againſt Proteſtants; and the ſentences already paſſed to their detriment be declared void. On their part, the Proteſtants engaged to aſſiſt the emperor with all their forces in reſiſting the invaſion of the Turks. Thus the Proteſtants, by their firmneſs, unanimity, and dexterity in availing themſelves of the emperor's ſituation, obtained terms which amounted almoſt to a toleration of their religion. But neither the emperor nor the pope were diſpoſed to abide by the unbiaſſed ſenſe of a general council, aſſembled, as the Proteſtants wiſhed, within the limit of the empire, but determined to decide their religious debates by the force of arms. After many evaſions and delays, it was propoſed, in the year 1545, to aſſemble a council at Trent, which was vigorouſly oppoſed by the Proteſtants. The emperor and the pope had mutually agreed to deſtroy all who ſhould dare to oppoſe this council. The meeting of that aſſembly was to ſerve as a ſignal for their taking arms; and accordingly its deliberations were ſcarcely begun, in the year 1546, when the Proteſtants perceived undoubted marks of a formidable union to overwhelm and cruſh them by one blow. The fathers, aſſembled in the council of Trent, promulgated

their decrees; and the Proteſtant princes in the diet of Ratiſbon proteſted againſt their authority; and were, in conſequence of this, proſcribed by the emperor, who raiſed an army to reduce them to obedience. Thus commenced the war of Smalcald, which was proſecuted with various ſucceſs on both ſides, till, in the year 1552, Charles was ſurpriſed at Inſpruck by Maurice of Saxony, and was conſtrained to conclude at Paſſau the famous treaty of *pacification*, (which ſee,) with the Proteſtants, which is conſidered by thoſe of Germany as the baſis of their religious liberty; and to promiſe in ſix months to aſſemble a diet, in which all the tumults and diſſenſions, that had been occaſioned by a variety of ſentiments in religious matters, ſhould be entirely removed. This diet, though not aſſembled at the ſtipulated time, met, however, at Augſburg, in the year 1555, and terminated thoſe deplorable ſcenes of bloodſhed, deſolation, and diſcord, that had ſo long afflicted both church and ſtate by that *religious peace*, as it is commonly called, which ſecured to the Proteſtants the free exerciſe of their religion, and eſtabliſhed this ineſtimable liberty upon the firmeſt foundations. For, after various debates, the following memorable acts were paſſed; that the Proteſtants who followed the confeſſion of Augſburg, ſhould for the future be conſidered as entirely exempted from the juriſdiction of the Roman pontiff, and from the authority and ſuperintendance of the biſhops; that they were left at perfect liberty to enact laws for themſelves, relating to their religious ſentiments, diſcipline, and worſhip; that all the inhabitants of the German empire ſhould be allowed to judge for themſelves in religious matters, and to join themſelves to that church whoſe doctrine and worſhip they thought the pureſt and moſt conſonant to the ſpirit of Chriſtianity; and that all thoſe, who ſhould injure or perſecute any perſon under religious pretexts, and on account of their opinions, ſhould be declared, and proceeded againſt, as public enemies of the empire, invaders of its liberty, and diſturbers of its peace.

In the year 1533, Henry VIII. king of England, who, in the beginning of theſe troubles, had oppoſed the doctrine and views of Luther with the utmoſt vehemence, partly becauſe he had ſpoken with contempt of Thomas Aquinas, the king's favourite author, having ſued for a divorce from Catharine of Arragon, his brother's widow, at the court of Rome, for almoſt ſix years, during which period Clement VII. negociated, promiſed, retracted, and concluded nothing, determined to apply to another tribunal for that decree which he had unſucceſsfully ſolicited at Rome. Cranmer, archbiſhop of Canterbury, by a ſentence founded on the authority of univerſities, doctors, and rabbies, who had been conſulted with reſpect to the point, annulled the king's marriage with Catharine; and Anne Boleyn, whoſe charms had captivated the king, was acknowledged as queen of England. Clement, apprehenſive leſt England would revolt from the holy ſee, determined to give Henry ſuch ſatisfaction as might ſtill retain him within the boſom of the church. But the violence of the cardinals precipitated him, in 1534, to iſſue a bull reſcinding Cranmer's ſentence, confirming Henry's marriage with Catharine, and declaring him excommunicated, if, within a time ſpecified, he did not abandon the wife he had taken, and return to her whom he had deſerted. Enraged at this unexpected decree, Henry kept no longer any meaſures with the court of Rome; his ſubjects ſeconded his reſentment; an act of parliament was paſſed, aboliſhing the papal power and juriſdiction in England; by another the king was declared ſupreme head of the church, and all the authority of which the popes were deprived was veſted in him; the *monaſteries*, (which ſee,) were ſuppreſſed, and their revenues applied to other purpoſes.

The people had been gradually prepared for this great innovation. Each ſucceeding ſeſſion of parliament had made ſome retrenchment from the power and profits of the Roman pontiff. Care had been taken, during ſome years, to teach the nation that a general council was much ſuperior to a pope. But now a biſhop preached every Sunday at Paul's Croſs, in order to inculcate the doctrine, that the pope was intitled to no authority at all beyond his own dioceſe.

The laws paſſed during this ſeſſion (1534) ſufficiently evince, that the king was determined not to ſurrender any part of his aſſumed prerogative. All payments made to the apoſtolic chamber: all proviſions, bulls, diſpenſations, were aboliſhed: monaſteries were to be ſubjected to the regulation and government of the king alone: the law for puniſhing heretics was moderated: the ordinary was prohibited from impriſoning or trying any perſon upon ſuſpicion alone, without preſentment by ten lawful witneſſes: and it was declared that to ſpeak againſt the pope's authority was no hereſy: biſhops were to be appointed by a *congé d'elire* from the crown, or, in caſe of the dean and chapter's refuſal, by letters patent; and no recourſe was to be had to Rome for palls, bulls, or proviſions. Campeggio and Ghinucci, two Italians, were deprived of the biſhoprics of Saliſbury and Worceſter, which they had hitherto enjoyed: the law which had been formerly made againſt paying annats, or firſt fruits, but which had been left in the king's power to ſuſpend or enforce, was finally eſtabliſhed: and a ſubmiſſion which was exacted two years before from the clergy, and which had been obtained with great difficulty, received this ſeſſion the ſanction of parliament. In this ſubmiſſion, the clergy acknowledged that convocations ought to be aſſembled by the king's authority only: they promiſed to enact no new canons without his conſent: and they agreed that he ſhould appoint 32 commiſſioners, in order to examine the old canons, and abrogate ſuch as ſhould be found prejudicial to his royal prerogative. An appeal was alſo allowed from the biſhop's court to the king in chancery. But the moſt important act paſſed this ſeſſion, was that which regulated the ſucceſſion to the crown: the marriage of the king with Catharine was declared unlawful, void, and of no effect: the primate's ſentence annulling it was ratified; and the marriage with queen Anne was eſtabliſhed and confirmed. The crown was appointed to deſcend to the iſſue of this marriage, and failing there, to the king's heirs for ever. An oath was likewiſe enjoined to be taken in favour of this order of ſucceſſion, under the penalty of impriſonment during the king's pleaſure, and forfeiture of goods and chattels: and all ſlander againſt the king, queen, or their iſſue, was ſubjected to the penalty of miſpriſion of treaſon. Theſe ſeveral acts, ſo contemptuous towards the pope, and ſo deſtructive of his authority, were paſſed at the very time that Clement pronounced his haſty ſentence againſt the king. The king found his eccleſiaſtical ſubjects as compliant as the laity. The convocation ordered that the act againſt appeals to Rome, together with the king's appeal from the pope to a general council, ſhould be affixed to all the doors of all the churches in the kingdom; and they voted that the biſhop of Rome had, by the laws of God, no more juriſdiction in England than any other foreign biſhop; and that the authority which he and his predeceſſors had there exerciſed, was only by uſurpation, and by the ſufferance of Engliſh princes. The biſhops went ſo far in their complaiſance, that they took out new commiſſions from the crown, in which all their ſpiritual and epiſcopal authority was expreſsly affirmed to be derived ultimately from the civil magiſtrate, and to be entirely dependent on his good pleaſure.

Henry, however, with the caprice peculiar to his character, continued to defend the doctrines of the Romish church as fiercely as he attacked their jurisdiction. He alternately persecuted the Protestants for rejecting the former, and the Catholics for acknowledging the latter.

Nothing more forwarded the first progress of the reformers, than the offer which they made, of submitting all religious doctrines to private judgment, and the summons given every one to examine the principles formerly imposed upon them. And what can be more just and reasonable? and yet the multitude, says Mr. Hume, were totally unqualified for this undertaking, though they were highly pleased with it. They fancied that they were exercising their judgment, while they opposed to the prejudices of ancient authority more powerful prejudices of another kind. The novelty itself of the doctrines; the pleasure of an imaginary triumph in dispute; the fervent zeal of the reformed preachers; their patience, and even alacrity, in suffering persecution, death, and torments; a disgust at the restraints of the old religion; an indignation against the tyranny and interested spirit of the ecclesiastics:—these motives, says the same historian, whilst, as some may imagine, he is depreciating the principles of the reformation, were prevalent with the people; and by such considerations were men so generally induced, during that age, to throw off the religion of their ancestors. In proportion, says the same author, as the practice of submitting religion to private judgment was acceptable to the people, it appeared, in some respects, dangerous to the rights of sovereigns, and seemed to destroy that implicit obedience on which the authority of the civil magistrate is chiefly founded. When some Englishmen, such were Tindal, Joye, Constantine, and others, retired to Antwerp, through fear of the exertion of the king's authority, they employed themselves in writing English books against the corruptions of the church of Rome; against images, relics, and pilgrims; and they excited the curiosity of men with regard to that question, which is the most important in theology, the terms of acceptance with the Supreme Being. These books, having been secretly conveyed to England, began to make converts every where; but it was a translation of the scriptures by Tindal that was esteemed the most dangerous to the established faith. Against Wolsey, a favourite minister of Henry VIII., it was one article of impeachment, that, by his connivance, he had encouraged the growth of heresy, and that he had protected and acquitted some notorious offenders. Wolsey was succeeded in the office of chancellor by sir Thomas More, who, irritated by polemics, became so superstitiously attached to the ancient faith, that few inquisitors have been guilty of greater violence in their prosecution of heresy. Several persons were not only brought into the courts for heretical offences, such as teaching their children the Lord's prayer in English, for reading the New Testament in that language, or for speaking against pilgrimages; and others were charged with the capital offences of harbouring persecuted preachers, neglecting the fasts of the church, and declaiming against the vices of the clergy. Some were tried, condemned, and committed to the flames. Notwithstanding the inconsistent conduct of Henry, his subjects having been encouraged, by his example, to break some of their fetters, were so impatient to shake off all that remained, that in the following reign, under his son Edward VI., with the general applause of the nation, a total separation was made from the church of Rome in articles of doctrine, as well as in matters of discipline and jurisdiction. (See ARTICLES.) In 1553, his death retarded the progress of the reformation; and his sister Mary, who succeeded him, imposed a-new the arbitrary laws and tyrannical yoke of Rome upon the people of England. But the execution of a great number of persons, who were burnt for the Protestant faith in the five years of her persecuting and bloody reign, so alienated the people from Popery, that queen Elizabeth, her sister, found it no hard matter to deliver her subjects from the bondage of Rome, and to establish that form of religious doctrine and ecclesiastical government, which still subsists in England.

The seeds of the reformation were very early sown in Scotland, by several noblemen of that nation, who had resided in Germany during the religious disputes that divided the empire. The first and most eminent opposer of the Papal jurisdiction was John Knox, a disciple of Calvin, who set out from Geneva for Scotland in 1559, and in a little while prevailed with the greatest part of the Scotch nation entirely to abandon the superstitions of Rome, and to aim at nothing less than the total extirpation of Popery. In the following year, *viz.* 1560, the parliament ratified a confession of faith, agreeable to the new doctrines, and passing a statute against the mass, not only abolished it in all the churches, but enacted, that whoever, any where, either officiated in it, or was present at it, should be chastised, for the first offence, with confiscation of goods, and corporal punishment, at the discretion of the magistrate; for the second, with banishment; and for the third, with loss of life. A law was also voted for abolishing the Papal jurisdiction in Scotland; the Presbyterian form of discipline was settled, leaving only at first some shadow of authority to certain ecclesiastics, whom they called superintendants. From that period to the present times the form of doctrine, worship, and discipline, that had been established at Geneva by the ministry of Calvin, has been maintained in Scotland with invincible obstinacy and zeal; and every attempt to introduce, into that kingdom, the rites and government of the church of England, has proved impotent and unsuccessful. See PRESBYTERIANS.

The cause of the reformation in Ireland underwent the same vicissitudes that had attended it in England. When Henry VIII., after the abolition of the Papal authority, was declared supreme head of the church of England, George Brown, a native of England, and a monk of the Augustin order, whom that monarch had created, in the year 1535, archbishop of Dublin, began to act with the utmost vigour, in consequence of this change in the hierarchy. He purged the churches of his diocese from superstition in all its forms, pulled down images, destroyed relics, abolished absurd and idolatrous rites, and, by the influence as well as authority he had in Ireland, caused the king's supremacy to be acknowledged in that nation. Henry shewed soon after, that this supremacy was not a vain title; for he banished the monks out of that kingdom, confiscated their revenues, and destroyed their convents. In the reign of Edward VI. farther progress was made in the reformation, but the accession of Mary retarded it, in consequence of which Brown and other Protestant bishops were deprived of their dignities in the church. When Elizabeth ascended the throne, the Irish were again obliged to submit to the form of worship and discipline established in England.

The reformation had not been long established in Britain, when the Belgic provinces, united by a respectable confederacy which still subsists, withdrew from their spiritual allegiance to the Roman pontiff. The means which Philip II. king of Spain used to obstruct the reformation, promoted it: the nobility formed themselves into an association, in the year 1566, and roused the people; who, under the heroic conduct of William of Nassau, prince of Orange, seconded by the succours of England and France, delivered this state

from

from the Spaniſh yoke: in conſequence of which the reformed religion, as it was profeſſed in Switzerland, was eſtabliſhed in the United Provinces; and, at the ſame time, an univerſal toleration granted to thoſe whoſe religious ſentiments were of a different nature, whether they retained the faith of Rome, or embraced the reformation in another form, provided that they made no attempts againſt the authority of the government, or the tranquillity of the public.

Whilſt Mr. Hume attributes the quick and ſurpriſing progreſs of the reformation in part to the late invention of printing, and revival of learning, he denies that reaſon had any conſiderable ſhare in opening men's eyes with regard to the impoſtures of the Romiſh church; alleging that philoſophy had made little progreſs, at leaſt not till long after the period of the reformation, and that no inſtance occurs in which argument has ever been able to free the people from that enormous load of abſurdity with which ſuperſtition has every where overwhelmed them: to which he adds, that the rapid advance of the Lutheran doctrine, and the violence with which it was embraced, prove ſufficiently that it owed not its ſucceſs to reaſon and reflection. The art of printing, and the revival of learning, he ſays, forwarded its progreſs in another manner. By means of that art, the books of Luther and his ſectaries, full of vehemence, declamation, and a rude eloquence, were propagated more quickly, and in greater numbers. The minds of men, ſomewhat awakened from a profound ſleep of ſo many centuries, were prepared for every novelty, and ſcrupled leſs to tread in any unuſual path which was opened to them. And as copies of the ſcriptures, and other ancient monuments of the Chriſtian faith, became more common, men perceived the innovations which were introduced after the firſt century; and though argument and reaſoning could not give conviction, an hiſtorical fact, well ſupported, was able to make impreſſion on their underſtandings. As the eccleſiaſtics would not agree to poſſeſs their privileges, though ancient and prior to almoſt every political eſtabliſhment in Europe, as matters of civil right, which time might render valid, but appealed ſtill to a divine right, they thus tempted men to look to their primitive charter, which, with little difficulty, they could perceive to be defective in truth and authenticity. Beſides, Luther and his followers, not ſatisfied with oppoſing the pretended divinity of the Romiſh church, and diſplaying the temporal inconveniences of that eſtabliſhment, proceeded to treat the religion of their anceſtors as abominable, deteſtable, and damnable; foretold by ſacred writ itſelf as the ſource of all wickedneſs and pollution. They denominated the pope antichriſt, called his communion the ſcarlet whore, and gave to Rome the appellation of Babylon; expreſſions which, however applied, were to be found in ſcripture, and which were better calculated to operate on the multitude than the moſt ſolid arguments. Excited by conteſt and perſecution on the one hand, by ſucceſs and applauſe on the other, many of the reformers carried to the greateſt extremities their oppoſition to the church of Rome; and in contradiction to the multiplied ſuperſtitions with which that communion was loaded, they adopted an enthuſiaſtic ſtrain of devotion, which admitted of no obſervances, rites, or ceremonies, but placed all merit in a myſterious ſpecies of faith, in inward viſion, rapture, and ecſtacy. The new ſectaries, ſeized with this ſpirit, were indefatigable in the propagation of their doctrine, and ſet at defiance all the anathemas and puniſhments with which the Roman pontiff endeavoured to overwhelm them.

Thus, in terms which appear to us too diſparaging, does our hiſtorian deſcribe the origin and progreſs of the reformation; nor does he pay due reſpect to the principles on which it was founded, and to the character of the perſons who were the principal agents in accompliſhing it. We are ready to acknowledge, that the collateral circumſtances above recited rendered its advances more rapid and more extenſive; but we cannot allow that it did not owe much of its ſucceſs to reaſon and reflection. But whatever may be our opinion of the primary cauſes that produced it, its influence on the minds and manners of mankind, on the ſtate of ſociety in general, and on the intereſts of liberty, religion, and virtue, has been eminently and extenſively beneficial. Luther had no ſooner began to attack the papal ſupremacy, than the charm, which had bound mankind for ſo many ages, was broken at once. The human mind, which had long continued as tame and paſſive, as if it had been taught to believe whatever was taught, and to bear whatever was impoſed, roufed of a ſudden, and became inquiſitive, mutinous, and diſdainful of the yoke to which it had hitherto ſubmitted. The reformation, wherever it was received, increaſed that bold and innovating ſpirit to which it owed its birth. Men who had the courage to overturn a ſyſtem, ſupported by every thing which can command reſpect or reverence, were not to be overawed by any authority, how great or venerable ſoever. After having been accuſtomed to conſider themſelves as judges of the moſt important doctrines in religion, to examine theſe freely, and to reject, without ſcruple, what appeared to them erroneous, it was natural for them to turn the ſame daring and inquiſitive eye to government, and to think of rectifying whatever diſorders or imperfections were diſcovered there. As religious abuſes had been reformed in ſeveral places, without the permiſſion of the magiſtrate, it was an eaſy tranſition to attempt the redreſs of political grievances in the ſame manner. But though the ſpirit of innovation, that was excited and promoted by the reformation, might in ſome inſtances prove the occaſion of turbulence and tumult, the good that eventually accrued from its operation far exceeded the partial and temporary evil that reſulted from it. The prevalence of this ſpirit was ſo general, that it muſt have been excited by cauſes that were natural, and of powerful efficacy; and the conſequences that flowed from them muſt have been as important and intereſting as the cauſes that produced them. The kingdoms of Denmark, Sweden, England, and Scotland, and almoſt one half of Germany, threw off their allegiance to the pope, aboliſhed his juriſdiction within their territories, and gave the ſanction of law to modes of diſcipline and ſyſtems of doctrine, which were not only independent of his power, but hoſtile to it. Nor was this ſpirit of innovation confined to thoſe countries which openly revolted from the pope; it ſpread through all Europe, and broke out in every part of it with various degrees of violence. It penetrated early into France, and made ſuch rapid progreſs, that the number of converts to the opinions of the reformers was ſo great, their zeal ſo enterpriſing, and the abilities of their leaders ſo diſtinguiſhed, that they ſoon ventured to contend for ſuperiority with the eſtabliſhed church, and were ſometimes on the point of obtaining it. In all the provinces of Germany which continued to acknowledge the papal ſupremacy, as well as in the Low Countries, the Proteſtant doctrines were ſecretly taught, and had gained ſo many proſelytes, that they were ripe for revolt, and were reſtrained merely by the dread of their rulers from imitating the example of their neighbours, and aſſerting their independence: hence in Spain and Italy, ſymptoms of the ſame diſpoſition to ſhake off the yoke appeared. The pretenſions of the pope to infallible knowledge and ſupreme power were treated by many perſons of eminent learning and abilities with ſuch ſcorn, or impugned

with ſuch vehemence, that the moſt vigilant attention of the civil magiſtrate, the higheſt ſtrains of pontifical authority, and all the rigour of the inquiſitorial juriſdiction, were requiſite to check or extinguiſh it. The defection of ſo many opulent and powerful kingdoms from the papal ſee was a fatal blow to its grandeur and power, and produced a very conſiderable diminution of its revenues. It likewiſe obliged the Roman pontiffs to adopt a different ſyſtem of conduct towards the nations which continued to recognize their juriſdiction, and to govern them by new maxims, and with a milder ſpirit. They became afraid of venturing upon any ſuch exertion of their authority as might alarm or exaſperate their ſubjects, and excite them to a new revolt. Hence it happens, that the popes, from the era of the reformation, have ruled rather by addreſs and management than by authority. They have been obliged not only to accommodate themſelves to the notions of their adherents, but to pay ſome regard to the prejudices of their enemies. In proceſs of time, and before the convulſions which have lately agitated Europe, they ſunk almoſt to a level with the other petty princes of Italy; and they hardly retain any ſhadow of the temporal power which they anciently poſſeſſed. Nevertheleſs, whilſt the reformation has been fatal to the power of the popes, it has contributed to improve the church of Rome both in ſcience and in morals. Many motives have ariſen out of the reformation, and the exiſtence of two rival churches, which have ſerved to engage the Catholic clergy to apply themſelves to the ſtudy of uſeful ſcience, and to pay a ſtrict attention to the manners of their clergy. In thoſe countries where the members of the two churches have mingled freely with each other, or have carried on any conſiderable intercourſe, either commercial or literary, an extraordinary alteration in the ideas, as well as in the morals, of the Popiſh eccleſiaſtics is manifeſt. The beneficial influence of the reformation has not only been felt by the clergy, and the inferior members of the Roman Catholic church; but it has extended to the ſee of Rome, and to the ſovereign pontiffs themſelves, whoſe character, at a later period, has been very different from that of ſeveral of their predeceſſors. Many of them have been conſpicuous for the virtues becoming their high ſtation; and by their humanity, their love of literature, and their moderation, have made ſome atonement to mankind for the crimes of thoſe who in former times occupied their places. Thus the reformation has eminently contributed to increaſe purity of manners, to diffuſe ſcience, and to inſpire humanity. With the progreſs of the reformation we may alſo connect a variety of other important benefits, both to individuals and to ſociety; and as they pertain to the inveſtigation of truth and the improvement of ſcience, to the promotion of liberty both civil and religious, to the diffuſion of knowledge and virtue, and to the advancement of the beſt intereſts of mankind. But the details of the advantages reſulting from the reformation to nations and private perſons, to religion in general, and genuine Chriſtianity in particular, would far exceed the limits to which we are confined.

See, on the ſubject of this article, Robertſon's Hiſt. of Charles V. vol. ii. p. 113, &c. vol. iii. p. 44, &c. Moſheim's Eccl. Hiſt. Eng. ed. 8vo. vol. iii. Burnet's Hiſt. of the Reformation, paſſim. For a comprehenſive, and, upon the whole, a juſt ſketch of the predifpoſing cauſes, and beneficial conſequences of the reformation, we refer the reader to a work which obtained the prize propoſed by the National Inſtitute of France, 15th of Germinal, in the year X. *viz.* "What has been the influence of the reformation by Luther on the political ſituation of the different ſtates of Europe, and on the progreſs of knowledge?" The work is entitled "An Eſſay on the Spirit and Influence of the Reformation by Luther," by C. Villers. We have two Engliſh tranſlations, one by B. Lambert, and the other by James Mill, 8vo. 1805.

Reformation, *Right of*, *Jus reformationis*, is a right which the princes of Germany claim to reform the church in their reſpective territories; as being inveſted with the ſpiritual as well as the temporal power.

The *jus reformationis* is annexed to the ſovereignty; by this they have the power of conſcience, the diſpoſition of eccleſiaſtical revenues, &c. as they enjoyed the ſame at the treaty of Munſter in 1624.

Reformation *of Images*, in *Optics*. See Anamorphosis.

REFORMED *Calendar* and *Church*. See the ſubſtantives.

Reformed *Officer*. See Reformado.

REFRACTED Angle, in *Optics*, the angle contained between the refracted ray and the perpendicular.

Refracted *Dials*, are ſuch as ſhew the hour by means of ſome refracting tranſparent fluid. See Dials, *Refracted*.

Refracted *Ray*, or *ray of refraction*. See Ray and Refraction.

Refracted *Viſion*. See Vision.

REFRACTING Telescope. See Telescope.

REFRACTION, Refractio, in *Mechanics*, the deviation of a moving body from its direct courſe, by reaſon of the different denſity of the medium it moves in; or a flexion and change of determination, occaſioned by a body's falling obliquely out of one medium into another of a different denſity.

Thus a ball A (*Plate* XXXVI. *Mechanics*, *fig.* 14.) moving in the air in the line A B, and falling obliquely on the ſurface of the water C D, does not proceed ſtraight to E, but deviates, or is inflected, to F. Again, if the ball, moving in water in the ſame line A B, ſhould fall obliquely on a ſurface of air C D; it will not proceed ſtraight to E, nor yet deflect to F, but to G. Now the deflection in each caſe is called the *refraction:* and the two caſes are diſtinguiſhed by means of the perpendicular M I; that B G being called *refraction towards the perpendicular*, or to the *axis of refraction;* and the other B F, *refraction from the perpendicular*, or *from the axis of refraction*.

Theſe refractions are ſuppoſed to ariſe hence, that the ball arriving at B, in the firſt caſe finds more reſiſtance or oppoſition on the one ſide O, *i. e.* from the ſide of the water, than it did from the ſide P, or that of the air; and in the latter more reſiſtance from the ſide P, which is now the ſide of the water, than the ſide O, which is that of the air.

The great law of refraction, then, which holds in all bodies, and all mediums, is that a body, paſſing obliquely out of a medium which reſiſts it more, is refracted towards the perpendicular; and in paſſing out of a medium which oppoſes it leſs into another which oppoſes it more, it is refracted from the perpendicular.

Hence the rays of light falling out of air into water are refracted towards the perpendicular; whereas a ball thrown into the water is refracted from it; becauſe water, which reſiſts the motion of light leſs than air, reſiſts that of the ball more; or, to ſpeak more juſtly, becauſe water, by its greater attraction, accelerates the motion of the rays of light more than air does; for that this is the true cauſe of refraction, at leaſt in light, ſhall be ſhewn under Refraction *of light*.

To have a body refracted, it is neceſſary that it ſhould fall obliquely on the ſecond medium. In perpendicular incidence there is no refraction.

Voſſius indeed, and Snellius, imagined they had obſerved a perpendicular ray of light undergo a refraction; a perpendicular object appearing in the water nearer than in reality it was; but this was to attribute that to a refraction of the perpendicular rays, which was owing to the divergency of the oblique rays after refraction, from a nearer point.

Yet there is a manifeſt refraction even of perpendicular rays found in *Iſland* CRYSTAL, which ſee.

Rohault adds, that though an oblique incidence be neceſſary in all other mediums we know of, yet the oblique muſt not exceed a certain degree; if it do, the body will not penetrate the medium, but will be reflected inſtead of being refracted.

Thus cannon-balls, in ſea-engagements, falling very obliquely on the ſurface of the water, are obſerved to mount aloft again, and frequently to ſweep the men from off the oppoſite decks; and the like happens to the little ſtones with which children make their ducks and drakes.

The ancients confounded refraction with reflection, and it was ſir Iſaac Newton who firſt taught us the juſt difference between them. He ſhews likewiſe, that there is a good deal of analogy between them, and particularly in the caſe of light.

The laws of refraction of the rays of light in mediums differently terminated, *i. e.* whoſe ſurfaces are plain, concave, convex, &c. make the ſubject of *dioptrics*; which ſee.

By refraction it is, that convex glaſſes, or lenſes, collect the rays, magnify objects, burn, &c. and hence the foundation of microſcopes, teleſcopes, &c.

By refraction it is, that all remote objects are ſeen out of their real places; particularly, that the heavenly bodies are apparently higher than they are in reality, &c.

The refraction of the air has many times ſo uncertain an influence on the places of celeſtial objects, very remote from the zenith, that wherever refraction is concerned, the concluſions deduced from obſervations that are much affected by it, will always remain doubtful, and too precarious in many caſes to be relied upon. See Dr. Bradley, in Phil. Tranſ. N° 485. See *Atmoſpherical* REFRACTION.

REFRACTION *of Light*, in *Optics*, is an inflection or deviation of the rays from their rectilinear courſe upon falling obliquely out of one medium into another, of a different denſity.

The term refraction is derived from the diſtortion which it occaſions in the appearance of an object viewed in part only by refracted light; thus, an oar, partially immerſed in water, appears to be bent, on account of the refraction of the light, by which its lower part is ſeen, in its paſſage out of the water into the air.

Although no ſenſible light can penetrate more than 700 feet deep into the ſea, and a length of ſeven feet of water has been found to intercept one-half of the light which enters into it; yet in tranſparent ſubſtances (no medium being, ſtrictly ſpeaking, abſolutely tranſparent) the greater part of the light penetrates to all diſtances with little interruption, and all rays, of the ſame kind, thus tranſmitted by the ſame ſurface, form with the perpendicular an angle of refraction, which is ultimately in a certain conſtant proportion to the angle of incidence; that is, for inſtance, one-half, three-fourths, or two-thirds, according to the nature of the ſurface. Thus, if the refractive properties of the ſubſtance were ſuch, that an incident ray, making an angle of one degree with the perpendicular, would be ſo refracted as to make an angle of only half a degree with the ſame line, another ray, incident at an angle of two degrees, would be refracted, without ſenſible error, into an angle of one degree. But when the angles are larger, they vary from this ratio, their ſines only preſerving the proportion with accuracy: for example, if the angle of incidence at the ſuppoſed ſurface were increaſed to 90°, the angle of refraction would be 30° only, inſtead of 45°.

It does not appear that, before Deſcartes, any perſon attempted to explain the phyſical cauſe of the refraction, and alſo the reflection of light, which he undertook to do by the reſolution of forces, on the principles of mechanics; in conſequence of which he was obliged to ſuppoſe that light paſſes with more eaſe through a denſe medium than a rare one: thus the ray A B (*Plate* XVIII. *Optics*, *fig.* 10.) falling obliquely on a denſer medium at B, is ſuppoſed to be acted on by two forces, one of them impelling it in the direction A C, and the other in A D, which alone can be affected by the change of medium: and ſince, after the ray has entered the denſer medium, it approaches the perpendicular B H, it is plain that this force muſt have received an increaſe, whilſt the other continued the ſame; for if B E be taken equal to B D, or C A, the conſequence of the angle I B H being leſs than A B C will be, that B H muſt be longer than B C or A D.

The firſt perſon who queſtioned the truth of this explanation of the cauſe of refraction was M. Fermat, who aſſerted, contrary to Deſcartes, that light ſuffers greater reſiſtance in water than in air, and greater in glaſs than in water; and he maintained that the reſiſtance of different mediums, with reſpect to light, is in proportion to their denſities. M. Leibnitz adopted the ſame general idea; and they reaſoned upon the ſubject in the following manner. Nature, they ſay, accompliſhes her ends by the ſhorteſt methods; light, therefore, ought to paſs from one point to another, either by the ſhorteſt road, or that in which the leaſt time is required. But it is plain that the line in which light paſſes, when it falls obliquely upon a denſer medium, is not the moſt direct or the ſhorteſt; ſo that it muſt be that in which the leaſt time is ſpent. And, whereas it is demonſtrable, that light falling obliquely upon a denſer medium (in order to take up the leaſt time poſſible, in paſſing from a point in one medium to a point in the other) muſt be refracted in ſuch a manner, that the ſines of the angles of incidence and refraction muſt be to one another, as the different facilities with which light is tranſmitted in thoſe mediums; it follows that, ſince light approaches the perpendicular when it paſſes obliquely from air into water (ſo that the ſine of the angle of refraction is leſs than that of the angle of incidence), the facility with which water ſuffers light to paſs through it is leſs than that of the air; ſo that the light meets with greater reſiſtance in water than in air. This method of arguing from final cauſes could not ſatisfy philoſophers. Dr. Smith obſerves that it agrees only to the caſe of refraction at a plain ſurface; and that the hypotheſis is altogether arbitrary. If he had endeavoured to accommodate his principle to concave and convex ſurfaces, as he had once propoſed, he would ſoon have perceived its inſufficiency. The eaſieſt way for a ray to paſs from a given point in any reſiſting medium into a vacuum, is in a perpendicular to the refracting ſurface, this being the ſhorteſt way, through any difficulty or reſiſtance whatever; but this being reduced to nothing at the refracting ſurface, it may then take any other courſe in vacuo, without any farther difficulty; and, on the contrary, in returning back from the vacuum into the denſe medium, it muſt take the ſhorteſt courſe through the ſame perpendicular as before. Thus, when the ſun ſhines upon the atmoſphere, all his rays ſhould be refracted into lines tending to the centre of the earth, as being the ſhorteſt and eaſieſt way through the atmoſphere, and then we ſhould ſee the ſun exactly over our heads, in all places and at all times. Such is the ſtrange

conſe-

conſequence that follows from an hypotheſis ſo arbitrary.

Dechales, in order to explain the law of refraction, ſuppoſes that every ray of light is compoſed of ſeveral ſmaller rays, which adhere to one another; and that they are refracted towards the perpendicular, in paſſing into a denſer medium, becauſe one part of the ray meets with more reſiſtance than another part; ſo that the former traverſes a ſmaller ſpace than the latter; in conſequence of which the ray muſt neceſſarily bend a little towards the perpendicular. This hypotheſis was adopted by the famous Dr. Barrow, who, as ſome ſay, was the author of it. On this hypotheſis, it is plain that mediums of a greater refractive power muſt give greater reſiſtance to the paſſage of the rays of light than mediums of a leſs refractive power, which is contrary to fact.

The Bernouillis, both father and ſon, have attempted to explain the cauſe of refraction on mechanical principles; the former on the equilibrium of forces, and the latter on the ſame principles with the ſuppoſition of etherial vortices; but neither of theſe hypotheſes have gained much credit. M. Mairan ſuppoſes a ſubtle fluid, filling the pores of all bodies, and extending, like an atmoſphere, to a ſmall diſtance beyond their ſurfaces; and then he ſuppoſes that the refraction of light is nothing more than a neceſſary and mechanical effect of the incidence of a ſmall body in thoſe circumſtances. There is more, he ſays, of the refracting fluid in water than in air, leſs in water than in glaſs, and in general leſs in a denſe medium than in one that is rarer. M. de Maupertuis ſuppoſes that the courſe which every ray takes, in paſſing from one medium into another, is that which requires the leaſt quantity of action, which depends upon the velocity of the body, and the ſpace it paſſes over; ſo that it is in proportion to the ſum of the ſpaces, multiplied by the velocity with which bodies paſs over them. From this principle he deduces the neceſſity of the ſine of the angle of incidence being in a conſtant proportion to that of refraction: and alſo all the other laws relating to the propagation and reflection of light.

Dr. Smith (in his Optics, Remarks, p. 70.) obſerves, that all other theories for explaining the reflection and refractions of light, except ſir Iſaac Newton's, ſuppoſe that it ſtrikes upon bodies, and is reſiſted by them, which has never been proved by any deduction from experience. On the contrary, it appears by various conſiderations, and might be ſhewn by Mr. Molyneux's and profeſſor Bradley's obſervations on the parallax of the fixed ſtars, that their rays are not at all impelled by the rapid motion of the earth's atmoſphere, nor by the object-glaſs of the teleſcope through which they paſs. And by ſir Iſaac Newton's theory of refraction, which is grounded on experience only, it appears, that light is ſo far from being reſiſted and retarded by refraction into any denſe medium, that it is ſwifter there than in vacuo, in the ratio of the ſine of incidence in vacuo to the ſine of refraction into the denſe medium. From ſome caſes of the production of colours, we are led to ſuppoſe, ſays Dr. Young (Lect. Phil. vol. i. p. 460.) that the velocity of light muſt be ſmaller in a denſer than in a rarer medium; and ſuppoſing this fact to be eſtabliſhed, the exiſtence of ſuch an attractive force as ſir Iſaac Newton ſuggeſts could no longer be allowed; nor, he ſays, could the ſyſtem of the emanation of light, in oppoſition to that of the undulation of an etherial medium, be maintained by any one. Prieſtley's Hiſt. of Light, &c. p. 102, &c. p. 333, &c.

The refraction of light, ſir Iſaac Newton ſhews, is not performed by the very rays falling on the ſurface of bodies; but it is done without any contact, by the action of ſome power belonging to bodies, and extending to a certain diſtance without their ſurfaces; by which ſame power, acting in other circumſtances, they are alſo emitted and reflected.

Admitting that certain powers of attraction and repulſion belong to bodies, and extend to a certain diſtance beyond their ſurfaces, and ſuppoſing alſo that light conſiſts of particles emitted from luminous bodies, ſir Iſaac Newton demonſtrates, in his "Principia," that the ſine of the angle of incidence muſt be always to the ſine of the angle of refraction in ſome certain ratio. For, as he proves geometrically, if two ſimilar mediums be ſeparated from each other by a ſpace terminated on both ſides by parallel planes, and a body, in its paſſage through that ſpace, be attracted or impelled perpendicularly towards either of thoſe mediums, and not agitated or hindered by any other force; and if the attraction be every where the ſame, at equal diſtances from either plane, taken towards the ſame hand of the plane, the ſine of incidence upon either plane will be to the ſine of emergence from the other plane in a given ratio.

In a corollary to this propoſition he alſo ſhews, that if, inſtead of one parallel ſpace, bodies be ſurrounded with ſeveral, or an infinite number of them, the attractive power of each of which differs from the next, increaſing or decreaſing, ſtill, the ratio reſpecting any two contiguous ones being given, the ratio of the extremes will be given. He alſo demonſtrates, that, if the cauſe of refraction be the attraction of the refracting medium, the velocity of light before its incidence will be to its velocity afterwards, as the ſine of the angle of refraction is to the ſine of the angle of incidence; ſo that light, in paſſing from a rarer medium into a denſer, receives an increaſe of velocity. The ſame things being ſuppoſed, he ſhews, that if the velocity before incidence be greater than afterwards, ſo that the angle of emergence muſt always increaſe, in conſequence of the repulſive power prevailing over the attractive one, the body will at length be reflected; and that, in this caſe, the angle of reflection muſt neceſſarily be equal to the angle of incidence.

That light does not conſiſt of any mode of action upon a fluid medium, he concludes from having demonſtrated that preſſure cannot be propagated through a fluid in rectilinear directions, unleſs where the particles of the fluid lie in a right line, but muſt diverge into the unmoved ſpaces; and that every tremulous body, in an elaſtic medium, propagates the motion of the pulſes on every ſide ſtraight forwards. Admitting this, there is hardly any hypotheſis that will agree with the phenomena of light, but that of particles emitted from the luminous body, affected by the attractions and repulſions of other bodies.

The ſame arguments by which we have proved, that *reflection* (which ſee) is performed without immediate contact, will go a great way towards demonſtrating the ſame of refraction: to which may be added the following ones.

1. Becauſe, if when light falls out of glaſs into air with the utmoſt obliquity it will be tranſmitted at, it be then made to fall a little more obliquely, it becomes wholly reflected: for the power of the glaſs, after it has refracted light emerging as obliquely as poſſible, ſuppoſing the rays to fall ſtill more obliquely, will be too ſtrong to let any of the rays paſs; conſequently, inſtead of being refracted, they will all be reflected.

2. Becauſe in thin lamellæ, or plates of glaſs, light is reflected and tranſmitted ſeveral times alternately, as the thickneſs of the lamellæ increaſes in arithmetical progreſſion; for here it depends on the thickneſs of the lamina which of the two the glaſs ſhall do, whether reflect it, or let it be tranſmitted.

3. Becauſe, whereas the power of other bodies both to reflect and refract light are very nearly proportional to their

denſities; yet unctuous and ſulphureous bodies are found to reflect more ſtrongly than according to their mere denſities: for as the rays act more ſtrongly on thoſe bodies to kindle them than on others, ſo do they again, by their mutual attraction, act more ſtrongly on the rays to refract them.

Laſtly; Becauſe not only thoſe rays tranſmitted through glaſs are found to be refracted, but alſo thoſe paſſing in the air, or in a vacuum near its extremities, or even near the extremes of many opaque bodies, *e. gr.* the edge of a knife, undergo a ſimilar inflection, from the attraction of the body. See LIGHT, and alſo INFLECTION.

The manner in which refraction is performed by mere attraction, without contact, may be thus accounted for: ſuppoſe H I (*Plate* XVIII. *Optics*, *fig.* 11.) the boundary of two mediums, N and O; the firſt the rarer, *e. gr.* air; the ſecond the denſer, *e. gr.* glaſs; the attractions of the mediums here will be as their denſities. Suppoſe *p* S to be the diſtance to which the attracting force of the denſer mediums exerts itſelf within the rarer. Let now a ray of light A *a* fall obliquely on the ſurface which ſeparates the mediums, or rather on the ſurface *p* S, where the action of the ſecond and more reſiſting medium commences. All attraction being performed in lines perpendicular to the attractive body, as the ray arrives at *a*, it will begin to be turned out of its rectilinear courſe by a ſuperior force, with which it is attracted by the medium O, more than by the medium N, *i. e.* by a force with which it is driven towards it in a direction perpendicular to its ſurface: hence the ray is bent out of its right line in every point of its paſſage between *p* S and R T, within which diſtance the attraction acts. Between thoſe lines, therefore, it deſcribes a curve *a* B *b*; but beyond R T, being out of the ſphere of attraction of the medium N, it will proceed uniformly in a right line, according to the direction of the curve in the point *b*.

Again, ſuppoſe N the denſer and more reſiſting medium, O the rarer, and H I the boundary, as before; and let R T be the diſtance to which the denſer medium exerts its attractive force within the rarer: even when the ray has paſſed the point B, it will be within the ſphere of ſuperior attraction of the denſer medium; but that attraction acting in lines perpendicular to its ſurface, the ray will be continually drawn from its ſtraight courſe B M perpendicularly towards H I: thus, having two forces or directions, it will have a compound motion, by which, inſtead of B M, it will deſcribe B *m*, which B *m* will in ſtrictneſs be a curve.

Laſtly, after it has arrived in *m*, being out of the influence of the medium N, it will perſiſt uniformly in a right line, in the direction in which the extreme of the curve leaves it.

Thus we ſee how refraction is performed, both *towards the perpendicular*, and *from it*.

But note, the attraction of the denſer medium, *e. gr.* N, is continually diminiſhing, as the ray proceeds from B, towards the limit of attraction R T; becauſe fewer and fewer parts ſtill come to act; at I H, *e. gr.* all the parts between that and *p* S attract; but at R T, none but thoſe in the line H I. Note, alſo, that the diſtance between *p* S and R T being ſmall, when we conſider refractions, no notice is taken of the curve part of the ray, but we conſider it as conſiſting of two ſtraight lines, C B, A B, or *m* B, A B.

Sir Iſaac Newton, not content with aſcribing the reflection, refraction, and inflection of light to powers of attraction and repulſion, extending beyond the ſurfaces of bodies and producing effect in the manner above explained, propoſes a conjecture concerning the phyſical cauſe of this attraction and repulſion; but his hypotheſis is no leſs liable to difficulties and objections than the hypotheſis of the mechanical production of the motion of light without attraction or repulſion. Does not the refraction of light, he ſays, ariſe from the different denſity of an etherial medium in different places, the light always receding from the denſer parts of the medium? And is not the denſity of it greater in free and open ſpaces void of air, and other groſs bodies, than within the pores of water, glaſs, cryſtal, gems, and other compact bodies? For when light paſſes through glaſs or cryſtal, and falling very obliquely upon the farther ſurface, is all reflected, the total reflection ought to ariſe rather from the denſity and vigour of the medium without and beyond the glaſs, than from the rarity and weakneſs of it.—Does not the etherial medium, in paſſing out of water, glaſs, cryſtal, and other compact and denſe bodies, into empty ſpaces, grow denſer and denſer by degrees, and by that means refract the rays of light, not in a point, but by bending them gradually in curve lines? And does not the gradual condenſation of this medium extend to ſome diſtance from the bodies, and thereby cauſe the inflections of the rays of light, which paſs by the edges of the denſe bodies, at ſome diſtance from the bodies?

REFRACTION, in *Dioptrics*, is the inflection or bending of the rays of light, in paſſing the ſurfaces of glaſſes, lenſes, and other tranſparent bodies of different denſities.

Thus a ray, as A B (*Plate* XVIII. *Optics*, *fig.* 11.) falling obliquely from the radiant A, upon a point B, in a diaphanous ſurface, H I, rarer or denſer than the medium along which it was propagated from the radiant; has its direction there altered by the action of the new medium; and inſtead of proceeding to M, it deviates, *e. gr.* to C.

This deviation is called the *refraction of the ray*; B C the *refracted ray*, or *line of refraction*; and B the *point of refraction*.

The line A B is called the *line of incidence*, or *ray of incidence*; and, in reſpect of it, B is alſo called the *point of incidence*.

The plane in which both the incident and refracted rays are found, is called the *plane of refraction*; a right line B E, drawn in the refracting medium perpendicular to the refracting ſurface, in the point of refraction B, is called the *axis of refraction*: and a right line D B, drawn perpendicular to the refracting ſurface, in the point of incidence B, along the medium through which the ray fell, is called the *axis of incidence*.

The angle A B I, included between the incident ray and the refracting ſurface, is called the *angle of incidence*; and the angle A B D, included between the incident ray and the axis of incidence, is called the *angle of inclination*. The angle M B C, which the refracted ray makes with the incident, is called the *angle of refraction*: and the angle C B E, which the refracted ray makes with the axis of refraction, is called the *refracted angle*.

REFRACTION, *general laws of*. 1. *A ray of light in its paſſage out of a rarer into a denſer medium*, e. gr. *out of air into glaſs*, *is refracted towards the perpendicular*, i. e. *towards the axis of refraction*.

Hence, the refracted angle is leſs than the angle of inclination; and the angle of refraction leſs than that of incidence; as they would be equal were the ray to proceed ſtraight from A to M. Hence, alſo, a ray perpendicular to the refracting ſurface, will paſs through without being refracted, as it cannot be refracted to the perpendicular. The phyſical cauſe of which is, that the attraction of the denſer medium, which, in an incidence oblique to its ſurface acts perpendicularly to that ſurface, draws the ray out of its courſe: this attraction, we ſay, in a perpendicular incidence, acts in the direction of the ray.

2. *The ratio of the ſine of the angle of inclination, to the*

fine of the refracted angle, is fixed and conſtant; viz. if the refraction be out of air into glaſs, it is found greater than as 114 to 76, but leſs than 115 to 76; that is, nearly as 3 to 2.

This ratio, aſſigned by Huygens, agrees with another of ſir Iſaac Newton, who makes the ſine of the angle of inclination to the ſine of the refracted angle, as 31 to 20; which is, likewiſe, nearly as 3 to 2. Indeed, there is ſome difference in the quantity of refraction, in different kinds of glaſs; but in phyſical matters, preciſeneſs is not neceſſary. In rain-water, Deſcartes found the ratio of the ſine of the angle of inclination, to the ſine of the refracted angle, as 250 to 187, that is nearly as 4 to 3; which agrees with ſir Iſaac Newton's obſervation, who makes it as 529 to 396. In ſpirit of wine, the ſame great author makes the ratio as 100 to 73; which is not far from the ſeſquitertian ratio. In air he makes it as 3201 to 3200; and as to air, he ſhews, that a ray of light, in traverſing quite through the atmoſphere, is refracted the ſame as it would be, were it to paſs with the ſame obliquity out of a vacuum into air of equal denſity with that in the loweſt part of the atmoſphere.

See the following table, in which the proportion of the ſines which meaſure the refractions of ſeveral bodies; the denſities of the bodies, eſtimated by their ſpecific gravity; and their refractive power, in reſpect of their denſities, are ſet down in ſeparate columns.

The refracting bodies.	The proportion of the ſines of incidence and refraction of yellow light.	The denſity and ſpecific gravity of the body.	The refractive power of the body in reſpect of its denſity.
A pſeudo-topaz, being a natural, pellucid, brittle, hairy ſtone, of a yellow colour	23 to 14	4.27	3979
Air	3201 to 3200	0.0012	5208
Glaſs of antimony	17 to 9	5.28	4864
A ſelenites	61 to 41	2.252	5386
Glaſs vulgar	31 to 20	2.58	5436
Cryſtal of the rock	25 to 16	2.65	5450
Iſland cryſtal	5 to 3	2.72	6536
Sal gemmæ	17 to 11	2.143	6477
Alum	35 to 24	1.714	6570
Borax	22 to 15	1.714	6716
Nitre	32 to 21	1.9	7079
Dantzick vitriol	303 to 200	1.715	7551
Oil of vitriol	10 to 7	1.7	6124
Rain-water	529 to 396	1.	7845
Gum arabic	31 to 21	1.375	8574
Spirit of wine well rectified	100 to 73	0.866	10121
Camphor	3 to 2	0.996	12551
Olive oil	22 to 15	0.913	12607
Linſeed oil	40 to 27	0.932	12819
Spirit of turpentine	25 to 17	0.874	13222
Amber	14 to 9	1.04	13654
A diamond	100 to 41	3.4	14556

Newton's Optics, edit. 3. p. 247.

M. Euler the younger, purſuing a ſcheme ſuggeſted by his father for aſcertaining the refractive powers of tranſparent liquors, made uſe of two Meniſcus glaſſes, which he put together when they were plunged in the fluid, the refractive power of which he wanted to determine; the edges of theſe glaſſes being ground flat, they immediately cohered, ſo that none of the fluid could eſcape; and then they might both together be wiped, and uſed as one object-glaſs in a long tube, which he could lengthen or ſhorten at pleaſure; and applying an eye-glaſs to it, the whole obſervation he had to make was to meaſure the exact length of his tube, when he could ſee through it moſt diſtinctly a turret, which was at a conſiderable diſtance from him. Or, when the focal diſtance was leſs than a foot, he only obſerved, at what diſtance from a wall the image of an oppoſite window was the moſt diſtinct. Ac. Berlin. 1762, p. 302.

The refractive power of the fluids which he examined in this manner, he expreſſed in the following tables.

A ray of light paſſing from air into	The ſine of the angle of incidence will be to that of refraction as
Diſtilled water	1.3358
Rain-water	1.3358
Well-water	1.3366
French wine	1.3453
French brandy	1.3603
Ditto a ſtronger kind	1.3646
Rectified ſpirit of wine	1.3685
Ditto more highly rectified	1.3706
The white of an egg	1.3685
Diſtilled vinegar	1.3442
A ſolution of gum arabic	1.3467
A ſolution of two ſcruples of white ſugar in an ounce of water	1.3457
A ſolution of two ſcruples of rock-ſalt, in ditto	1.3477
A ſolution of two ſcruples of ſalt of urine, in ditto	1.3400
Oil of Provence	1.4651
Oil of turpentine	1.4822

To unity.

N. B. The rock-ſalt and the ſalt of urine were purified by a double cryſtallization.

By a ſecond pair of Meniſcuſes.	The ſine of the angle of incidence will be to that of refraction as
Diſtilled water	1.3358
Rain-water	1.3358
Well-water	1.3362
French wine	1.3458
French brandy	1.3600
Ditto a ſtronger kind	1.3618
Spirit of wine rectified	1.3683
Ditto more highly rectified	1.3705
Tea	1.3376
Mineral alkali ſaturated (I ſuppoſe with water)	1.3600
Spirit of nitre	1.4025
A ſolution of two ſcruples of Glauber's ſalt in an ounce of water	1.3430
A ſolution of two ſcruples of digeſtive ſalt of Sylvius in ditto	1.3454
A ſolution of two ſcruples of ſal ammoniac in ditto	1.3488
A ſolution of two ſcruples of copperas in ditto	1.3395
Oil of tartar per deliquium	1.3917
Oil of Provence	1.4648
Oil of turpentine	1.4822

To unity.

The refractive power of ſome other fluids found by the ſecond pair of Meniſcuſes, 18th Auguſt, 1761, Reaumur's thermometer being 31 *degrees above the freezing point.*

A ray of light paſſing from air into	The ſine of the angle of incidence will be to that of refraction as	
Well-water	1.3351	
Four different ſolutions of nitre, *viz.*		
Twelve grains of depurated nitre to an ounce of water	1.3380	
Twenty-four grains of depurated nitre to an ounce of water	1.3398	
Thirty-eight grains of depurated nitre to an ounce of water	1.3450	
Thirty-eight grains of depurated nitre to two ounces of water	1.3540	
Four different infuſions		To unity.
of parſley	1.3355	
of nutſhells	1.3359	
of ſaffron	1.3363	
of fiſh-ſcales	1.3353	
of Zeltzer water	1.3353	
of Eger water	1.3358	
Anodyne liquor	1.3650	
Spirit of camphor	1.3757	
Spirit of Saxon ſope	1.4088	

That the refractive power of theſe fluids, thus determined by M. Euler, may be more eaſily compared with Mr. Hauſkbee's and ſir Iſaac Newton's experiments, he reduced the reſult of their obſervations into the following tables, exactly ſimilar to his own.

The refractive power of certain fluids found by Mr. Haukſbee, ſee his Experiments, p. 292.

A ray of light paſſing from air into	The ſine of the angle of incidence will be to that of refraction as	
Water	1.3359	
Spirit of honey	1.3359	
Spirit of ſal ammoniac	1.3377	
Oil of amber	1.3377	
Spirit of hartſhorn	1.3390	
Human urine	1.3419	
White of an egg	1.3511	
Jelly of hartſhorn	1.3541	
French brandy	1.3626	
Spirit of wine	1.3721	
Diſtilled vinegar	1.3721	
Gum ammoniac	1.3723	
Aqua regia	1.3898	
Ditto from aqua fortis and ſal ammoniac	1.3964	To unity.
Aqua fortis	1.4044	
Spirit of nitre	1.4076	
The cryſtalline humour of an ox's eye	1.4635	
Butter of antimony	1.6831	
Oil of vitriol	1.4262	
Oil of wax	1.4524	
Oil of lavender	1.4960	
Oil of roſemary	1.4719	
Oil of origanum	1.4770	
Oil of ginger	1.4799	
Oil of oranges	1.4833	
Oil of turpentine	1.4833	
Oil of ſavine	1.4857	

	The ſine of the angle of incidence will be to that of refraction as	
Oil of flowers of muſk	1.4878	
Oil of mint	1.4911	
Oil of amber	1.5010	
Oil of cummin	1.5088	
Oil of fennel	1.5114	To unity.
Oil of cloves	1.5136	
Oil of aniſe	1.5191	
Oil of cinnamon	1.5340	
Oil of ſaſſafras	1.5443	

The refractive powers of ſome tranſparent liquors according to the obſervations of ſir Iſaac Newton. See Optics, p. 247.

A ray of light paſſing from air into	The ſine of the angle of incidence will be to that of refraction as	
A yellow pſeudo-topaz	1.6429	
Air	0.9997	
Glaſs of antimony	1.8889	
A ſelenites	1.4878	
Glaſs	1.5500	
Cryſtal of the rock	1.5620	
Iſland cryſtal	1.6666	
Sal gem	1.5455	
Alum	1.4577	
Borax	1.4667	
Nitre	1.5238	
Dantzick vitriol	1.5000	To unity.
Oil of vitriol	1.4285	
Rain-water	1.3358	
Gum arabic	1.4771	
Spirit of wine well rectified	1.3698	
Camphor	1.5000	
Olive oil	1.4666	
Linſeed oil	1.4814	
Spirit of turpentine	1.5625	
Amber	1.5556	
A diamond	2.4390	

See Prieſtley's Hiſt. of Light, &c. p. 479, &c.

Whence the different refractive power in different fluids ariſes, is not determined. Sir Iſaac Newton ſhews, that in many bodies, *e. gr.* glaſs cryſtal, a ſelenites, pſeudo-topaz, &c. the refractive power is proportionable to their denſities; only in ſulphureous bodies, as camphor, linſeed oil, olive, amber, ſpirit of turpentine &c. the power is two or three times greater than in other bodies of equal denſity; yet even theſe have the refractive power with reſpect to each other nearly as their denſities.

Water has a refractive power in a middle degree between thoſe two kinds of ſubſtances, and is, probably, of a middle nature. Salts and vitriols have refractive powers in a middle degree between thoſe of earthy ſubſtances and water, and accordingly are compoſed of thoſe two ſorts of ſubſtances. Spirit of wine has a refractive power in a middle degree between thoſe of water and oily ſubſtances; and accordingly ſeems to be compoſed of both, united by fermentation. It appears, therefore, that all bodies ſeem to have their refractive powers proportional to their denſities, or very nearly, excepting ſo far as they partake of more or leſs ſulphureous oily particles, and thereby have their refractive powers made greater or leſs. Whence it ſeems reaſonable to attribute the refractive power of all bodies

bodies chiefly, if not wholly, to the ſulphureous parts with which they abound.

From the obſervations of M. Euler it appears, that there is no fluid, and probably no tranſparent ſubſtance of any kind, the refractive power of which is leſs than that of rain-water, or diſtilled water; and betwixt air and rain-water there is no ſubſtance that has an intermediate refractive power.

After rain-water immediately follows well-water; but there are probably as many varieties in its refractive power as there are different wells. We may, however, conclude, that the ratio of refraction from air into well-water is contained between the limits of 1.336 to 1, and 1.337 to 1.

Spirituous liquors have a greater refractive power in proportion to their ſtrength: but the ratio of refraction from air into any ſpirituous liquor is never leſs than 1.34, nor greater than 1.37.

There is, probably, no kind of ſalt, but what, being diſſolved in water, increaſes its refractive power.

The ſolutions of ſalt of urine and of vitriol have the leaſt refractive powers, and thoſe of rock-ſalt and ſal ammoniac the greateſt; but the ratio of refraction from air into any ſaline ſolution, preſerving the proportion of one ounce of ſalt to twelve of water, will be contained between the limits of 1.34 to 1, and 1.35 to 1.

Diſtilled vinegar, and the ſolution of gum arabic, have nearly the ſame refractive power with common French wine; and the refractive power of white of egg is the ſame as that of rectified ſpirit of wine.

Mineral alkali ſaturated, ſeems to have the ſame refractive power with very ſtrong brandy.

Spirit of nitre and oil of tartar per deliquium have a medium refractive power between ſpirituous liquors and oils.

The refractive powers of oils approach the neareſt to that of glaſs, eſpecially oil of turpentine, which had the greateſt refractive power of all the fluids on which he had made experiments.

Sir Iſaac Newton ſuſpected that different *degrees of heat* might have ſome effect on the refractive power of bodies, but his method of determining the general refraction was not ſufficiently accurate to aſcertain this circumſtance; but happily this method of M. Euler's proved to be well adapted to this purpoſe.

From his experiments made for this purpoſe, he infers, that the focal diſtance of a ſingle lens of glaſs diminiſhes with the heat communicated to it; and this diminution of the focal diſtance is not owing to the increaſe of bulk in the glaſs by heat; for the effect of this change is both inconſiderable, and of a contrary nature. There can be no doubt, therefore, but that this alteration in the focal diſtance is owing to a change in the refractive power of the glaſs itſelf, which, as well as, probably, that of all other tranſparent ſubſtances, is increaſed by heat, and diminiſhed by cold.

It may ſeem ſurpriſing that the focal diſtance of a ſingle lens ſhould decreaſe with heat, and yet that of the meniſcuſes filled with any fluid, ſhould increaſe with heat; but M. Euler obſerves, that it by no means follows from hence, that theſe fluids are affected by heat in a manner different from glaſs; and, after computing the effect of every circumſtance of this complex experiment, of the two glaſſes, and the fluid combined, he concludes, that heat increaſes the refractive power of water, and of other fluids, as well as that of glaſs.

He farther obſerves, that as 66 degrees of heat diminiſhed the focal diſtance $\frac{1}{60}$th part, 33 degrees ought to have diminiſhed it $\frac{1}{120}$th part; whereas the diminution in this caſe was $\frac{1}{97}$th. From hence, ſays he, one may perhaps conclude, that when it is very cold, the ſame change in the thermometer has a greater effect on the refractive power of the glaſs than when it is very hot. But he acknowledges that experiments of this kind are not capable of ſo much preciſion as one could wiſh, and that, perhaps in reality, the 66 degrees made a change of $\frac{1}{70}$th, and the 33 degrees of $\frac{1}{120}$th; but he imagined that a great number of experiments, made in different temperatures of the air, might decide this queſtion, eſpecially if object-glaſſes of a very great focal diſtance were made uſe of. Ac. Berl. 1762.

The duke de Chaulnes, not ſatisfied with the methods uſed by Newton and others for determining the refractive power of glaſs, propoſed another mode of doing it, which is very ingenious, and, when well conducted, promiſing ſucceſs. He formed the glaſs into plates, the ſurfaces of which were truly plane and parallel, and having placed ſmall objects on each of them, he found, by means of a compound microſcope, to which he applied the moſt exquiſite micrometer, the different diſtances at which they were diſtinctly viſible, and compared them with the thickneſs of the glaſs. This, he ſays, gives the proportion of the ſines of the angles of incidence and refraction in that kind of glaſs directly. In this method he aſcertained the mean refractive power of 15 kinds of glaſs. Ac. Par. 1767. See Prieſtley's Hiſt. of Light, &c. p. 483, &c.

Dr. W. H. Wollaſton has propoſed a new method of examining refractive as well as diſperſive powers, by priſmatic reflection. This method was ſuggeſted by a conſideration of ſir Iſaac Newton's priſmatic eye-glaſs, the principle of which depends on the reflection of light at the inner ſurface of a denſe refracting medium.

Since the range of inclination, within which total reflection takes place, depends not only on the denſity of the reflecting priſm, but alſo on the rarity of the medium adjacent to it, the extent of that range varies with the difference of the denſities of the two media. When, therefore, the refractive power of one medium is known, that of any rarer medium may be learned, by examining at what angle a ray of light will be reflected from it.

For inſtance, when any object is laid under a priſm of flint-glaſs, with air alone interpoſed, the internal angle of incidence at which the viſual ray begins to be totally reflected, and at which the object ceaſes to be ſeen by refraction, is about 39° 10′; but when the object has been dipped in water, and brought into contact with the glaſs, it continues viſible, by means of the higher refractive power of the water, as far as 57½° of incidence. When any kind of oil, or any reſinous cement, is interpoſed, this angle is ſtill greater, according to the refractive power of the medium employed; and, by cements that refract more ſtrongly than the glaſs, the object may be ſeen through the priſm, at whatever angle of incidence it is viewed.

In examining the refractive powers of fluids, or of fuſible ſubſtances, the requiſite contact is eaſily obtained; but, with ſolids, which can in few inſtances be made to touch to any great extent, this cannot be effected without the interpoſition of ſome fluid, or cement, of higher refractive power than the medium under examination. Since the ſurfaces of a ſtratum ſo interpoſed are parallel, it will not effect the total deviation of a ray paſſing through it, and may therefore be employed without riſk of any error in conſequence.

Thus, reſin, or oil of ſaſſafras, interpoſed between plate-glaſs and any other priſm, will not alter the reſult.

If, on the ſame priſm, a piece of ſelenite and another of plate-glaſs be cemented near each other, their powers may

be compared with the ſame accuracy as if they were both in abſolute contact with it.

For ſuch a mere compariſon of any two bodies, a common triangular priſm is beſt adapted; but, for the purpoſe of actual meaſurement of refractive powers, Dr. Wollaſton has preferred the uſe of a ſquare priſm, becauſe, with a very ſimple apparatus, it ſhews the ſine of refractive power ſought, without the need of any calculation.

Let A (*Plate* XVIII. *Optics*, *fig.* 12.) be a ſquare or rectangular priſm, to which any ſubſtance is applied at *b*, and let any ray of light parallel to *c b* be refracted through the priſm, in the direction *b d e*.

Then, if *e f* and *e d* be taken proportional to the ſines that repreſent the refractive powers of the priſm and of air, *f g*, which is intercepted between *f* and the perpendicular *e g*, will be the correſponding ſine to repreſent the refractive power of the medium *b*. For ſince *e d g* (oppoſite to *e f*) is the angle of refraction, *e f g* (oppoſite to *e d*) muſt be equal to the angle of incidence *b d h*; and *e f* : *f g* :: *b d* : *d h* :: ſine of *c b i* : ſine of *h b d*.

All, therefore, that is requiſite for determining the refractive power of *b*, is to find the means of meaſuring the line *f g*. On this principle, the inſtrument in *fig.* 13 is conſtructed. On a board, *a b*, is fixed a piece of flat deal *c d*, to which, by a hinge at *d*, is jointed a ſecond piece *d e*, 10 inches long, carrying two plane ſights at its extremities. At *e* is a ſecond hinge, connecting *e f*, 15.83 inches long; and a third at the other extremity of *e f*, by which *f g* is connected with it. At *i* alſo is a hinge, uniting the radius *i g* to the middle of *e f*; and then, ſince *g* moves in a ſemicircle *e g f*, a line joining *e* and *g* would be perpendicular to *f g*.

The piece *c d* has a cavity in the middle of it, ſo that, when any ſubſtance is applied to the middle of the priſm P, it may continue to reſt horizontally on its extremities. When *e d* has been ſo elevated, that the yellow rays in the fringe of colours (obſervable where perfect reflection terminates) are ſeen through the ſights, the point *g*, by means of a vernier which it carries, ſhews by inſpection the length of the ſign of refraction ſought.

The advantages which this method poſſeſſes above the uſual mode of examining refractive powers, are greater than they may at firſt ſight appear. The uſual practice has been, to form two ſurfaces of the ſubſtance under examination, ſo inclined to each other that the deviation occaſioned by them might be meaſured. The inclination of theſe ſurfaces to each other muſt alſo be known; and thence the refractive power might be computed. But, in the method here propoſed, it is ſufficient to have only one ſurface, and the reſult is obtained at once, without computation.

The facility of determining refractive powers is conſequently ſuch as to render this property of bodies a very convenient teſt in many philoſophical inquiries.

The following table exhibits a ſeries of ſubſtances, arranged according to their refractive powers.

Diamond	2.44
Plumbago	——
Native ſulphur (double)	2.04
Glaſs, conſiſting of lead 6 and ſand 1	1.987
Glaſs of antimony	1.98
Jargon	1.95
Spinelle ruby	1.812
Arſenic	1.811
Muriate of antimony, variable.	
White ſapphire	1.768
Gum dragon	——
Iceland ſpar, ſtrongeſt	1.657
Sulphate of barytes (double)	1.646
Balſam of Tolu	1.60
Guaiacum	1.596
Benzoin	——
Flint glaſs	1.586
Ditto	1.583
Horn	——
Phoſphorus	1.579
Mica	——
Opium	——
Amber	1.547
Rock cryſtal (double)	1.547
Old plate-glaſs	1.545
Colophony	1.543
Box-wood	——
Bees-wax	1.542
Oil of ſaſſafras	1.536
Red ſealing-wax	——
Spermaceti, cold	——
Sugar, after fuſion	——
Arſeniate of potaſh	——
Maſtic	——
Elemi	——
White wax (cold)	——
Oil of cloves	1.535
Copal	1.535
Anime	1.535
Radcliffe crown-glaſs	1.533
Pitch	——
Centre of cryſtalline of fiſh, and dry cryſtalline of an ox	1.530
Canada balſam	1.528
Crown glaſs, common	1.525
Selenite	1.525
Caoutchouc	1.524
Gum lac	——
Dutch plate-glaſs	1.517
Human cuticle	——
Gum arabic	1.514
Balſam of capivi	1.507
Oil of amber	1.505
Engliſh plate-glaſs	1.504
French plate-glaſs	1.500
Oil of nutmeg	1.497
Sulphate of potaſh	1.495
Tallow, cold	1.49
Iceland ſpar, weakeſt	1.488
Camphor	1.487
Linſeed oil	1.485
Butter, cold	1.480
Eſſence of lemon	1.476
Oil of turpentine, common	1.476
Oil of turpentine, rectified	1.470
Oil of almonds	——
Oil of olives	1.469
Oil of peppermint	1.468
Oil of lavender	1.467
Tallow, melted	1.460
Alum	1.457
Spermaceti, melted	1.446
Cryſtalline lens of an ox	1.447
to	1.380
Computed average of ditto	1.430
Sulphuric acid	1.435
Fluor ſpar	1.433
Nitric acid (ſp. gr. 1.48)	1.410

Alcohol

Alcohol	1.37
White of an egg	1.36
Æther	1.358
Vitreous humour of an eye	1.336
Water	1.336
Atmospheric air (Hauksbee)	1.00032

See Phil. Trans. vol. xcii. for 1802. art. 12. See DISPERSION *of Light*.

From the law laid down in the beginning of this article, it follows, that one angle of inclination, and its corresponding refracted angle, being found by observation, the refracted angles, corresponding to the several other angles of inclination, are easily computed. Now, Zahnius and Kircher have found, that if the angle of inclination be 70°, the refracted angle will be 38° 50′; on which principle Zahnius has constructed a table of refractions out of air into glass, for the several degrees of the angle of inclination; a specimen of which follows:

Angle of Inclination.	Refracted Angle.			Angle of Refraction.		
°	°	′	″	°	′	″
1	0	40	5	0	19	55
2	1	20	6	0	39	54
3	2	0	3	0	59	56
4	2	40	5	1	19	55
5	3	20	3	1	39	57
10	6	39	16	3	20	44
20	13	11	35	6	48	25
30	19	29	29	10	30	31
45	28	9	19	16	50	41
90	41	51	40	48	8	20

Hence it appears, that if the angle of inclination be less than 20°, the angle of refraction out of air into glass is almost one-third of the angle of inclination; and, therefore, a ray is refracted to the axis of refraction, by almost a third part of the quantity of its angle of inclination. And on this principle it is that Kepler, and most other dioptrical writers, demonstrate the refractions in glasses; though in estimating the law of these refractions, he followed the example of Alhazen and Vitellio, and sought to discover it in the proportion of the angles, and not in that of the sines.

The true law of refraction was first discovered by Willebrord Snellius, professor of mathematics at Leyden; who found by experiment that the secants of the complements, or co-secants, of the angles of incidence and refraction, are always in the same ratio. It is vulgarly attributed, however, to Descartes; who having seen it in Snellius's MS., first published it in his Dioptrics, without naming Snellius; as we are informed by Huygens. The form in which Descartes gives this law is different from that of Snellius, and in general more commodious; but it might have been easily deduced from it. According to him, the sine of the angle of refraction always bears the same proportion to the sine of the angle of incidence. Indeed, as the rays of light are not all of the same degree of refrangibility, this constant ratio must be different in different kinds. The ratio, therefore, observed by authors, is to be understood of rays of the mean refrangibility, *i. e.* of green rays. The difference of refraction between the least and most refrangible rays, that is, between violet and red rays, sir Isaac Newton shews is about the $27\frac{1}{2}$th part of the whole refraction of the mean refrangible; which difference he owns is so small, that there seldom needs to be any regard paid to it.

3. *When a ray passes out of a denser into a rarer medium, e. gr. out of glass into air, it is refracted from the perpendicular, or from the axis of refraction.* And hence the angle of refraction is greater than the angle of inclination.

Hence, also, if the angle of inclination be less than 30°, M B C (*Plate* XVIII. *Optics, fig.* 11.) is nearly equal to one-third of M B E; therefore M B C is one-half of C B E; consequently, if the refraction be out of glass into air, and the angle of inclination less than 30°, the ray is refracted from the axis of refraction by almost one-half part of the angle of inclination. And this is the other dioptrical principle used by most authors after Kepler, to demonstrate the refraction of glasses.

If the refraction be out of air into glass, the ratio of the sine of inclination to the sine of the refracted angle is as 3 to 2, or, more accurately, as 17 to 11; if out of air into water, as 4 to 3: therefore, if the refraction be the contrary way, *viz.* out of glass or water into air, the ratio of the sines, in the former case, will be as 2 to 3, or 11 to 17, and in the latter as 3 to 4.

Hence, if the refraction be from water or glass into air, and the angle of incidence or inclination be greater than about $48\frac{1}{2}$° in water, or greater than about 40° in glass, the ray will not be refracted into air, but will be reflected into a line, which makes the angle of reflection equal to the angle of incidence; because the sines of $48\frac{1}{2}$° and 40° are to the radius as 3 to 4, and as 11 to 17 nearly, and therefore when the sine has a greater proportion to the radius than as above, the ray will not be refracted.

4. *A ray falling on a curve surface, whether concave or convex, is refracted after the same manner as if it fell on a plane which is a tangent to the curve in the point of incidence.*

For the curve and plane surface touching it, have an infinitely small part common to them both (each being originally generated by the flux of a point). But a ray is refracted in such a little part; therefore it is the same as if it were refracted in such a plane.

5. *If a right line* E F (*Plate* XVIII. *Optics, fig.* 14.) *cut a refracting surface,* G H, *at right angles; and if, from any point in the denser medium, as* D, *be drawn* D C *parallel to the incident ray* A B: *this will meet the refracted ray in* C; *and will be to it as the sine of the refracted angle to the sine of the angle of inclination.*

For $o = x$; but if B C pass out of a denser medium into a rarer, $y > x$; and out of a rarer into a denser, $y < x$; therefore, in the former case, $y > o$, in the latter $y < o$; consequently, in the former, $o + u < y + u$; in the latter $y + u < o + u$. But in the one case $o + u$, and in the other $y + u$, are equal to two right angles; therefore, $o + u$ in this, and $y + u$ in the other, are less than two right angles, and consequently D C will meet B C. But since $o = x$, or the angle of inclination, and y is the refracted angle, it is evident that C B is to C D as the sine of the angle o to the sine of the angle y, or in the ratio of the sine of the angle of inclination to the sine of the refracted angle.

Hence, if B C pass out of glass into air, it is in a subsesquialterate ratio to C D; if, on the other hand, it passes out of air into glass, it is in a sesquialterate ratio to C D.

Hence, also, if light pass out of water into air, C B is in a subsesquitertian ratio to C D; if out of air into water, in a sesquitertian. See *figs.* 14 and 15.

REFRACTION *in plane surfaces, laws of.* 1. If parallel rays be refracted out of one transparent medium into another of a dif-

a different denſity, they will continue parallel after refraction. The phyſical reaſon is, that, being parallel, their obliquity, or angle of incidence, is the ſame; but, at equal obliquities, we have ſhewn the refraction is equal; conſequently the parallelifm, which they had before the refraction, will be retained after it.

But this may be alſo demonſtrated geometrically: thus, if the rays be perpendicular to the refracting ſurface, they will paſs without any refraction; conſequently being parallel before their paſſage, they will be ſo after it. If they fall obliquely, as A B and C D (*fig.* 16.), the angles of incidence *o* and *u*, and, conſequently, alſo the angles of inclination *x* and *y*, will be equal. But the ſines of the angles of inclination *x* and *y* have the ſame ratio to the ſines of the refracted angles *m* and *n*; therefore the refracted angles *m* and *n*, and alſo the angles *s* and *r*, are equal; conſequently the refracted rays are parallel.

Hence a glaſs, plane on both ſide, being turned directly to the ſun, the light paſſing through it will be propagated after the ſame manner as if the glaſs were away; for the rays being perpendicular, will paſs without refraction. If the glaſs be turned obliquely to the ſun, the light, after refraction, will be of the ſame intenſity as before, the intenſity depending on the ſpiſſitude or cloſeneſs of the rays, and on the angle with which they ſtrike the object, or the eye; both which are here unvaried.

2. If two rays D C and C P (*fig.* 17.) proceeding from the ſame radiant C, and falling on a plane ſurface of a different denſity, ſo that the points of refraction D and P are equally diſtant from the cathetus of incidence G K, the refracted rays D F and P Q have the ſame virtual focus, or the ſame point of diſperſion G.

Hence, 1. Since, in rays very near each other, the diſtance from the cathetus is the ſame as to ſenſe, very near rays will diverge from the ſame point G, *i. e.* they will have the ſame virtual focus G.

And hence, 2. When refracted rays, falling on the eye placed out of the cathetus of incidence, are either equally diſtant from the cathetus, or very near each other, they will flow upon the eye, as if they came to it from the point G; conſequently the point C will be ſeen by the refracted rays as in G.

3. If a ray C D fall obliquely out of a thinner into a denſer medium, having a plane ſurface, the diſtance of the radiant point C K will have a leſs ratio to the diſtance of the point of diſperſion, or virtual focus, K G, than the ſine of the refracted angle to the ſine of the angle of inclination. But if the diſtance of the point of refraction, from the cathetus of incidence K D, be leſs than the eleventh or nineteenth part of the diſtance of the radiant point C K; and if in the former caſe the tenth, and in the latter the hundredth, part of it be ſo ſmall, that it cannot be aſſigned, or need not be minded, then will C K be to K G, as to ſenſe, in the ratio of the ſine of the refracted angle, to the ſine of the angle of inclination.

Hence, 1. If the refraction be out of air into glaſs, the diſtance of the point of diſperſion of rays near the cathetus is ſeſquialterate of the radiant point; of more remote rays greater than ſeſquialterate. But if the refraction be out of air into water, the diſtance of the ſame point will be ſeſquitertian, when the rays are near the cathetus; and when more remote, greater than ſeſquitertian.

Hence, 2. If the eye be placed in a denſe medium, objects in a rarer will appear more remote than they are; and the place of the image, in any given caſe, may be determined from the ratio of the refraction. *Thus, to fiſhes ſwimming under water, objects out of the water muſt appear farther diſtant than in reality they are.*

4. If a ray D G fall obliquely out of a denſer into a rarer medium A B, the diſtance of the radiant point G K has a greater ratio to the diſtance of the point of diſperſion K C, than the ſine of the refracted angle has to the ſine of the angle of inclination. In the other caſe of the preceding theorem, K G will be to K C, as to ſenſe, in the ratio of the ſine of the refracted angle, to the ſine of the angle of inclination.

Hence, 1. If the refraction be out of glaſs into air, the diſtance of the point of diſperſion of the rays near the cathetus of incidence is ſubſeſquialterate of the diſtance of the radiant point; that of the more remote rays is leſs than ſubſeſquialterate.

But, 2. If the refraction be out of water into air, the diſtance of the point of diſperſion of rays near the cathetus is ſubſeſquitertian; of thoſe more remote, leſs than ſubſeſquitertian.

And, 3. The eye, therefore, being placed in a rarer medium, objects, placed in a denſer, appear nearer than they are; and the place of the image may be determined in any given caſe by the ratio of refraction. Hence, the bottom of a veſſel full of water is raiſed by refraction to a third part of its height, with reſpect to an eye perpendicularly over the refracting ſurface; and hence *fiſhes, and other bodies under water, appear nearer than they really are.*

5. If the eye be placed in a rarer medium, an object ſeen in a denſer medium, by a ray refracted in a plane ſurface, will appear larger than it really is. If the object be in a rarer, and the eye in a denſer medium, the object will appear leſs than it is. And, in each caſe, the apparent magnitude is to the real one in a ratio compounded of the diſtance of the point to which the rays tend before refraction, from the refracting ſurface D E (*fig.* 18.) to the diſtance of the eye G L from the ſame, and of the diſtance G M of the object A B from the eye, to its diſtance F M from a point F, to which the rays tend before refraction.

Hence, 1. If the object A B be very remote, F M will be phyſically equal to G M; and, therefore, the real magnitude M B is to its apparent one M H, as G L to F L, or the diſtance of the eye G from the refracting plane to the diſtance of the point of convergence F from the ſame plane.

Hence, 2. *Objects under water, to an eye in the air, appear larger than they are; and to fiſhes under water, objects in the air appear leſs than they are.*

REFRACTION, *Laws of, in ſpherical ſurfaces, both concave and convex.* 1. A ray of light D E (*fig.* 19.) parallel to the axis of a denſer ſphere, after a ſingle refraction in E, falls in with the axis in the point F, beyond the centre C.

For the ſemidiameter C E, drawn to the point of refraction E, is perpendicular to the ſurface K L, and is therefore the axis of refraction; but a ray out of a rarer into a denſer medium, we have ſhewn, is refracted towards the perpendicular, or the axis of refraction; therefore the ray D E will converge to the axis of the ſphere A F; and will, therefore, at length concur with it, and that beyond the centre C, in F; becauſe the angle of refraction F E H is leſs than the angle of inclination C E H.

2. If a ray D E fall on a ſpherically convex ſurface of a denſer medium, parallel to its axis A F; the ſemidiameter C E will be to the refracted ray E F in the ratio of the ſine of the angle of refraction, to the ſine of the angle of inclination; but the diſtance of the focus, or point of concurrence from the centre C F, is to the refracted ray F E, in the

ratio

ratio of the fine of the refracted angle, to the fine of the angle of inclination.

3. If a ray D E fall on a denſer ſpherical convex ſurface K L, parallel to the axis A F, the diſtance of the focus from the refracting ſurface F B muſt be to its diſtance from the centre F C, in a ratio greater than that of the fine of the angle of inclination, to the fine of the refracted angle. But if the rays be very near the axis, and the angle of inclination B C E be only of a few degrees, the diſtances of the focus from the ſurface, and the centre, F B and F C, will be nearly in the ratio of the fine of the angle of inclination, to the fine of the refracted angle.

Hence, 1. If the refraction be out of air into glaſs; in the caſe of rays near the axis, B F : F C :: 3 : 2. And in the caſe of rays remote from the axis, B F : F C > 3 : 2. Conſequently, in the former caſe, B C : B F :: 1 : 3; and in the latter, B C : B F < 1 : 3.

And, 2. If the refraction be out of air into water; in the former caſe, B F : F C :: 4 : 3; and in the latter, B F : F C > 4 : 3. Conſequently, in the former, B C : B F :: 1 : 4; and in the latter, B C : B F < 1 : 4.

Hence, 3. Since the ſun's rays are parallel as to ſenſe, if they fall on the ſurface of a ſolid glaſs ſphere, or of a ſphere full of water, they will not concur with the axis within the ſphere; ſo that Vitellio was miſtaken, when he imagined, that the ſun's rays, falling on the ſurface of a cryſtalline ſphere, were refracted to the centre.

4. If a ray D E (*fig.* 20.), parallel to the axis F A, fall out of a denſer into a rarer ſpherical medium, after refraction, it will diverge from the axis; and the diſtance of the point of diſperſion, or the virtual focus from the centre of the ſphere F C, will be to its ſemi-diameter C E in the ratio of the fine of the refracted angle, to the fine of the angle of refraction; but to the portion of the refracted ray drawn back, F E, it will be in the ratio of the fine of the refracted angle, to the fine of the angle of inclination.

5. If a ray E D fall parallel to the axis A F on the ſpherically convex ſurface K L of a rarer medium, out of a denſer, the diſtance of the point of diſperſion from the centre F C, is to its diſtance from the ſurface F B, in a ratio greater than that of the fine of the refracted angle to the fine of the angle of inclination. But if the rays D E be very near the axis F A, the ratio will be very nearly the ſame with that of the fine of the refracted angle to the fine of the angle of inclination.

Hence, 1. If the refraction be out of glaſs into air, in the caſe of rays near the axis, F C : F B :: 3 : 2. Conſequently B C : F B :: 1 : 2. Therefore, in the caſe of rays more remote from the axis, F C : F B > 3 : 2.

2. If the refraction be out of water into air; in the former caſe F C : F B :: 4 : 3. Conſequently, B C : F B :: 1 : 3; in the latter caſe therefore, F C : F B > 4 : 3.

3. Since then the point of diſperſion F is more remote from the refracting ſurface K L, if the rays proceed out of water, than if they paſs out of glaſs into air; parallel rays are leſs diſperſed in the former caſe than in the latter.

6. If a ray H E (*fig.* 19.) fall parallel to the axis F A, out of a rarer, on the ſurface of a ſpherically concave denſer medium; the refracted ray E N will be driven from the point of the axis F; ſo that F E will be to F C in the ratio of the fine of the angle of inclination, to the fine of the refracted angle.

7. If a ray E H fall parallel to the axis F B on the concave ſurface K L of a ſpherical denſer medium, from a rarer; the diſtance of the point of diſperſion from the refracting ſurface F B, is to its diſtance from the centre F C, in a ratio greater than that of the fine of the angle of inclination, to the fine of the refracted angle. But if the rays be very near the axis, and the angle B C E be very ſmall, B F will be to C F very nearly in the ratio of the fine of the angle of inclination, to the fine of the refracted angle.

Hence, 1. If the refraction be out of air into glaſs; in the caſe of rays near the axis, F B : F C :: 3 : 2; in the caſe of rays more remote from the axis, F B : F C > 3 : 2; conſequently, in the former, B C : F C :: 1 : 2. And hence, in the latter, B C : F C < 1 : 2.

Hence alſo, 2. If the refraction be out of air into water; in the caſe of rays near the axis, F B : F C :: 4 : 3. In the caſe of rays more remote from the axis, F B : F C > 4 : 3; conſequently, in the firſt caſe, B C : F C :: 1 : 3. And hence, in the latter, B C : F C > 1 : 3.

And hence, 3. Since the point of diſperſion F is farther from the centre C, if the refraction be in water than in air; rays will be leſs diſperſed in the latter caſe than in the former.

8. If the ray H E (*fig.* 20.) fall parallel to the axis A F, from a denſer upon the ſurface of a ſpherical concave rarer medium, the refracted ray will concur with the axis A F, in the point F; ſo that the diſtance of the point of concourſe from the centre C F, may be to the refracted ray F E, in the ratio of the fine of the refracted angle, to the fine of the angle of inclination.

9. If a ray H E fall parallel to the axis A F on the concave ſurface of a rarer medium out of a denſer, the diſtance of the focus from the centre F C will be to its diſtance from the refracting ſurface F B in a greater proportion than the fine of the refracted angle, to the fine of the angle of inclination. But if the rays be very near the axis, F C will be to F B in the proportion of theſe fines.

Hence, 1. If the refraction be out of glaſs into air; in the caſe of rays near the axis, F C : F B :: 3 : 2; in the caſe of rays more remote from the axis, F C : F B > 3 : 2. Whence, in the former caſe, B C : F B :: 1 : 2.

2. If the refraction be out of water into air; in the caſe of rays near the axis, F C : F B :: 4 : 3; in the caſe of rays more remote, F C : F B > 4 : 3. Whence, in the former caſe, B C : F B :: 1 : 3. For the demonſtration of theſe ſeveral laws of refraction, we refer to Wolfius's Elem. Matheſ. &c. tom. iii. p. 179, &c. See alſo LENS.

REFRACTION *in a glaſs priſm.* If a ray of light D E (*fig.* 21.) fall obliquely out of air on a priſm A B C; being refracted towards the perpendicular, inſtead of proceeding to F, it will decline to G, *i. e.* towards a line H I, drawn perpendicular to the ſurface A B in the point of refraction E. Again, ſince the ray E G, paſſing out of the glaſs into air, falls obliquely on C B, it will be refracted to M, ſo as to recede from the perpendicular N G O. *And hence ariſe the various phenomena of the priſm.* See COLOUR and REFRANGIBILITY.

REFRACTION *in a convex lens.* If parallel rays, A B, C D, and E F (*fig.* 22.) fall on the ſurface of a lens 2 B 3 K, the perpendicular ray A B will paſs unrefracted to K, where emerging into air perpendicular, as before, it will proceed ſtraight to G. But the rays C D and E F, falling obliquely out of air into glaſs, in D and F, will be refracted towards the axis of refraction (*i. e.* towards lines H I and L M, drawn perpendicular to the refracting ſurface in the points of refraction D and F) and decline to Q and P. Again, emerging obliquely out of the glaſs into the ſurface of the air, they will be refracted from the perpendicular, and, therefore, D Q will not proceed to X, but to G; and F P, not to V, but to G; thus, likewiſe, might all the other rays, falling on

the ſurface of the glaſs, be ſhewn to be refracted ſo as to meet the reſt about the point G. See Focus and Lens.

Hence the great property of convex glaſſes; *viz. that they collect parallel rays, or make them converge into a point.*

Refraction *in a concave lens.* Parallel rays A B, C D, and E F (*fig.* 23.) falling on a concave lens G B H I M K, the ray A B, falling perpendicular on the glaſs at B, will paſs unrefracted to M; where being ſtill perpendicular, it will paſs into the air without refraction, to L. But the ray C D, falling obliquely on the ſurface of the glaſs, will be refracted towards the perpendicular N D O, and proceed to Q; and the ray D Q, again falling obliquely out of the glaſs upon the ſurface of air, will be refracted from the perpendicular R Q S, and proceed to V. After the ſame manner might the ray E F be ſhewn to be refracted to Y, and thence to Z.

Hence the great property of concave glaſſes; *viz. that they diſperſe parallel rays, or make them diverge.* See Lens and Mirror.

Refraction *in a plane glaſs.* If parallel rays E F, G H, I L (*fig.* 24.) fall obliquely on a plane glaſs A B C D, the obliquity being the ſame in all, by reaſon of their parallelism, they will be all equally refracted towards the perpendicular; and accordingly, being ſtill parallel at M, O, and Q, they will paſs out into the air equally refracted again from the perpendicular, and ſtill parallel.

Thus will the rays E F, G H, and I L, at their entering the glaſs, be inflected towards the right; and in their going out as much inflected to the left; ſo that the firſt refraction is here undone by the ſecond; though not ſo as that the object is ſeen in its true place. For the ray B Q, being produced back again, will not coincide with the ray L I, but will fall to the right of it; and this the more as the glaſs is thicker; however, as to matter of colour, the ſecond refraction does really undo the firſt. See Colour.

Refraction *of Heat.* See Heat, Light, and Rays *of Heat.*

Refraction *in Iceland* or *Iſland cryſtal.* See *Iceland* Crystal. Dr. Young, who maintains that radiant light conſiſts in undulations of the luminiferous ether, takes occaſion to make ſome remarks on ſir Iſaac Newton's theory of the peculiar refraction in Iceland cryſtal. Newton, he ſays, has advanced the ſingular refraction of the Iceland cryſtal, as an argument that the particles of light muſt be projected corpuſcles; ſince he thinks it probable that the different ſides of theſe particles are differently attracted by the cryſtal, and ſince Huygens has confeſſed his inability to account, in a ſatisfactory manner, for all the phenomena. But contrarily to what might have been expected from Newton's uſual accuracy and candour, he has laid down a new law for the refraction, without giving a reaſon for rejecting that of Huygens, which Mr. Haüy has found to be more accurate than Newton's; and, without attempting to deduce from his own ſyſtem any explanation of the more univerſal and ſtriking effects of doubling ſpars, he has omitted to obſerve, that Huygens's moſt elegant and ingenious theory perfectly accords with theſe general effects, in all particulars, and of courſe derives from them additional pretenſions to truth; this he omits, in order to point out a difficulty for which only a verbal ſolution can be found in his own theory, and which will probably long remain unexplained by any other.

Dr. Wollaſton, in his paper on the oblique refraction of Iceland cryſtal, confirms the experiments of Huygens on this ſubſtance, with additional evidence, deduced from the ſuperiority of his mode of examining the powers of refraction. He obſerves that Dr. Young has already applied the Huygenian theory with conſiderable ſucceſs to the explanation of ſeveral other optical phenomena, and that it appears to be ſtrongly ſupported by ſuch a coincidence of the calculations deduced from it, with the reſults of theſe experiments, as could have ſcarcely happened to a falſe theory.

In ordinary caſes, the incipient undulations are of a ſpherical form; but in the Iceland cryſtal light appeared to Huygens to proceed as if the undulations were portions of an oblate ſpheroid, of which the axis is parallel to the ſhort diagonal of an equilateral piece of the cryſtal, and its centre the point of incidence of its ray. From this ſpheroidal form of the undulations, he deduces the obliquity of refraction; and lays down a law obſervable in all refractions, at any ſurface of the ſpar, whether natural or artificial, which bears the cloſeſt analogy to that which obtains, univerſally, at other refractory ſurfaces; for as, in other caſes, the ratio is given between the ſine of incidence and ſine of refraction, (or ordinate of the *ſpherical* undulation propagated,) ſo in the Iceland cryſtal, the ratio between the ſine of incidence and ordinate of refraction (in any one ſection of the *ſpheroidical* undulation) in a given ratio, but different in different planes.

Dr. Wollaſton obſerves, that though we do not fully underſtand the exiſtence of a double refraction, and are utterly at a loſs to account for the phenomena occurring upon a ſecond refraction, by another piece of the ſpar, yet that the oblique refraction, when conſidered alone, is nearly as well explained as any other optical phenomenon. Phil. Tranſ. for 1801 and for 1802.

Refraction, *Particular laws of,* in different kinds of lenſes; ſee Lens.

Refraction, *Atmoſpherical,* is generally conſidered under two diſtinct heads; *viz.* aſtronomical refraction, which is that relating to the refraction of the moon, ſtars, and other celeſtial bodies; and terreſtrial refraction, or that which takes place in terreſtrial obſervations.

It appears, from the article Refraction, that a ray of light is refracted in paſſing obliquely out of one medium into another of different denſity; and as the atmoſphere may be conſidered as compoſed of an infinitude of ſtrata, whoſe denſity increaſe as they are poſited nearer the earth, the luminous rays which paſs through it are acted on as if they paſſed ſucceſſively through media of increaſing denſity, and are therefore inflected more and more towards the earth, as the denſity augments, that is, as they approach the eye of the obſerver. In conſequence of this it is, that rays from objects, whether celeſtial or terreſtrial, proceed in curves which are *concave* towards the earth; and ſince the mind always refers the place of objects to the direction in which the rays reach the eye, that is, to the direction of the tangent to the curve at that point, it follows, that the apparent or obſerved elevation of objects is always greater than the true one, at leaſt with the exception of ſome few remarkable anomalies which ſometimes, in terreſtrial obſervations, produce a contrary effect, and of which we have ſtated a few particular inſtances under the article Mirage, and on which ſubject ſome other curious facts are recorded in a memoir of profeſſor Vince's, in the Phil. Tranſ.; in Nicholſon's Philoſophical Journal, 4to.; and more particularly by M. Monge, in vol. i. of the "Decade Egyptienne." Referring the reader therefore to thoſe works, to which we ought alſo to add the memoir by M. Biot, in vol. x. of the National Inſtitute, for an account and explanation of thoſe phenomena, we ſhall confine our preſent obſervations to thoſe caſes only, in which an uniform law is ſuppoſed to have place, and which, as we have ſeen, has a conſtant tendency to augment the obſerved altitude of both terreſtrial and celeſtial objects.

objects. In order to submit the phenomena of refraction to ſtrict mathematical inveſtigation, it muſt be obſerved that, in conſequence of the inconſiderable height of the atmoſphere, and its ſpherical form, a luminous ray impinging upon it, even in the moſt unfavourable caſe, that is directly in the horizon, traverſes only a ſmall quantity of this medium; and in this ſpace, if the atmoſphere is calm, the denſity of the air at equal heights above the level of the ſea is every where the ſame. Therefore, in ſuppoſing the earth ſpherical, a ſuppoſition which may be admitted, in the preſent caſe, without any ſenſible error, we may conſider the atmoſphere as compoſed of ſucceſſive ſpherical concentric ſhells, or ſtrata, of which the denſity diminiſhes from the ſurface of the earth upwards.

Let us conceive, now, a luminous ray, coming from a diſtance, to penetrate into one of the ſuppoſed ſpherical ſhells; then, if through the common centre of theſe ſhells, which is the ſame as the centre of the earth, we ſuppoſe a plane to paſs in the direction of the luminous ray, the ſpherical beds of the atmoſphere will be found divided into two equal portions, which acting equally upon the ray, can produce no deviation of it from that plane; whence it follows, that the effect of refraction is entirely produced in a vertical direction, and in ſuch a manner as to augment the apparent altitudes of the heavenly bodies, and conſequently to diminiſh their zenith diſtances.

But the intenſity of theſe effects will not be the ſame at all heights, for we know that in all caſes the quantity of refraction depends upon the obliquity of incidence, and therefore the refraction in the zenith is equal to zero, and increaſes from that point to the horizon, where it is the greateſt.

If, now, we knew the law by which the denſity of the air is diminiſhed in aſcending from the earth, that is, if we knew the difference in the denſity of any two conſecutive ſtrata, it would be comparatively a direct and eaſy problem to find the whole amount of refraction for any given angle of obſervation; but unfortunately the uniformity of decreaſe in the denſity of the atmoſphere, which, according to theory, is in geometrical progreſſion, is ſo much interrupted by the multitude of cauſes which may tend to produce this effect, that it is found that the quantity of refraction computed on this principle, will by no means agree with that deduced from actual obſervation. It has been, however, demonſtrated, that the quantity of refraction, in all caſes exceeding 10 or 12 degrees of elevation, is not ſenſibly affected by any irregularity in the law of denſity, in the ſtrata of which we have ſuppoſed the atmoſphere to be compoſed, but that it depends ſimply upon its preſſure and temperature at the time and place of obſervation, which are indicated at the time by the barometer and thermometer. It was formerly thought, alſo, that refraction was influenced by the degree of humidity and dryneſs of the air; but from a great variety of intereſting and accurate experiments, carried on by M. M. Biot and Arrago, it appears indiſputably eſtabliſhed, that no ſenſible effect is thence produced. See a memoir on this ſubject by the former author, in vol. x. of the National Inſtitute.

But before we proceed farther on this intereſting ſubject, it will be proper to give a ſketch of the ſeveral improvements which the theory has experienced in the hands of different celebrated aſtronomers; in doing which we ſhall avail ourſelves of a memoir, publiſhed by Dr. T. S. Evans in the Philoſophical Magazine, which contains a minute and circumſtantial detail of many important particulars connected with this ſubject. There appears to be but little doubt that the aſtronomic refraction was known to the ancients, ſince it is expreſsly mentioned by Ptolemy, although not made uſe of in his calculations. He ſays, near the end of the 8th book of the Almageſt, that in the riſing and ſetting of the heavenly bodies, there are changes which depend upon the atmoſphere, and he mentions it more at length in a work on optics, which, unfortunately, has not been handed down to us. Alhazen, an Arabian writer, who is generally ſuppoſed to have lived about the year 1100, and to have taken the greater part of his optics from the works of Ptolemy, ſpeaks alſo decidedly of it, and ſhews the manner of convincing ourſelves of it by experiment. "Take," ſays he, "an armillary, which turns round its poles, and meaſure the diſtance of a ſtar from the pole of the world when it paſſes near the zenith in the meridian, and when it is riſing or ſetting near the horizon, and you will find the diſtance from the pole leſs in the latter caſe." He then demonſtrates that this muſt ariſe from refraction, but he does not ſtate its quantity.

In the collection of obſervations made by Bernard Walter, and publiſhed by Willebrode Snell in 1618, it is ſtated, that the obſervations were ſo exact, that they pointed out to Walter the quantities by which the altitudes of the ſtars and planets were increaſed on account of the refraction.

Tycho Brahe, however, appears to be the firſt who aſſerted, with any degree of accuracy, that the refraction elevates the heavenly bodies rather more than half a degree when on the horizon. (See Progymn. p. 15.) But either his inſtruments or his obſervations were not ſufficiently correct to determine it with certainty for all degrees from the zenith to the horizon; and, accordingly, where theſe failed, the reſt were ſupplied by conjecture. He believed that the ſun's refraction was 34′ in the horizon, and that it became inſenſible at 45° of altitude. For the ſtars, however, he aſſumed an entirely different quantity, *viz.* 30′ in the horizon; but this, according to him, terminated at only 20° of altitude.

The following is the manner in which it is related (Encly. Method.) that Tycho made this diſcovery. He had determined, with one or two inſtruments extremely well made, the latitude of the place by obſervations of Polaris above and below the pole. He determined it alſo by the ſun's altitude in both ſolſtices, and found it four minutes leſs in the latter. At firſt he doubted the goodneſs of his inſtruments, and therefore conſtructed, with the utmoſt care, as many as ten others, of different ſizes and forms, but they all gave nearly the ſame reſults. He could, therefore, no longer attribute this difference in the two determinations of the latitude to any defect in the obſervations, but endeavoured, by an attentive conſideration of the ſubject, to find out the cauſe of this ſingular phenomenon. At length he ſuppoſed it could only ariſe from the refraction which elevated the ſun at the winter ſolſtice, having then only 11° of elevation above the horizon. This reſult agreed very well with the principles of optics; but ſtill Tycho Brahe could ſcarcely perſuade himſelf that the refraction was ſufficiently large to produce ſo great a difference. On this account, he made other inſtruments of ten feet diameter, whoſe axes correſponded exactly with the pole of the world, and with theſe he meaſured the declination of the ſtars out of the meridian. He then found, that even in ſummer the refraction, although inſenſible at the meridian altitude of the ſun, was very conſiderable near the horizon, and amounted to half a degree in the horizon. See Progymn. p. 79—104. Street's Aſtr. Carol. p. 119.

Tycho Brahe's table of refraction is as follows:

Alt.	Refraction.		Alt.	Refraction.	
°	′	″	°	′	″
0	30	0	11	5	00
1	21	30	12	4	30
2	15	30	13	4	00
3	12	30	14	3	30
4	11	00	15	3	00
5	10	00	16	2	30
6	9	00	17	2	00
7	8	15	18	1	15
8	6	45	19	0	30
9	6	00	20	0	00
10	5	30			

In this ſtate the refraction remained for many years. Even Riccioli, in 1665, ſuppoſed it nothing at about 26° of altitude; but he thought the moon had only 29′ of horizontal refraction in ſummer, the ſun 30′, and the ſtars 30′ 37″. It was not till after the year 1672, that a tolerably near table of refraction made its appearance, when the elder Caſſini took the ſubject into conſideration. (Mem. de l'Acad. tom. v. p. 81.) What led to this was the voyage of Richer to Cayenne in that year, upon the utility of which ſome very excellent remarks were made by Caſſini, ſhewing how far obſervations made in a ſituation ſo near the equator tended to confirm or diſprove certain theories derived from obſervations made in Europe. Several very uſeful deductions were drawn from a compariſon of thoſe made both at Paris and Cayenne; among others, the refraction was ſettled upon more accurate elements than heretofore, and a new table computed, for the firſt time, of its quantity, for all degrees, up to the zenith; an abridgment of which is given below:

Alt.	Refraction.		Alt.	Refraction.	
0°	32′	20″	°	′	″
1	27	56	30	1	42
2	21	04	40	1	10
3	16	06	45	0	59
4	12	48	50	0	50
5	10	32	60	0	34
10	5	28	70	0	21
15	3	36	80	0	10
20	2	39			

From the relation of his grandſon it appears, however, that Caſſini had at one time computed three tables of refraction for all altitudes; one for winter, another for ſummer, and a third for ſpring and autumn; but ſeveral doubts having been ſuggeſted to him reſpecting this arrangement, although in appearance conformable to nature, and principally the obſervations of Richer at Cayenne, where the refraction was found little different from that at Paris, he changed his opinion; and judging, that ſince the great difference of heat of the torrid zone from that of the temperate zone, which we inhabit, does not cauſe ſenſible differences in the refraction; therefore the greateſt heat or cold of our climate could not change it much; and he then fixed upon one table, which was that uſed by the aſtronomers of the Royal Obſervatory of Paris up to the year 1745.

It was always thought, before the time of Caſſini, that the refraction did not extend its influence higher than 45° of altitude: and he is generally conſidered as the firſt who proved that it reached all the way to the zenith. He alſo ſuppoſed that near the equator the horizontal refraction was leſs than in our climate by about one-third; that this difference decreaſed as far up as 60°, after which it was the ſame nearly for both climates.

From this diſcovery it followed, as a natural conſequence, that the refraction muſt be greater near the pole than at Paris: and this was ſhortly afterwards proved to the Academy by the publication of a work expreſsly on that ſubject. (Refractio ſolis inoccidui, &c. Holmiæ, 4to. 1695.) The king of Sweden, being, in 1694, at Tornea, in Weſt Bothnia, near the latitude of 65° 45′, and obſerving that the ſun did not ſet there in the ſummer ſolſtice, ſent the following year ſome mathematicians to make more certain and exact obſervations of this curious phenomenon. They are contained in this book, and Meſſrs. Caſſini and De la Hire concluded from them, that in the latitude of 65° 45′ the horizontal refraction muſt be 58′, or nearly double of that at Paris.

According to an obſervation made by ſome Dutchmen who paſſed the winter of 1596—7, in Nova Zembla, in latitude 76° north, the ſun, which had entirely diſappeared the 14th of November, began to riſe again the 24th of January, *viz.* ſix days ſooner than was expected, according to aſtronomical calculations. If ſo, when the ſun has been two or three months under the horizon, as the Dutchmen obſerved in 1597, the cold becomes dreadful, and perhaps the refraction increaſes prodigiouſly. M. le Monnier aſſures us, that he found by the obſervations printed in 1599, that on the 24th and 27th of January 1597, there were more than $4\frac{1}{2}$ degrees of refraction: that he could neither explain theſe obſervations, reject them as doubtful, nor ſuppoſe any error, as was done by moſt of the other aſtronomers, Kepler, Caſſini, Scotø, and, laſtly, M. le Gentil, in his Voy. dans les Mers des Indes, tom. i. p. 395. tom. ii. p. 832, who maintained that there were errors in the obſervations, and accordingly read a memoir on the ſubject. If it were not ſo difficult a taſk to winter in theſe high latitudes, we might expect ſuch obſervations as would remove all doubt on the ſubject; and, perhaps, bring others to light of as great or greater importance.

The refraction of the north being ſo conſiderable, is very uſeful to the inhabitants, who are deprived of the ſun's light during many months; as it makes the ſun riſe much earlier, and ſet much later to them, than it otherwiſe would.

About the year 1725, Mr. Flamſteed, the Engliſh aſtronomer royal, publiſhed his table computed from his own obſervations: and this was the one commonly uſed in England for many years afterwards.

Sir Iſaac Newton alſo conſtructed one from theory, which was firſt publiſhed by Dr. Halley in the Philoſophical Tranſactions, N° 368, for 1721. He made the horizontal refraction 33′ 45″; whereas Mr. Flamſteed's was only 33′ 0″.

But although the refraction might be determined within a few ſeconds at all altitudes by obſervation; yet, the law of its increaſe from the zenith to the horizon was a ſubject that occupied the principal mathematicians and aſtronomers for more than a century. Newton having diſcovered the general principles of attraction, found that the refraction was a conſequence of this law of nature; and that it aroſe from the attraction of the atmoſphere on the particles of light. On this principle the curve which a ray of light deſcribes might be determined; ſince it is ſucceſſively attracted

tracted by different layers of the atmosphere, increasing in density as they approach the earth, and, consequently, bending the ray more and more from the right line which it described in the vacuum previous to its reaching the atmosphere. There are many authors who have endeavoured to find from theory the curve described by this ray in its course, by the assumption of various hypotheses; but perfection, and our attempts to arrive at it, as is well observed by the elder Cassini in discoursing on this subject, are like the progress of certain curves and their asymptotes. The principal of these writers on the subject are Bernouilli (Hydrodyn. 1738, p. 221.); Boscovich (Oper. tom. ii.); Bouguer (Prix de 1729. Memoires, 1739, p. 407; 1749, p. 75.); Cassini (Epist. ad Montanari, 1665. Refrassioni è Parallosse, &c. 1671. Mem. for 1714, and his Astr. vol. i. p. 11. Paris, 1740, in 2 vols. 4to.); Descartes (Dioptrique, 4to. Paris, 1637); De la Grange (Nouveaux Mémoires de Berlin, vol. iii.); Euler (Mem. de Berlin, 1754, tom. x.); Gregory (Astronomy, vol. i. p. 358. edit. of 1715, in 8vo.); Hodgson (Mathematics, vol. i. p. 367. Fluxions, p. 133.); Huygens (Traité de la Lumiere, p. 44. Dioptrica, 4to. 1703); Kramp (Analyse des Refract. Astr. et Terres, 4to. Strasburg, 1799); Lambert (Les Proprietés Remarquables de la Route de la Lumiere. A la Haye, 1759. Another edition in German, 1773); La Place (Mécanique Céleste, vol. iv. p. 231.); Mayer (Tables, 1770); Newton (Principia, b. i. sect. 14.); Oriani (Ephem. de Milan. 1788); Thomas Simpson (Mathematical Dissertations, 1743); Brook Taylor (Methodus Incrementorum, 4to. Lond. 1715. Propos. 27. p. 108.); Heinsius (Dissertatio de Computo refractionum Astron. 4to. Leipsig, 1749); Tobias Mayer (De Refractionibus Astronomicis, 4to. Altorf. 1781); La Hire (Mem. de l'Acad. pour 1702, p. 52.); d'Alembert (Opuscules Mathématiques, tom. viii. p. 297.)

It was conjectured by many of the early writers, that the refraction was subject to variations depending upon the weather: but it then amounted to little more than a conjecture, on account of the indifferent manner in which astronomic instruments were divided. Picard found by meridian altitudes of the sun in 1669, that it was greater in winter than in summer. He found also that it was less by day than by night. In the observations given at the end of his journey to Uraniburg, to settle the latitude of that place, and its difference of longitude from Paris, for the purpose of comparing the observations of Tycho Brahe with those made at the Royal Observatory of Paris, he found the horizontal refraction for the first limb of the sun that made its appearance above the horizon there 33′ 2″, and for the second 32′ 37″. So that in the small interval of time that the sun was in rising, the refraction was diminished 25 seconds by the warmth arising from the sun's presence.

A quadrant being also directed by him from the top of Mount Valerian towards the summit of the church of Notre Dame at Paris, he found the depression 20′; but the sun had scarcely risen, when it was increased to 22′; exhalations being raised by the sun's presence, and the medium between Paris and Mount Valerian become more equal; whereas, before the sun rose, the air of Paris was more dense than that of Mount Valerian.

The density of the atmosphere being the immediate cause of the refraction, it was very natural to suppose that it must decrease as this density became less; whether by causes which diminished its weight, or by the expansion produced by heat: and, indeed, astronomers were not long after this, before they discovered that very sensible differences were occasioned by these circumstances.

But all the honour of introducing corrections on account of the variation of density in the atmosphere, as indicated by the barometer and thermometer, is due to Messrs. Lowthorpe and Hauksbee; the former of whom, in 1698, proved by a very simple experiment, in the presence of the Royal Society, that the refractive power of air is directly proportional to its density: and the latter, by repeating and extending the same course of experiments in the year 1708, with the machinery pointed out by the former, found that the variations of refraction, depending on the barometer, are proportional to the alteration of height of the mercury in the tube: and by a series of these experiments, he furnished us with a table of the corrections which it is necessary to make on account of the changes of heat indicated by the thermometer. These experiments, although not quite conclusive on the subject, were yet made with as much accuracy and care as the nature of the machinery, and the state of experimental philosophy of that time, would admit. An example is also given, towards the end of his paper, on the mode of applying them to correct the refraction. By these, Hauksbee found that a volume of air expressed by unity, when the thermometer was at 180° above zero, became, at 50° below, one-eighth more dense: or, which is the same thing, that the air lost one-eighth of its density, for an elevation of 180° of Fahrenheit's thermometer; which is exactly the difference of heat between melting ice and boiling water. But although this one-eighth, as will be shewn hereafter, was too small; yet it laid the foundation for other experiments, since made by several philosophers, by which the quantity of expansion has been determined more accurately.

We have already shewn that the refraction near the pole is greater than in our climate; the degree of cold being more intense. It was also found to be less in the torrid zone, where the heat is greater than in Europe. Bouguer made a variety of observations at Peru, the result of which he has given us. In 1740, he came down into an island situated in the river of Emeralds, called isle of Inca, where he determined the refraction from 1° to 7° of altitude; and the table which he afterwards computed shews the refraction to be about one-seventh less than in Europe. The horizontal refraction he found to be 27′: but at 6° of altitude it is 7′ 4″; and at 45°, it is 44″. Bouguer then gives a table for Quito, which is more elevated above the level of the sea. M. le Gentil found it greater at Pondicherry in India, although in the torrid zone.

The refraction diminishes when we are elevated above the level of the sea. Bouguer observed the quantity of it at Chimboraço, 2388 toises above the level of the sea, and found it in the horizon only $19\frac{3}{4}'$. At the cross of Pitchinca, 2044 toises above the sea, he found it 20′ 48″; at Quito, 1479 toises above the sea, 22′ 50″: but at the level of the sea 27′. These observations, when joined with the theory, produced the following rule; *viz.* if we take the excess of 5158 toises above the elevation of the place, with regard to the level of the sea, the refraction will be as the square root of this excess. Thus the square root of 5158 toises is 27′, for the horizontal refraction, at the level of the sea, in the torrid zone: and the square root of the excess of 5158 above the elevation of the place will be its horizontal refraction. The quantity 5158 is the height above which the refractive matter no longer produces any sensible effect, at least in the torrid zone.

But although by this time considerable attention had been paid to the subject, yet great differences were to be found in the tables then most in use. Thus at the altitude of 30°, according to Flamsteed, the refraction was 1′ 23″; Newton, 1′ 30″; Cassini, 1′ 42″; and de la Hire, 1′ 55″; leaving an uncertainty of more than half a minute: and it must have been very mortifying to an observer, after having taken the utmost

utmoſt pains to avoid errors of two or three ſeconds, to find his reduced obſervations liable to ſo great an error, according to the choice of his table of refraction.

It is indeed rather extraordinary, that in a memoir publiſhed by Caſſini de Thury, among thoſe of the Academy for 1745, he attempted to reconcile a number of obſervations with each other, by conſidering the ſtate of the thermometer only, without at all noticing that of the barometer; although at that time Hauksbee's experiments had been publiſhed about 37 years.

He concludes his paper, as is very natural to ſuppoſe, without being able to make the obſervations agree: nor does it clearly appear that the French noticed the above-mentioned experiments made by Hauksbee till about the year 1749. It is alſo worthy of remark, that although the neceſſity of introducing corrections on account of the alterations of the barometer and thermometer were likewiſe ſhewn to be abſolutely neceſſary by Dr. Halley (Phil. Tranſ. N° 364), and the circumſtance mentioned, and in ſome degree admitted by Le Monnier (Hiſt. Celeſt.), yet it does not appear that he followed the advice of his illuſtrious contemporary, but merely endeavoured, as Caſſini did, to reconcile his obſervations with the ſtate of the thermometer at the time of making theſe obſervations, without taking the barometer into account.

It would be endleſs to notice the different opinions reſpecting both the terreſtrial and the aſtronomic refraction which are to be met with in the writings of various authors on the ſubject: and it would be equally uſeleſs to notice all the tables of its quantity given by them, ſome of which differ very much from others. It will be ſufficient to mention thoſe only who made ſome conſiderable advances towards obtaining it with greater accuracy.

The next of theſe in order was La Caille (Mem. de l'Ac. de Sc. 1755, p. 547.), who in determining it certainly beſtowed very great pains, by making and reducing an immenſe number of obſervations, and afterwards comparing them with others made at Greenwich by Dr. Bradley, at Gottingen by Mayer, at Bologna by Zanotti, and by La Lande, who was then at Berlin. From theſe it appeared that the refraction at 45° of altitude was $1' 6\frac{1}{2}''$; but this, as will hereafter be ſeen, was too great by ſome ſeconds. In his paper on the ſubject, which is divided into four parts, he proves, firſt, that the mean refractions are very nearly the ſame for the ſame apparent altitudes throughout the whole extent of the temperate zone; ſince thoſe which were obſerved at Paris did not exceed thoſe obſerved at the Cape of Good Hope but by $\frac{1}{10}$ at moſt. In the ſecond he determines the abſolute quantity of the mean refraction for the apparent height of the pole at Paris, and gives the reſult of his obſervations with regard to the latitude of Paris and of the Cape of Good Hope. In the third he gives his table of mean refraction, and another of corrections depending upon the ſtate of the barometer and thermometer; concluding with ſome reflections on its conſtruction and uſe. In the fourth he compares his new table with the moſt celebrated of thoſe that had before that time been in uſe among aſtronomers; and he then ſhews how it agrees with the obſervations of Bradley, Zanotti, and Mayer.

But by La Caille's memoir it appears, that previous to this time M. Mayer had formed and communicated to him a table of aſtronomic refractions which he computed by means of an algebraic formula, the co-efficients of which he deduced from his own obſervations, and took into account the variations relative to thoſe of the barometer and thermometer. He found the alteration of refraction for a depreſſion of 15 lines in the barometer, the ſame as for a riſe of 10° in the thermometer, and the variation for each degree of the latter, according to his table, $\frac{1}{27}$ of the whole mean refraction, which he adapted for 28 inches of the barometer, and 0° of the thermometer. This proportion takes place down to 80° of zenith diſtance. Mayer conſidered alſo that the mean refraction is the ſame for all parts of the earth; and that the only variation which takes place depends on the changes of the weight and temperature of the atmoſphere.

La Caille, in comparing Mayer's table with obſervations, found that his correction for the thermometer was a little over-rated; and accordingly, for his new table, altered it to $\frac{1}{27}$ for each degree. And here it may be obſerved that La Caille did not correct his altitudes above 36° at Paris, and 30° at the Cape; firſt, becauſe he only noted the barometer and thermometer in the night, when he obſerved ſtars below 30° of altitude. Secondly, becauſe, that at 36° of altitude, where the mean refraction is about $1\frac{1}{2}$ minute, the variation which belongs to 10° of the thermometer only amounts to $3\frac{1}{2}$ ſeconds; a quantity about equal to the limits of the errors of obſervations made with an inſtrument of ſix feet.

The formula given by Euler (Mem. de l'Ac. de Berlin, 1754, p. 131.), appeared alſo about this time. It took into account the variation of the refraction depending upon the thermometer and barometer, but was certainly too complicated to be generally adopted. He ſhews, however, that in very different hypotheſes the refraction will be ſufficiently exact, if taken in the inverſe ratio of the degrees of heat, when the ſtar or planet is not too near the horizon, but the preciſe quantity of this ratio was unknown to him.

In this ſtate the refraction ſtood when Dr. Bradley took the ſubject into conſideration, and began to find its quantity from his own obſervations. The rule which he adopted, although a very elegant one, he neither lived to complete nor to preſent to the world; but it was publiſhed after his death by Dr. Maſkelyne, (Pref. to 1ſt vol. of Obſ. 1765. Phil. Tranſ. 1764 and 1787, p. 157. Req. Tables, &c.), and has commonly been uſed in England up to the preſent time. He found the mean refraction at 45° of altitude 57″, and, that at all other altitudes, it was equal to 57″ multiplied by the tangent of the zenith diſtance, diminiſhed by three times the refraction. Then ſuppoſing the mean ſtate of the atmoſphere to be at 29.6 inches of the barometer, and 50° of Fahrenheit's thermometer, he made the true or corrected refraction equal to $57'' \times t, (Z.D. - 3r) \times \frac{\text{barom.}}{29.6} \times \frac{400}{350 + \text{ther.}}$, where it is to be underſtood that the maſs of air is ſuppoſed to increaſe in bulk $\frac{1}{100}$ for each degree of Fahrenheit's ſcale.

A variety of experiments has been made at various times to aſcertain the increaſe in bulk of a quantity of air repreſented by unity for a certain number of degrees of riſe of the thermometer. The following is a liſt of ſome of them;

	for 1°
M. Bonne	1.00 25777
Bradley	1.00 25000
Dalton	1.00 20701
De Luc	1.00 20888
Fahrenheit	1.00 25777
Gay Luſſac	1.00 20868
Groombridge	1.00 21000
Hauksbee	1.00 06933
La Caille	1.00 22222
Mayer	1.00 20444
Shuckburg	1.00 22222
Mean of all except Hauksbee's	1.00 22490

The

The refraction deduced from Bradley's very neat and ſimple formula was, in a few years, adopted by nearly all the aſtronomers of eminence throughout Europe. The extreme facility with which it might be computed, and the corrections applied, whether from the formula itſelf, or from tables ready calculated for that purpoſe, was a powerful recommendation in its favour; but its near agreement with obſervation ſoon eſtabliſhed it.

We muſt now, without entering farther into detail of minor improvements, proceed at once to the chapter given by La Place on this ſubject, in his "Mecanique Celeſte," vol. iv. p. 231, where he has drawn, from an inveſtigation which we cannot undertake to exhibit in this place, the following general formula, for expreſſing the refraction for all angles of elevation above 12 decimal, or 10.8 ſexageſimal degrees, *viz.*

$$r = \frac{a p \,.\, \text{tan. } z}{0.76\,(1 + t \,.\, 0.00375)} - \frac{a p}{0.76} \,.\, 0.00125254\, \frac{\text{tan. } z}{\text{cof.}^2 z} + \frac{\frac{1}{2} a^2 \text{ ſin. } 1'' \, p^2}{[0.76(1 + t \,.\, 0.00375)]^2} \times \frac{(1 + 2\,\text{cof.}^2 z)\,\text{tan. } z}{\text{cof.}^2 z};$$

where all the quantities are known except r and a; which latter repreſents a conſtant co-efficient; *viz.* z is the obſerved zenith diſtance under the barometric preſſure p, in metres, and t the temperature of the centigrade thermometer, r being the refraction: all, therefore, that is required for determining r, is the value of the unknown co-efficient a; which is to be drawn from obſervations on the circumpolar ſtars, in the following manner.

Let Z be the diſtance of one of theſe ſtars from the zenith, in its ſuperior meridian paſſage; Z', this diſtance at the inferior meridian paſſage, obſerved from the ſame point of the terreſtrial ſurface; r and r', the correſponding refractions. Now all the other quantities, except a, being known, we may, for the ſake of ſimplicity, put the above formula for both paſſages under this form,

$$r = \text{A}\,a + \text{B}\,a^2, \quad r' = \text{A}'a + \text{B}'a^2;$$

where A, B, A', B', are all known quantities. Writing alſo Z, Z', for the obſerved zenith diſtances, the true zenith diſtance, D, corrected for refraction, will be

$$\text{Z} + \text{A}\,a + \text{B}\,a^2, \text{ and } \text{Z}' + \text{A}'a + \text{B}'a^2,$$

which are, therefore, now equal to each other; conſequently, by addition, we have

$$\text{Z} + \text{Z}' + (\text{A} + \text{A}')\,a + (\text{B} + \text{B}')\,a^2 = 2\,\text{D};$$

in which all the quantities are known, except a and D. But by repeating ſimilar obſervations on ſome other ſtar, and denoting by Z'', Z''', A'', A''', B'', and B''', the ſimilar quantities before repreſented by Z, Z', A, A', &c. alſo a and D remaining the ſame for all ſtars obſerved in the ſame place, we ſhall have theſe two equations:

$$\text{Z} + \text{Z}' + (\text{A} + \text{A}')\,a + (\text{B} + \text{B}')\,a^2 = 2\,\text{D},$$
$$\text{Z}'' + \text{Z}''' + (\text{A}'' + \text{A}''')\,a + (\text{B}'' + \text{B}''')\,a^2 = 2\,\text{D};$$

from which it is obvious, the conſtant co-efficient a may be obtained by the uſual methods of elimination.

In the above operation, however, we have ſuppoſed the polar diſtances of the ſame ſtar to be the ſame for its ſuperior and inferior paſſage; whereas we know that, in conſequence of the effect of preceſſion, nutation, and aberration, this diſtance is conſtantly varying; and we ought, therefore, to introduce theſe variations into the above equation. But our object being merely to give a general view of the principles made uſe of for the determination of the co-efficient a, we have not thought it neceſſary to enter ſo ſtrictly into the minutia of the computation. It appears from the above, that the conſtant co-efficient a may be determined by means of four obſervations on two different circumpolar ſtars; and conſequently, that every ſuch ſet of obſervations ought to produce the ſame reſult, or the ſame value of a. Conſidering, however, the extreme accuracy required in ſuch caſes, both in the inſtruments and the application of them, ſome little diſagreement is to be expected; and indeed one is ſurpriſed to ſee it ſo ſmall, as it has been found to be in various obſervations undertaken for this purpoſe, and the mean of which we have every reaſon to conſider as perfectly correct; and which is ſtated by M. Biot, who has intereſted himſelf very much on this ſubject, at 187".24 for the decimal diviſion, or 60".666 for the ſexageſimal.

But now, in order to ſimplify our firſt formula, by taking $p = 0.76$ metres, and $t = 0$, this may be put under the form,

$$r = a \,\text{tan. Z}\left(1 - \frac{0.00125254}{\text{cof.}^2 z}\right) + \tfrac{1}{2} a^2 \text{ ſin. } 1''\, \frac{1 + 2\,\text{cof.}^2 z}{\text{cof.}^2 z}\,\text{tan. Z};$$

in which, ſubſtituting for $\text{cof.}^2 z$, its value $\frac{1}{1 + \text{tan.}^2 z}$, and the proper numerical value of a, as above found, as alſo of ſin. 1", the whole is reduced to the following form, *viz.*

$$r = 0.99918761 \,.\, a\,\text{tan. Z} - 0.0011105823 \,.\, a\,\text{tan.}^3 \text{Z};$$

which latter form M. Biot has ſhewn to be equivalent to

$r = 187''.24 \,.\, \text{tan.}\,(\text{Z} - 3.25\,r)$ for the decimal diviſion;
$r = 60''.666 \,.\, \text{tan.}\,(\text{Z} - 3.25\,r)$ for the ſexageſimal diviſion.

But the reduction of it to this form would occupy more ſpace than can be allowed for this article. This laſt form is as ſimple as can be deſired, from which the following rule in words may be deduced, *viz.* *The refraction under the ſame barometric preſſure, and the ſame degree of temperature, is proportional to the tangent of the apparent zenith diſtance of the ſtar, diminiſhed by $3\frac{1}{4}$ times the refraction.*

It muſt be remarked, however, that the formula $r = \text{A}\,\text{tan.}\,(\text{Z} - 3.25\,r)$, though it exhibits the law of refraction in as ſimple a form as can be deſired, is not well adapted for calculation, in conſequence of r entering on both ſides of the equation; and aſtronomers have, therefore, given different methods of rendering the above formula more commodious. In order to which, it is firſt put under the form,

$$\text{tan.}\,nr = \text{tan.}^2\, n\,\text{R}\,\text{tan.}\,(\text{Z} - nr);$$

R repreſenting the refraction, anſwering to $\text{Z} = 90°$. Let us now add ſucceſſively to both ſides of this equation, the quantities $+\,\text{tan.}\,nr\,\text{tan.}^2\, n\,\text{R} - \text{tan.}\,nr\,\text{tan.}^2\, n\,\text{R}$, and we ſhall have,

$$\text{tan.}\,nr\,(1 + \text{tan.}^2\, n\,\text{R}) = \text{tan.}^2\, n\,\text{R}\,[\text{tan.}\,(\text{Z} - nr) + \text{tan.}\,nr],$$
$$\text{tan.}\,nr\,(1 - \text{tan.}^2\, n\,\text{R}) = \text{tan.}^2\, n\,\text{R}\,[\text{tan.}\,(\text{Z} - nr) - \text{tan.}\,nr].$$

Now, dividing theſe equations, member by member, nr will be eliminated, and we obtain

$$\frac{1 + \text{tan.}^2\, n\,\text{R}}{1 - \text{tan.}^2\, n\,\text{R}} = \frac{\text{tan.}\,(\text{Z} - nr) + \text{tan.}\,nr}{\text{tan.}\,(\text{Z} - nr) - \text{tan.}\,nr},$$

$$\text{or } \frac{1}{\text{cof. } 2\,n\,\text{R}} = \frac{\text{ſin. Z}}{\text{ſin.}\,(\text{Z} - 2\,n\,\text{R})};$$

whence we draw

$$\text{ſin.}\,(\text{Z} - 2\,nr) = \text{cof. } 2\,n\,\text{R} \,.\, \text{ſin. Z}.$$

Now

Now Z and n R being known, we may compute the ſecond ſide of this equation; whence the arc $Z - 2nr$ is known, and conſequently $2nr$; which, divided by $2n$, will give r, as required. But it may be found ſtill more ſimply by the formula,

$$\text{tan. } ur = \text{tan. } n\,\text{R tan. } \tfrac{1}{2}n;$$

tan. n being found by means of the auxiliary equation,

$$\text{tan. } u = \text{ſin.}^2\, n\,\text{R . tan. Z.}$$

On the principle above explained, the following table of refractions has been computed, agreeing with the temperature of + 14° on the centigrade thermometer, and under a preſſure of 0.76 metres of the barometer; which is the ſame as 57°.2 Fahrenheit, and 29.922 Engliſh inches. And for any other temperature and preſſure, the correſponding corrections muſt be made as indicated in Tables II. and III.; which tables are computed by means of the general formula given in the preceding part of this article.

We had intended to give here a ſhort abſtract of a very intereſting paper on this ſubject, publiſhed by Mr. Groombridge, in the Philoſophical Tranſactions for 1810; but having already exceeded our uſual limits, we can only refer the reader to the volume itſelf, where he will find ſeveral neat and uſeful formulæ.

Having thus given a ſketch of the method of determining the quantity of aſtronomical refraction for all angles of elevation, and under various degrees of temperature and barometric preſſure, let us add a few words on the ſubject of terreſtrial or horizontal refraction; for the determination of which, the following method has been ſucceſsfully practiſed in the Engliſh Trigonometrical Survey.

Let A, A′, (*Plate* XIX. *Aſtronomy, fig.* 11.) be two elevated places on the ſurface of the earth; B D, the intercepted arc of the earth's ſurface; C, the centre of the earth; A H′, A′ H, the horizontal lines at A, A′, produced to meet the oppoſite vertical lines C H′, C H. Let a, a', repreſent the apparent places of the objects A, A′; then is a' A A′ the refraction obſerved at A, and a A′ A the refraction obſerved at A′; and half the ſum of theſe angles will be the horizontal refraction, if we aſſume it equal at each ſtation.

Now an inſtrument being placed at each of theſe ſtations A, A′, the reciprocal obſervations are made at the ſame inſtant of time, which is determined by means of ſignals or watches previouſly regulated for that purpoſe; that is, the obſerver at A takes the apparent depreſſion of A′, at the ſame moment that the other obſerver takes the apparent depreſſion of A. Then, in the quadrilateral A C A I, the two angles A, A′, are right angles, and conſequently the angles I and C are together equal to two right angles; but the three angles of the triangle I A A′, are together equal to two right angles; and conſequently the angles A and A′ are together equal to the angle C, which is meaſured by the arc B D. If, therefore, the ſum of the two depreſſions H A′ a, H′ A a, be taken from the ſum of the angles H A′ A, and H′ A A′, or, which is equivalent, from the angle C, (which is known, becauſe its meaſure B D is known,) the remainder is the ſum of the two refractions. Hence this rule, "take the ſum of the two depreſſions from the meaſure of the intercepted terreſtrial arc, half the remainder is the refraction." If, by reaſon of the minuteneſs of the contained arc B D, one of the objects, inſtead of being depreſſed below the tangent A H′, appears elevated, as ſuppoſe A to a'', then the ſum of the angles a'' A A′, and a A′ A, will be greater than the ſum I A A′ + I A′ A, or than C, by the angle of elevation a'' A A′; but if from the former ſum there be taken the depreſſion H A′ A, there will remain the ſum of the two refractions, ſo that in this caſe the rule becomes as follows: "Take the depreſſion from the ſum of the contained arc and elevation, and half the remainder is the refraction."

The quantity of this terreſtrial refraction is eſtimated by Dr. Maſkelyne at one-tenth of the diſtance of the object obſerved, expreſſed in degrees of a great circle. Whence, if the diſtance be 10,000 fathoms, its 10th part, 1000 fathoms, is the 60th part of a degree, or one minute, which, therefore, is the refraction in altitude of the object at that diſtance. But Le Gendre is induced, by ſeveral experiments, to allow only one-fourteenth part of the diſtance for the refraction in the altitude, ſo that on the diſtance of 10,000 fathoms, the 14th part of which is 714 fathoms, he allows only 44″ of terreſtrial refraction, ſo many being contained in 714 fathoms. (See his Memoir on the Trigonometrical Operations.) Again, Delambre makes the quantity of terreſtrial refraction to be one-eleventh part of the arc of diſtance. And the Engliſh meaſurers, from many very exact obſervations, determine the quantity of the medium refraction to be a twelfth part of the ſaid diſtance. The mean of all theſe is about .085 of the intercepted arc, which is probably not very far from the truth: this quantity, however, it muſt be obſerved, is found to vary very conſiderably with the different ſtates of the weather and atmoſphere, from one-ſeventh to one-eighteenth of the contained arc.

Table I. Of Refraction.

Barometer 29.922 Inches = 0.76 Metre; Thermometer Centigrade, 14°; Fahrenheit's, 57°.2; Reaumur's, 11°.2.

Apparent altitude.	Refraction minus parallax of the ⊙	Refraction of the ſtars.	Differences.	Apparent altitude.	Refract. minus parallax of the ⊙	Refract. of the ſtars.	Differ.	Apparent altitude.	Refract. minus parallax of the ⊙	Refract. of the ſtars.	Diff.	Apparent altitude.	Refract. minus parallax of the ⊙	Refract. of the ſtars.	Diff.
° ′	′ ″	′ ″	″	° ′	′ ″	′ ″	″	°	′ ″	′ ″	″	°	′ ″	′ ″	″
0 0	33 7	33 16	110	6 0	8 13	8 22	11	21	2 20	2 28	7	56	0 34	0 39	1
10	31 17	31 25	103	10	8 2	8 11	11	22	2 13	2 21	7	57	0 33	0 37	1
20	29 33	29 42	96	20	7 51	7 59	11	23	2 6	2 14	6	58	0 31	0 36	1
30	27 57	28 6	88	30	7 40	7 48	11	24	2 0	2 8	5	59	0 30	0 35	1
40	26 29	26 38	82	40	7 29	7 38	10	25	1 55	2 3	6	60	0 29	0 33	1
50	25 7	25 15		50	7 19	7 28		26	1 49	1 57		61	0 28	0 32	
			76				10				5				1
1 0	23 50	23 59	70	7 0	7 9	7 18	9	27	1 44	1 52	4	62	0 26	0 31	1
10	22 40	22 49	65	10	7 0	7 9	9	28	1 40	1 48	4	63	0 25	0 29	1
20	21 35	21 44	61	20	6 51	7 0	9	29	1 36	1 43	4	64	0 24	0 28	1
30	20 34	20 43	56	30	6 43	6 51	8	30	1 32	1 39	4	65	0 23	0 27	1
40	19 38	19 47	53	40	6 35	6 44	8	31	1 28	1 35	4	66	0 22	0 26	1
50	18 45	18 54		50	6 27	6 36		32	1 24	1 32		67	0 21	0 24	
			48				7				3				1
2 0	17 57	18 6	45	8 0	6 20	6 28	7	33	1 21	1 28	3	68	0 20	0 23	1
10	17 12	17 20	43	10	6 13	6 21	7	34	1 18	1 25	3	69	0 19	0 22	1
20	16 29	16 38	39	20	6 5	6 14	7	35	1 15	1 22	3	70	0 18	0 21	1
30	15 50	15 59	37	30	5 58	6 7	6	36	1 12	1 19	3	71	0 17	0 20	1
40	15 13	15 22	35	40	5 52	6 1	6	37	1 9	1 16	3	72	0 16	0 19	1
50	14 39	14 47		50	5 46	5 54		38	1 6	1 13		73	0 15	0 18	
			32				6				2				1
3 0	14 6	14 15	30	9 0	5 39	5 48	6	39	1 4	1 11	2	74	0 14	0 17	1
10	13 36	13 45	29	10	5 33	5 42	6	40	1 2	1 8	2	75	0 13	0 15	1
20	13 7	13 16	27	20	5 28	5 36	6	41	0 59	1 6	2	76	0 12	0 14	1
30	12 41	12 49	25	30	5 22	5 31	5	42	0 57	1 4	2	77	0 11	0 13	1
40	12 15	12 24	24	40	5 17	5 25	5	43	0 55	1 2	2	78	0 10	0 12	1
50	11 51	12 0		50	5 12	5 20		44	0 53	0 59		79	0 10	0 11	
			22				5				2				1
4 0	11 29	11 38	22	10 0	5 6	5 15	28	45	0 51	0 57	2	80	0 9	0 10	1
10	11 7	11 16	20	11 0	4 39	4 47	23	46	0 49	0 55	1	81	0 8	0 9	1
20	10 47	10 56	19	12 0	4 15	4 24	20	47	0 48	0 54	2	82	0 7	0 8	1
30	10 28	10 37	18	13 0	3 55	4 4	18	48	0 46	0 52	2	83	0 6	0 7	1
40	10 10	10 19	17	14 0	3 38	3 46	15	49	0 44	0 50	2	84	0 5	0 6	1
50	9 53	10 2		15 0	3 23	3 31		50	0 43	0 48	1	85	0 4	0 5	1
			16				14				2				1
5 0	9 37	9 45	15	16 0	3 9	3 18	12	51	0 41	0 46	1	86	0 3	0 4	1
10	9 21	9 30	15	17 0	2 57	3 6	11	52	0 39	0 45	1	87	0 3	0 3	1
20	9 6	9 15	14	18 0	2 47	2 55	10	53	0 38	0 43	1	88	0 2	0 2	1
30	8 52	9 1	14	19 0	2 37	2 45	9	54	0 37	0 42	2	89	0 1	0 1	1
40	8 38	8 47	13	20 0	2 28	2 36	8	55	0 35	0 40	1	90	0 0	0 0	
50	8 26	8 34	12	21 0	2 20	2 28		56	0 34	0 39					
6 0	8 13	8 22													

TABLE II. Of Corrections to the preceding Table of Refractions for different Degrees of Temperature. An Increaſe of Cold augments Refraction; therefore, the Correction is Additive for a Temperature leſs than 14° of the Centigrade, and Subtractive for thoſe above it.

Correction Additive.										Correction Subtractive.							
Centigrade	−2°	0°	+2°	+4°	+6°	+8°	+10°	+12°	+14°	+16°	+18°	+20°	+22°	24°	26°	28°	30°
Fahrenheit	28.4	32	35.6	39.2	42.8	46.4	50	53.6	57.2	60.8	64.4	68	71.6	75.2	78.8	82.4	86
Reaumur	−1.6	0°	+1.6	+3.2	+4.8	+6.4	+8	+9.6	+11.2	+12.8	+14.4	+16	+17.6	+19.2	+20.8	22.4	+24
Apparent Altitude.																	
o	″	″	″	″	″	″	″	″	″	″	″	″	″	″	″	″	″
5	37	32	28	23	18	14	9	5	o	4	9	13	17	21	25	29	33
5½	35	30	26	21	17	13	8	4	o	4	8	12	16	20	23	27	31
6	32	28	24	20	16	12	8	4	o	4	7	11	14	18	22	25	28
7	28	24	21	17	14	10	7	3	o	3	6	10	13	16	19	22	25
8	25	22	18	15	12	9	6	3	o	3	6	9	11	14	17	21	22
9	22	19	16	14	11	8	5	3	o	3	5	8	10	13	15	17	20
10	20	17	15	12	16	7	5	3	o	2	5	7	9	11	14	16	18
12	17	15	12	10	8	6	4	2	o	2	4	6	8	10	11	13	15
14	14	13	11	9	7	5	4	2	o	2	3	5	7	8	10	11	13
16	13	11	9	8	6	5	3	2	o	1	3	4	6	7	9	10	11
18	11	10	8	7	5	4	3	1	o	1	3	4	5	6	8	9	10
20	10	9	7	6	5	4	2	1	o	1	2	3	5	6	7	8	9
25	8	7	6	5	4	3	2	1	o	1	2	3	4	5	5	6	7
30	6	6	5	4	3	2	2	1	o	1	2	2	3	4	4	5	6
40	4	4	3	3	2	2	1	1	o	1	1	2	2	3	3	3	4
50	3	3	2	2	2	1	1	o	o	o	1	1	1	2	2	2	3
60	2	2	2	1	1	1	1	o	o	o	1	1	1	1	1	2	2
70	1	1	1	1	1	1	o	o	o	o	o	1	1	1	1	1	1
80	1	1	1	o	o	o	o	o	o	o	o	o	o	o	o	1	1
90	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o

TABLE III. Of Corrections to the Table of Refractions relative to the Weight of the Atmoſphere. An Increaſe of Atmoſpheric Preſſure augments Refraction; the Correction is Additive when the Barometer is more than 29.922 Inches, but Subtractive when leſs.

Correction Additive.								Correction Subſtractive.						
Metres.	0.795	0.790	0.785	0.780	0.775	0.770	0.765	0.760	0.755	0.750	0.745	0.740	0.735	0.730	0.725
Inches.	31.301	31.104	30.907	30.710	30.513	30.316	30.119	29.922	29.725	29.528	29.331	29.134	28.937	28.740	28.543
Apparent Altitudes.															
o	″	″	″	″	″	″	″	″	″	″	″	″	″	″	″
5	27	23	19	16	12	8	4	o	4	8	12	16	20	24	27
5½	25	22	18	14	11	7	4	o	4	7	11	15	18	22	25
6	24	20	17	13	10	7	3	o	3	7	10	14	17	20	24
7	21	18	15	12	9	6	3	o	3	6	9	12	15	18	21
8	18	16	13	10	8	5	3	o	3	5	8	11	14	16	18
9	16	14	12	9	7	5	2	o	2	5	7	10	12	14	16
10	15	12	11	8	6	4	2	o	2	4	6	9	11	13	15
12	12	11	9	7	5	4	2	o	2	4	5	7	9	11	12
14	10	9	8	6	5	3	2	o	2	3	5	6	8	9	11
16	9	8	7	5	4	2	1	o	1	3	4	5	7	8	9
18	8	7	6	5	4	2	1	o	1	2	4	5	6	7	8
20	7	6	5	4	3	2	1	o	1	2	3	4	5	6	7
25	6	5	4	3	3	2	1	o	1	2	2	3	4	5	6
30	5	4	3	3	2	1	1	o	1	1	2	3	3	4	5
40	3	3	2	2	1	1	1	o	o	1	1	2	2	3	3
50	2	2	2	1	1	1	o	o	o	1	1	1	2	2	2
60	2	1	1	1	1	1	o	o	o	o	1	1	1	1	2
70	1	1	1	1	o	o	o	o	o	o	o	1	1	1	1
80	o	o	o	o	o	o	o	o	o	o	o	o	o	o	1
90	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o

To

To obſerve the Refraction of a Star, &c. 1. Obſerve the meridian altitude of a ſtar near the zenith; whence the latitude of the place being known, the true declination of the ſtar is eaſily had, the ſtar being now void of any ſenſible refraction. 2. Obſerve the altitude of the ſame ſtar in any other degree, and note the time by a pendulum. 3. For the given time of obſervation, from the declination of the ſtar compute its true altitude.

This being thus found leſs than the altitude obſerved, ſubtract the one from the other; and the remainder is the refraction for that moment, in that degree.

REFRACTION *of Altitude*, is an arc of a vertical circle, by which the altitude of a ſtar is increaſed by the refraction.

REFRACTION *of Declination*, is an arc of a circle of declination, by which the declination of a ſtar is increaſed or diminiſhed by the refraction.

REFRACTION *of Aſcenſion and Deſcenſion*, is an arc of the equator, by which the aſcenſion and deſcenſion of a ſtar, whether right or oblique, is increaſed or diminiſhed by means of the refraction.

REFRACTION *of Longitude*, is an arc of the ecliptic, by which the longitude of a ſtar is increaſed or diminiſhed by means of the refraction.

REFRACTION *of Latitude*, is an arc of a circle of latitude, by which the latitude of a ſtar is increaſed or diminiſhed by means of refraction.

REFRACTION, in *Commerce*, is a term ſometimes uſed by merchants, where there has been an overſight in an account, to the prejudice of a perſon; who thereupon demands reſtitution of ſo much, added or omitted by miſtake.

You muſt make me a refraction of five pounds forgot in your account. I will deduct or make you a refraction of 30*s*. charged inadvertently in my bill.

REFRACTORY, in *Chemiſtry*. See an explication of the term under APYROUS.

REFRAIN, Fr., in *Muſic*, the termination of every verſe or ſtanza of a ſong, by the ſame words and the ſame melody. (See BURDEN.) The word, according to Menage (Dict. Etym.) is derived from the Spaniſh *refran*.

REFRAN, Span., a proverb; the burden of a ſong in that language, being uſually ſententious, and including ſome moral precept.

REFRANGIBLE, whatever is capable of being refracted. See REFRANGIBILITY.

REFRANGIBILITY *of Light*, the diſpoſition of the rays to be refracted.

A greater or leſs refrangibility is a diſpoſition to be more or leſs refracted, in paſſing at equal angles of incidence, into the ſame medium.

That the rays of light are differently refrangible, is the foundation of ſir Iſaac Newton's whole theory of light and colours. The truth of the principle, which was inveſtigated and eſtabliſhed by our great philoſopher in the year 1616, will appear from the following experiments.

1. Let E G (*Plate* XIX. *Optics*, *fig.* 1.) repreſent the window-ſhutter of a dark room, and F a hole in it, through which the light is tranſmitted to the priſm A B C, which refracts it towards P T, where it appears in an oblong form; its length being about five times greater than its breadth, and exhibiting the various colours of the rainbow. In *fig.* 2. *a g b* repreſents a ſecond priſm, which refracts the light back again to Q, where the image is round; whereas, without the interpoſition of this ſecond priſm, the light would have proceeded to P T, and, conſequently, have been oblong, as before. In this experiment ſir Iſaac Newton took care that the plane *a g* was placed exactly parallel to B C, and alſo *b g* to A C, that the rays might be equally refracted, though in contrary ways, by both priſms. He alſo obſerved, that both priſms muſt be placed very near to one another; for if their diſtance be ſo great, that colours begin to appear in the light, before its incidence on the ſecond priſm, thoſe colours will not be deſtroyed by the refraction of that priſm.

2. Having placed one of two boards behind the priſm at the window, ſo that the light might paſs through a ſmall hole made in it for the purpoſe, and fall on the other board at the diſtance of about twelve feet, a hole being made in it to admit the paſſage of the incident light, he then placed another priſm behind the ſecond board, ſo that the light which was tranſmitted through both the boards might paſs through that alſo, and be again refracted before it arrived at the wall. This being done, he took the firſt priſm in his hand, and turned it about its axis ſo much, as to make the ſeveral parts of the image, caſt on the ſecond board, ſucceſſively to paſs through the hole in it, that he might obſerve to what places on the wall the ſecond priſm would refract them; and he ſaw, by the change of thoſe places, that the light tending to that end of the image, towards which the refraction of the firſt priſm was made, did, in the ſecond priſm, ſuffer a refraction conſiderably greater than the light which tended to the other end. The true cauſe, therefore, of the length of that image was diſcovered to be no other, than that light is not ſimilar or homogeneal, but that it conſiſts of rays, ſome of which are more refrangible than others; ſo that without any difference in their incidence on the ſame medium, ſome of them ſhall be more refracted than others; and therefore, that according to their particular degrees of refrangibility, they will be tranſmitted through the priſm to different parts of the oppoſite wall.

To make this capital experiment, which ſir Iſaac Newton himſelf juſtly calls the *experimentum crucis*, let S F (*fig.* 3.) repreſent a ray of the ſun, which, after paſſing through a hole in the window-ſhutter F, is received by the priſm in A B C, cloſe behind which is placed a board D E, with a hole in it at G, to admit any of the rays after they have been ſeparated by the priſm; then *d e* will repreſent the other board, placed at a conſiderable diſtance from the former, with a hole in it, *g*, to receive any part of the light tranſmitted through the other board. Behind this ſecond board is placed another priſm, *a b c*, through which different rays of light, falling upon it in the very ſame place, and with preciſely the ſame angle of incidence, will be refracted higher or lower, on the oppoſite wall M N. This experiment was conducted with the utmoſt circumſpection and accuracy; and it is obſerved, that neither the different magnitude of the hole in the window-ſhutter, nor the different thickneſſes of the priſm, at the place where the rays paſſed through it, nor the different inclinations of the priſm to the horizon, nor the different matter of the priſms, made any ſenſible change in the length of the image.

3. In order farther to eſtabliſh this famous hypotheſis of the different refrangibility of the rays of light, he held a priſm in a beam of the ſun, which was tranſmitted into the room through a hole in the window-ſhutter, ſo that its axis might be perpendicular to that beam; and having turned the priſm about its axis to make the image aſcend and deſcend, and when it ſeemed to be ſtationary between theſe contrary motions, he fixed the priſm ſo that the refractions of both ſides might be equal to each other. In this ſituation he looked at the hole through the priſm, and obſerved the length of its refracted image to be many times greater than its breadth: the moſt refracted part of it was violet, the leaſt refracted red, the middle parts blue, green, and yellow, in order. The ſame thing happened when he removed the priſm

out of the ſun's light, and looked through it upon the hole ſhining by the light of the clouds beyond it.

4. Conſidering that if the image of the ſun ſhould be drawn into an oblong form, either by a dilatation of every ray, or by any other caſual inequality of the refractions, the ſame oblong image would, by a ſecond refraction, made ſideways, be drawn out as much in breadth, he placed a ſecond priſm immediately after the firſt, in an oblique poſition with reſpect to it, that it might again refract the light of the beam of the ſun's light, which came to it through the firſt priſm; ſo that in the firſt priſm, the beam would be refracted upwards, and in the ſecond ſideways. But he found that the breadth of the image was not increaſed by the refraction of the ſecond priſm, but only its upper part, which in the firſt priſm ſuffered the greateſt refraction, and appeared violet and blue, did again, in the ſecond priſm, ſuffer a greater refraction, than the lower part of it, which was red and yellow, and this without any dilatation of the breadth of the image. Thus let S (*fig.* 4.) repreſent the ſun, F the hole in the window, A B C the firſt priſm, and D H the ſecond. If Y repreſent the round image of the ſun, made by a direct beam of light, when the priſms are taken away, P T will be the oblong image of the ſun, made by the ſame beam paſſing through the firſt priſm only, and *p t* will be the image made by the croſs refractions of both priſms together. Sometimes he placed a third priſm after the ſecond, and ſometimes a fourth after the third; by all which the image might be often refracted ſideways, but the rays which were more refracted than the reſt in the firſt priſm, were alſo more refracted in all the others, and that without any dilatation of the image ſideways; and, therefore, thoſe rays, on account of their conſtancy of a greater refraction, he called the more refrangible ones. He obſerves, in order to render the meaning of this experiment more evident, that all the rays, which are equally refrangible, fall upon a circle anſwering to the ſun's diſc. Let, therefore, A G (*fig.* 5.) repreſent the circle which all the moſt refrangible rays, tranſmitted from the whole diſc of the ſun, would illuminate, and paint upon the oppoſite wall, if they were alone. Let E L be the circle which all the leaſt refrangible rays would, in like manner, illuminate, and paint, if they were alone, and let B H, C J, and D K, be the circles which ſo many intermediate kinds of rays would ſucceſſively paint upon the wall, if they were ſingly propagated from the ſun, the reſt being always intercepted, and conceive that there are other intermediate circles without number, which other innumerable intermediate kinds of rays would ſucceſſively paint upon the wall, if the ſun ſhould ſucceſſively emit every kind by itſelf. Now ſince the ſun emits rays of all theſe kinds at once, they muſt altogether illuminate and paint innumerable equal circles, of all which, being ranged according to their different degrees of refrangibility, the oblong image P T before deſcribed is compoſed.

Now if the ſun's circular image, Y, which is made by an unrefracted beam of light, was by any dilatation of the ſingle rays, or by any other irregularity in the refraction of the firſt priſm, converted into the oblong image P T, then ought every circle in the image to be in like manner drawn out into a ſimilar oblong figure, contrary to the reſult of this experiment.

He conſidered farther, that by the breadth of the hole through which the light enters into the dark chamber, there is a penumbra made in the circumference of the image Y, which is alſo viſible at the ſides of the oblong images P T and *p t*. He, therefore, placed at that hole a lens, or object-glaſs of a teleſcope, which might caſt the image of the ſun diſtinctly on Y, without any penumbra at all; and he found that the penumbra of the rectilinear ſides of the oblong images P T and *p t* was alſo thereby taken away, ſo that they were as diſtinctly defined as the circumference of the firſt image Y.

There are ſome other circumſtances attending this experiment, by which the concluſion drawn from it is made ſtill more plain and convincing.

Let the ſecond priſm, D H, (*fig.* 6.) be placed not immediately after the firſt, but at ſome diſtance from it, ſo that the light from the firſt priſm may fall upon it in the form of an oblong ſpectrum *q r*, parallel to this ſecond priſm, and may be refracted ſideways, to form the oblong image, *p t*, upon the wall, and it will be found that this image, *p t*, is inclined to the image P T, which the firſt priſm would have formed without the ſecond; the blue ends, P and *p*, being farther diſtant from one another than the red ones, T and *t*; and, conſequently, the rays which go to the blue end, *q*, of the image *q r*, and which, therefore, ſuffer the greateſt refraction in the firſt priſm, are again, in the ſecond priſm, more refracted than the reſt.

At two holes made near one another in his window-ſhutter, he placed two priſms, one at each, which might caſt upon the oppoſite wall two oblong coloured images of the ſun; and at a little diſtance from the wall he placed a long ſlender paper, with ſtraight and parallel edges; and he placed the priſms and papers, ſo that the red colour of one image, at T, (*fig.* 7.) might fall directly upon one half of the paper, and the violet colour, M, of the other image, upon the other half of the ſame paper. Then with a black cloth he covered the wall behind the paper, that no light might be reflected from it to diſturb the experiment; and viewing the paper through a third priſm, held parallel to it, he ſaw that half of it which was illuminated by the violet light to be divided from the other half, by a greater refraction, eſpecially when he retired to a conſiderable diſtance from the paper.

He farther cauſed the two images, P T and M N (*fig.* 8.) to coincide, in an inverted order of their colours, the red end of each falling on the violet end of the other; and then viewing them through a priſm D H, held parallel to their length, they no longer appeared coincident, as when they were viewed with the naked eye, but in the form of two diſtinct images, *p t* and *m n*, croſſing one another in the middle; which ſhews that the red of the one image, and the violet of the other, which were coincident at P N and M T, being parted from one another by a greater refraction of the violet to *p m*, than that of the red to *n* and *t*, differ in degree of refrangibility.

Having placed a priſm, whoſe two angles at its baſe were equal to one another, and half right ones, and the third a right one, in a beam of the ſun's light, admitted into the room as before, he turned it ſlowly about its axis, till all the light which went through one of its angles, and was refracted by it, began to be reflected by its baſe, (at which, till then, it went out of the glaſs,) and then he obſerved that thoſe rays which had ſuffered the greateſt refraction were ſooner reflected than the reſt. He imagined, therefore, that thoſe rays of the reflected light, which were moſt refrangible, did firſt of all, by a total reflection, become more copious in that light than the reſt; and that afterwards the reſt, alſo, by a total reflection, became as copious as theſe. To try this, he made the reflected light paſs through another priſm, and, being refracted by it, to fall afterwards upon a ſheet of white paper, at ſome diſtance behind it, and there to paint the uſual colours of the priſm. Then cauſing the firſt priſm to be turned about its axis, he obſerved, that when thoſe rays which, in this priſm, had ſuffered the

greateſt

greateſt refraction, and were of a blue and violet colour, began to be wholly reflected, the blue and violet light on the paper, which received the rays from the ſecond priſm, was ſenſibly increaſed, above that of the red and yellow, which was leaſt refracted; and afterwards, when the reſt of the light, which was green, yellow, and red, began to be wholly reflected in the firſt priſm, the light of thoſe colours on the paper received as great an increaſe as the violet and blue had done before. From this it is manifeſt, that the beam reflected by the baſe of the priſm, being augmented firſt by the more refrangible rays, and afterwards by the leſs refrangible ones, is compounded of rays differently refrangible. This experiment is illuſtrated by *fig.* 9, in which A B C repreſents the firſt priſm, on the baſe of which the light falls, at M. When this priſm is turned about its axis, according to the order of the letters A B C, the more refrangible rays, M H, emerge more and more obliquely; and at length, after their moſt oblique emergence, are reflected towards N, and going on to *p*, increaſe the number of rays N *p*. By continuing the motion of the firſt priſm, the leſs refrangible rays, M G, are reflected to N, and increaſe the number of rays N *t*.

Since it appears from ſir Iſaac Newton's experiments, that different rays of light have different degrees of refrangibility, it neceſſarily follows that the rules laid down by preceding philoſophers, concerning the refractive power of water, glaſs, &c. muſt be limited to the middle kind of rays, as it may be ſuppoſed that Kepler, Snellius, and others would attend to them principally. Sir Iſaac, however, proves that the ſine of the incidence of every kind of light, conſidered apart, is to its ſine of refraction in a given ratio. This he deduces both by experiment, and alſo geometrically, from the ſuppoſition that bodies refract the light by acting upon its rays in lines perpendicular to their ſurfaces.

Upon the whole it appears, that the blue rays are more refracted than the red ones, and that there is, likewiſe, unequal refraction in the intermediate rays; and upon the whole it appears, that the ſun's rays have not all the ſame refrangibility, and, conſequently, are not of the ſame nature. It is alſo obſerved, that thoſe rays which are moſt refrangible are alſo moſt reflexible. See the proof of this under REFLEXIBILITY. Newton's Optics, p. 22, &c. ed. 3.

The difference between refrangibility and reflexibility was firſt diſcovered by ſir Iſaac Newton, in 1671-2, and communicated in a letter to the Royal Society, dated February 6, 1671-2, and publiſhed in the Philoſophical Tranſactions, N° 80, p. 3075, and from that time vindicated by him from the objections of ſeveral authors; particularly F. Pardies, M. Mariotte, Fr. Linus, or Lin, and other gentlemen at the Engliſh college at Liege; and at length it was more fully laid down, illuſtrated, and confirmed, by a great variety of experiments, in his excellent treatiſe of Optics.

But farther, as not only thoſe colours of light produced by refraction in a priſm, but alſo thoſe reflected from opaque bodies, have their different degrees of refrangibility and reflexibility; and as a white light ariſes from a mixture of the ſeveral coloured rays, the ſame great author concluded all homogeneous light to have its proper colour, correſponding to its degree of refrangibility, and not capable of being changed by any reflections, or any refractions; that the ſun's light is compoſed of all the primary colours; and that all compound colours ariſe from a mixture of the primary ones, &c.

The different degrees of refrangibility he conjectures to ariſe from the different magnitude of the particles of which the different rays conſiſt. Thus the moſt refrangible rays, *i. e.* the red ones, he ſuppoſes to conſiſt of the largeſt particles; the leaſt refrangible, *i. e.* the violet rays, of the ſmalleſt particles; and the intermediate rays, yellow, green, and blue, of particles of intermediate ſizes.

Having given a general view of the Newtonian theory of colours, as they depend upon the refraction of light, under the article COLOUR, we ſhall here add ſome farther particulars on this ſubject. From a review of that article, and of what has been above delivered, we may infer that, as the rays of light differ in refrangibility, they alſo differ in their diſpoſition to exhibit this or that particular colour; ſo that colours are not modifications of light, derived from refractions or reflections of natural bodies, but original and connate properties, which are different in different rays. Moreover, to the ſame degree of refrangibility always belongs the ſame colour, and to the ſame colour the ſame degree of refrangibility; nor are the ſame ſpecies of colour, and degree of refrangibility, that are proper to any particular kind of rays, ſuſceptible of change by refraction and by reflection of natural bodies, nor by any other cauſe which ſir Iſaac Newton could obſerve. Although a ſeeming tranſmutation of colours may be made by a mixture of different kinds of rays, yet, in ſuch mixtures, the component colours themſelves do not appear; but, by their mutually allaying each other, conſtitute a middle colour: and, therefore, if, by refraction, the different rays be ſeparated, colours will emerge different from that of the compoſition. Thus blue and yellow powders, finely mixed, appear green to the naked eye; and yet the colours of the component particles are not thereby really changed, but only blended: for when they are viewed with a microſcope, they ſtill appear blue and yellow. It appears that there are alſo two ſorts of colours: the one original and ſimple; the other compounded of theſe. The original and primary colours are red, orange, yellow, green, blue, indigo, and a violet purple, and an indefinite variety of intermediate gradations. The ſame colours in ſpecie with thoſe primary ones may be alſo produced by a compoſition: thus a mixture of yellow and blue makes green; of red and yellow, orange; and of orange and yellowiſh-green, yellow. In general, if any two colours are mixed, which, in the ſeries of thoſe that are produced by the priſm, are not too far diſtant from one another, they, by their mutual alloy, compoſe that colour which appears in the midway between them; but thoſe which are ſituated at too great diſtance have not this effect: *e. gr.* orange and indigo do not produce the intermediate green, nor ſcarlet and green the intermediate yellow.

The moſt wonderful compoſition is that of whiteneſs, which no one ſort of rays alone can exhibit, but which is always compounded; ſo that all the aforeſaid primary colours, mixed in a certain proportion, are neceſſary to form it. See COLOUR.

Having ſhewn, in the preceding part of this article, the extremes of the different degrees of refrangibility in the different kinds of light, we ſhall now proceed to give the reſult of Newton's inveſtigation, concerning the different degrees of refrangibility of all the different kinds of light, according to their ſeveral colours; particularizing this part of the ſubject with an explanation of the method which he made uſe of to define the boundaries of each colour, in the oblong image of the ſun above deſcribed. In that image, though there was a manifeſt difference of colour, not only between the two extremes, but alſo in the intermediate parts, yet the exact place at which any one colour ended, and another began, was far from being ſufficiently diſtinguiſhable.

guiſhable. The reaſon of this indiſtinctneſs is, that rays of every kind coming from all parts of the ſun's diſc, an entire image of the ſun is projected on the paper, conſiſting of a circle of each particular colour; and as the rays differ in kind by infinitesimal degrees, from the extreme red to the extreme violet, there muſt, in fact, be thouſands of theſe circles in the ſame oblong image, the centres of which are infinitely near to one another; ſo that the light is intimately mixed, eſpecially in the middle of the image, where it is the brighteſt.

If theſe circles, as he obſerves, whilſt their centres keep their diſtances and poſitions, could be made leſs in diameter, their interfering one with another, and conſequently the mixture of heterogeneous rays, would be proportionably diminiſhed. Thus, in P T, (*fig.* 10.) the circles of which the ſolar image conſiſts, expand into one another; but in the ſame figure, *p t*, being compoſed of leſs circles, but having their centres at the ſame diſtance as the former, do not extend into one another, the mixture being diminiſhed in proportion to the diameters of the circles.

Now theſe circles would be diminiſhed, if, without the room, at a great diſtance from the priſm, towards the ſun, ſome opaque body was placed, having a round hole in the middle of it, to intercept all the ſun's light, excepting ſo much as, coming from the middle of its diſc, could paſs through that hole to the priſm; for ſo the ſeparate circles would no longer anſwer to the whole diſc of the ſun, but only to that part of it which can be ſeen from the priſm, through that hole. But that theſe circles may anſwer more diſtinctly to the hole, a lens is to be placed by the priſm, to caſt the image of the hole, that is, of each ſeparate circle, diſtinctly upon the paper; and if this be done, it will not be neceſſary to place that hole very far off, not even beyond the window. Inſtead, therefore, of that hole, he made uſe of the hole in his window-ſhutter, in the following manner.

At about 10 or 12 feet from the window, he placed a lens, by which the image of the hole might be diſtinctly caſt upon a ſheet of white paper, at the diſtance of 6, 8, 10, or 12 feet from the lens. Then, immediately after the lens, he placed a priſm, by which the refracted light might be thrown upwards, or ſideways; and he moved the paper that received it, either towards the priſm, or from it, till he found the exact diſtance at which the ſides of the image appeared moſt diſtinct. By this means the circular images of the hole were terminated moſt diſtinctly, without any penumbra, and therefore extended into one another the leaſt that they could; and conſequently the mixture of the heterogeneous rays was the leaſt of all. And by uſing a greater or leſs hole in the window-ſhutter, he made the circular images greater or leſs at pleaſure, and thereby the mixture of rays in the oblong image was as much or as little as he choſe. He ſometimes made the breadth of the image 40 times, and ſometimes 60 or 70 times leſs than its length. In this manner, he ſays, light is made ſufficiently ſimple, and homogeneal, for trying any of his experiments about ſimple light; for that the heterogeneous rays in this light are ſo few, as hardly to be perceived, excepting, perhaps, in the indigo and violet, which, being dark colours, do eaſily ſuffer a ſenſible allay by that little ſcattering light, which uſed to be refracted irregularly by the inequalities of the priſm. The whole proceſs of this experiment is ſo evident, by inſpection of *fig.* 11, that it needs no particular illuſtration.

Inſtead of a circular hole, our author recommends a hole ſhaped like a long parallelogram, with its length parallel to the priſm. For if this hole be an inch or two long, and but a 10th or 20th part of an inch broad, or narrower, the light of the image will be as ſimple as before, or more ſimple, and the image will become much broader, and therefore more fit for theſe experiments.

Or, inſtead of this hole, another may be formed of a triangle of equal ſides, whoſe baſe may be about the 10th part of an inch, and its height an inch or more. For, by this means, if the axis of the priſm be parallel to the perpendicular of the triangle, the image *p t* (*fig.* 12.) will now be formed of equicrural triangles, *a g*, *b h*, *c i*, *d k*, *e l*, *f m*, &c. and innumerable other intermediate ones, anſwering to the triangular hole in ſhape and bigneſs, and lying one after another in a continual ſeries, between two parallel lines, *a f*, *g m*. Theſe triangles are a little intermingled at their baſes, but not at their vertices; and therefore the light on the brighter ſide, *a f*, of the image, where the baſes of the triangles are, is a little compounded, but on the darker ſide, *g m*, it is altogether uncompounded; and in all places between the ſides, the compoſition is proportionable to the diſtances of the places from that obſcurer ſide *g m*; and having an image of ſuch a compoſition, we may try experiments either in its ſtronger and leſs ſimple light, near the ſide *a f*; or in its weaker and more ſimple light, near the other ſide *g m*, as ſhall ſeem moſt convenient.

In making theſe experiments, he adviſes, that the chamber be made very dark, that the lens be very good, being made of glaſs free from bubbles and veins, the ſides of the priſm truly plane, and its poliſh elaborate, with an angle of about 65 or 70 degrees; and the edges of the priſm and lens, as far as they make any irregular refraction, ſhould be covered with black paper glued on them. He alſo obſerves, that all the uſeleſs light ſhould be intercepted with black paper, or other black obſtacles. It being difficult to get glaſs priſms fit for theſe nice experiments, he ſometimes uſed priſmatic veſſels made with pieces of broken looking-glaſſes, and filled with rain-water; and to increaſe the refraction, he ſometimes ſtrongly impregnated the water with *ſaccharum ſaturni*.

When he had, by this means, got the ſides of the coloured image, as A F, G M, (*fig.* 13.) diſtinctly defined, he delineated on paper the outlines of it F A P G M T, and held the paper ſo that the image might fall on this figure, and coincide with it exactly; whilſt an aſſiſtant, whoſe eyes could diſtinguiſh colours better than his own, did, by right lines drawn croſs the image, mark the confines of each colour; and this operation being frequently repeated, both on the ſame and on different papers, he found that the obſervations agreed well enough with one another, and that the ſides, M G and F A, were by this means divided like a muſical chord; ſo that if G M were produced to X, making M X equal to G M, and if G X, *l* X, *i* X, *h* X, *e* X, *g* X, *a* X, M X, were in proportion to one another, as the numbers 1, $\frac{8}{9}$, $\frac{5}{6}$, $\frac{4}{5}$, $\frac{3}{4}$, $\frac{3}{5}$, $\frac{2}{3}$, and $\frac{1}{2}$, and ſo repreſented the chords of the key, and of a tone, a third minor, a fourth, a fifth, a ſixth major, a ſeventh, and an eighth above that key. And the intervals M *a*, *a g*, *g e*, *e h*, *h i*, *i l*, and *l* G, were the ſpaces which the ſeveral colours, red, orange, yellow, green, blue, indigo, and violet, took up.

Now theſe intervals or ſpaces, ſubtending the differences of the refractions of the rays, going to the limit of thoſe colours, that is to the points M, *a*, *g*, *e*, *h*, *i*, *l*, G, may, without any ſenſible error, be accounted proportional to the differences of the ſines of refraction of thoſe rays, having one common ſine of incidence; and, therefore, ſince the common ſine of incidence of the moſt and leaſt refrangible rays, out of glaſs into air, was found in proportion to their ſines of refraction as 50 to 77 and 78; if the difference between

tween 77 and 78 be divided, as the line G M is divided by thoſe intervals, there will be 77, 77$\frac{1}{9}$, 77$\frac{2}{9}$, 77$\frac{3}{9}$, 77$\frac{4}{9}$, 77$\frac{5}{9}$, 77$\frac{6}{9}$, 78, for the ſines of refraction of thoſe rays out of glaſs into air, their common ſine of incidence being 50. So then the ſines of the incidences of all the red-making rays out of glaſs into air were to the ſines of their refractions not greater than 50 to 77, nor leſs than 50 to 77$\frac{1}{9}$; but they varied from one another according to all their intermediate proportions, and ſo of the other colours.

Having demonſtrated that the light of the ſun conſiſts of a certain proportion of differently coloured light, our author proves, by another ſeries of experiments, what has been already demonſtrated by a ſingle one mentioned above, that when a beam of light has been divided into its component parts, if they be again mixed, they will produce white; or if any one of them be intercepted, the image will appear tinged, and in a different manner, according to the different colours that are thereby prevented from mixing with the reſt: and to complete the whole, he obſerves, that intercepting all the colours that compoſe the white image except one, and thereby making it to exhibit the appearance of all the colours in order; yet, if he made this ſucceſſion of all the colours very quick, the appearance was always white, though it was demonſtrable that only one colour took place at any one time; and he juſtly obſerves, that if each of theſe colours in ſucceſſion give the idea of whiteneſs, much more will they produce that effect, when they are ſo intimately mixed as they are in a natural ſun-beam.

Not content with compoſing whiteneſs from the ſeparately coloured rays of the ſun, he attempted, and ſucceeded in his attempt, to do the ſame with natural coloured bodies, obſerving the ſame proportions of the reſpective colours that he had found in the ſolar image. The coloured powders which he made uſe of at firſt produced only a kind of grey; but this was in fact a dull white, or whiteneſs mixed with ſhade: for when he contrived to throw a very ſtrong light upon it, it became intenſely white, ſo that a friend of his, who happened to call upon him while he was buſy about theſe curious experiments, and who knew nothing of what he had been doing, pronounced that the powders he had been mixing, when thus illuminated, made a better white than ſome very fine white paper, with which he was comparing it.

As the preceding proportion of all the priſmatic colours makes a white, it is evident that when they are mixed in different proportions, or when only a few of them are uſed, they will make different colours; and our philoſopher has given us the following ingenious method of knowing, in a mixture of primary colours, the quantity and quality of each being given, the colour of the compound. With the centre O, (*fig.* 14.) and the radius O D, deſcribe a circle A D F, and divide the circumference into ſeven parts, proportional to the ſeven muſical tones or intervals contained in an octave, that is in proportion to the numbers $\frac{1}{9}$, $\frac{1}{16}$, $\frac{1}{10}$, $\frac{1}{9}$, $\frac{1}{10}$, $\frac{1}{16}$, $\frac{1}{9}$. Let the firſt, D E, repreſent a red colour, the ſecond, E F, orange, and ſo of the reſt; and let all theſe colours be ſuppoſed to paſs gradually into one another. Let *p* be the centre of gravity of the arc D E, and *q*, *r*, *s*, *t*, *u*, *x*, be the centres of gravity of the other arcs; and about thoſe centres let circles, proportional to the number of rays of each colour in the given mixture, be deſcribed. Then find a common centre of gravity of all thoſe circles; and if a line be drawn from the centre of the circle O, through this point, as ſuppoſe at *z*, the point Y, in which it terminates at the circumference, will ſhew the colour that ariſes from the mixture; and the line O Z will be proportioned to the fullneſs or intenſeneſs of the colour, the centre O repreſenting perfect white. But if only two of the primary colours, which in this circle are oppoſite to one another, be mixed in an equal proportion, the point Z will fall upon the centre O, and yet the colour compounded of thoſe two will not be perfectly white, but ſome faint anonymous colour; for he could never, by mixing only two primary colours, produce a perfect white. Whether it might be the reſult of three taken at equal diſtances in the circumference he could not tell; but he did not much queſtion, but that four or five of them would be ſufficient. Theſe, however, as he obſerves, are curioſities of little or no moment to the underſtanding of the phenomena of nature, ſince, in all natural whites, there is a mixture of all kinds of rays. Newton's Optics. Prieſtley's Hiſt. of Light and Colours.

For the method of correcting the effect of the different refrangibility of the rays of light in glaſſes, ſee Aberration and Telescope; ſee alſo Dispersion *of Light*.

Refrangibility *of Radiant Heat*. See Rays *of Heat*. Radiant heat, as well as light, is not only refrangible, but it is alſo ſubject to the laws of the diſperſion, ariſing from its different refrangibility. The priſm refracts radiant heat, ſo as to ſeparate that which is leſs efficacious from that which is more ſo. The whole quantity of radiant heat contained in a ſun beam, if this different refrangibility did not exiſt, muſt inevitably fall uniformly on a ſpace equal to the area of the priſm; and if radiant heat were not refrangible at all, it would fall upon an equal ſpace, in the place where the ſhadow of the priſm, when covered, may be ſeen. But neither of theſe events taking place, it is evident that the radiant heat is ſubject to the laws of refraction, and alſo to thoſe of the different refrangibility of light. Whence Dr. Herſchel is led to ſurmiſe, that radiant heat conſiſts of particles of light of a certain range of momenta, which range may extend a little farther, on each ſide of refrangibility, than that of light. (See Rays *of Heat*.) Dr. Herſchel having found that two degrees of heat were obtained from that part of the priſmatic ſpectrum which contained the violet rays, while the full red colour, on the oppoſite ſide, gave no leſs than ſeven degrees, infers from theſe facts the different refrangibility of the rays which occaſion heat, as clearly and certainly as it is concluded that the refrangibility of light is aſcertained by the diſperſion and variety of the colours. But he proceeds farther, and obſerves, that the rays of heat are of a much more extenſive refrangibility than thoſe of light. In order to make this appear, he delineates a ſpectrum of light, by aſſuming a line of a certain length; and, dividing it into ſeven parts, according to the dimenſions aſſigned to the ſeven colours by ſir Iſaac Newton, in the fourth figure of the ſecond part of his Optics, repreſents the illuminating power of which each colour is poſſeſſed, by an ordinate drawn to that line. And here, as the abſolute length of the ordinates is arbitrary, provided they be proportional to each other, he aſſumes the length of that which is to expreſs the maximum, equal to $\frac{2}{3}\frac{7}{3}$ of the whole line.

Thus, let G Q (*fig.* 15.) repreſent the line that contains the arrangement of the colours, from the red to the violet. Then, erecting on the confines of the yellow and green the line L R = $\frac{2}{3}\frac{7}{3}$ of G Q, it will repreſent the power of illumination of the rays in that place. For, by experiments already delivered, we have ſhewn that the maximum of illumination is in the brighteſt yellow or paleſt green rays. From the ſame experiments we collect, that the illuminations of yellow and green are equal to each other, and not much inferior to the maximum; this gives us the ordinates K and M. Then, by the reſt of the ſame experiments, we obtain alſo the

the ordinates H, I, N, O, P, with ſufficient accuracy for the purpoſe here intended. All theſe being applied to the middle of the ſpaces which belong to their reſpective colours, we have the figure G R Q G, repreſenting what may be called the ſpectrum of illumination.

We are now, in the ſame manner, to find a figure to expreſs the heating power of the refracted priſmatic rays, or what may be called the ſpectrum of heat. In order to determine the length of the baſe, Dr. Herſchel examined the extent of the inviſible rays, and found, that at a diſtance of two inches beyond viſible red, his thermometer, in a few minutes, acquired $1\frac{1}{4}$ degree of heat. The extent of the coloured ſpectrum at that time, or the line which anſwered to G Q in his figure, meaſured 2.997 inches. If two inches had been the whole of the extent of the inviſible part, it might be ſtated to be in proportion to the viſible one as 2 to 3; but we are to make ſome allowance for a ſmall ſpace required beyond the laſt ordinate, that the curve of the heating power drawn through it may reach the baſe; and indeed, at $2\frac{1}{4}$ inches beyond viſible red, Dr. Herſchel could ſtill find $\frac{1}{2}$ degree of heat. It appears therefore ſufficiently ſafe, to admit the baſe of the ſpectrum of heat A Q, to be to that of the ſpectrum of light G Q, as $5\frac{1}{4}$ to 3; or, conforming to the Newtonian figure before mentioned, the baſe of which is 3.3 inches, as $57\frac{3}{4}$ to 33. Now, if we aſſume for the maximum of heat, an ordinate of an equal length with that which was fixed upon for the maximum of light, it will give us a method of comparing the two ſpectra together. Accordingly, Dr. Herſchel has drawn the ſeveral ordinates B, C, D, E, F, G, H, I, K, L, M, N, O, P, of ſuch lengths as, from experiments made on purpoſe, it appeared they ſhould be, in order to expreſs the heat indicated by the thermometer, when placed on the baſe, at the ſeveral ſtations pointed out by the letters.

A mere inſpection of the two figures, which have been drawn as lying upon one another, will enable us now to ſee how very differently the priſm diſperſes the heat-making rays, and thoſe which occaſion illumination, over the areas A S Q A, and G R Q G, of our two ſpectra! Theſe rays neither agree in their mean refrangibility, nor in the ſituation of their maxima. At R, where we have moſt light, there is but little heat; and at S, where we have moſt heat, we find no light at all!

REFRESHMENT, *Quarters of.* See QUARTERS.

REFRET, *Fr.* the burden of a ſong. This word is only to be found in the ſecond folio edition of Bailey's Dictionary, 1736. In no French dictionary is there authority for it. Cotgrave, Dict. du Vieux Langage; Trevoux, Dict. de l'Académie; and Gloſſaries, have been conſulted in vain.

REFRIGERANT, REFRIGERATIVE, in *Medicine*, or *cooling*, from *frigus*, *cold*, an appellation given to ſuch remedies as were ſuppoſed to poſſeſs a power of cooling the internal parts. Hence all diluents, ſuch as ptiſan, gruel, and other thin drinks, vegetable and mineral acids, neutral ſalts, and other ſubſtances, which are deſtitute of ſtimulating qualities, and communicate a ſenſation of coolneſs to the tongue and throat, have been conſidered as refrigerant. As they have no actual power of generating cold in the animal body, the term is ſomewhat incorrect; but as it expreſſes the oppoſite quality to that of ſtimulating, which is uſed alſo as ſynonimous with *heating*, it is ſtill retained, and applied to diet, drink, and medicine of a non-ſtimulant quality. In this ſenſe, the term is nearly ſynonimous with *ſedative*.

Whatever, in fact, increaſes the circulation, increaſes the heat of the body, and *vice verſâ*; potentially, therefore, all ſedative medicines may be ſaid to be refrigerant. The uſe of refrigerants will thence be inferred to be proper in all thoſe caſes in which there is an over-excitement of the circulation, either locally or generally; ſuch as local inflammations, febrile diſeaſes, hæmorrhages, and the like. In the caſe of external inflammations, indeed, actual refrigeration may be produced, by the application of cold ſubſtances, water or ice, or by the abſtraction of heat by means of evaporation; both of which afford the means of directly diminiſhing the activity of the veſſels of the part. Thus, in burns and ſcalds, the pain is inſtantly relieved, and the inflammation effectually reduced, by the immerſion of the part in cold water, if ſufficiently perſevered in. But in reſpect to internal refrigerants, their operation is of a negative kind, and conſiſts rather in the removal of uneaſy ſenſations, and in the excluſion of ſtimulant ſubſtances, than in the actual ſuppreſſion of increaſed action. See SEDATIVE.

REFRIGERATION, denotes the act of cooling, or the abſtraction of heat from various ſubſtances. This is effected in a variety of ways, and for various purpoſes of domeſtic uſe and of art; and the degree of cold that is produced is eſtimated by an inſtrument called the *thermometer*, which ſee. Under this head it is needleſs to repeat the principles of refrigeration, and the different proceſſes that are uſed for this purpoſe, which are amply ſtated and deſcribed under the articles COLD, CONGELATION, COOLING, FREEZING, HEAT, ICE, ICE-*houſes*, &c.

REFRIGERATORY, REFRIGERATORIUM, in *Chemiſtry*, a copper veſſel filled with cold water, ſoldered round the capital of an alembic, to cool and condenſe the vapours raiſed thither by the fire, and to convert them into a liquor, to be diſcharged thence through the beak. See ALEMBIC.

The water in the refrigeratory is to be changed from time to time, as it begins to grow warm.

Sometimes they content themſelves with wrapping a wet cloth about the head of the alembic, inſtead of a refrigeratory; but the more uſual method now is, to ſupply the place of the refrigeratory by a worm, or ſpiral pipe, running through a tub of cold water.

Diſtillation chiefly conſiſts in evaporation and refrigeration. See DISTILLATION.

REFUGE, REFUGIUM, in our *Old Cuſtoms*, a *ſanctuary*, or *aſylum*; which ſee reſpectively.

At Paris there is an hoſpital called the *Refuge*, in which diſſolute women are ſhut up.

REFUGE, *Cities of*, in *Scripture Hiſtory*, ſix cities ſelected from the 48 appropriated to the reſidence of the Levites, which were appointed for the protection of perſons from the rigour of the law, who were chargeable with involuntary homicide. Some have ſuppoſed that all the cities of the Levites were aſyla; but it appears from Numb. xxxv. 6. that only ſix of them were appointed to this uſe. Theſe aſyla were intended not only for Jews, but for Gentiles, or for ſtrangers who dwelt among them. (Numb. xxxv. 15.) They were not deſigned as ſanctuaries for wilful murderers and all ſorts of atrocious villains among the Jews, as they were among the Greeks and Romans, and as ſuch places have ſince been in Roman Catholic countries, but merely for ſecuring thoſe who had been guilty of involuntary homicide (Deut. xix. 4—10.) from the effects of private revenge, until they were cleared by a legal proceſs. It is obſervable, that the Iſraelites are commanded to "prepare the way," that is, to make the road good, "that every ſlayer may flee thither," without impediment, and with all expedition. (Deut. xix. 3.) By having good roads to them, at leaſt 32 cubits, or about 48 feet in breadth, and bridges wherever

wherever they were neceſſary, theſe cities were to be eaſy of acceſs; and at croſs roads poſts were erected with inſcriptions, directing the way to the "city of refuge." Upon this Hottinger remarks, that it was probably in alluſion to this cuſtom, that John the Baptiſt is deſcribed as "the voice of one crying in the wilderneſs, prepare ye the way of the Lord, make his paths ſtraight." (Luke, iii. 4—6.) He was the Meſſiah's forerunner, and in that character was to remove the obſtacles to men's flying to him as their aſylum, and obtaining σωτηριον τε θεε, the ſalvation of God. Every year, on the 15th of Adar, (February,) the magiſtrates were to inſpect the roads, and aſcertain their good condition. Theſe cities were to be ſupplied with water and proviſions; but they were not to be the reſidence of any artiſts who made weapons, by the uſe of which the relations of the deceaſed might gratify their revenge. It was neceſſary that thoſe who took refuge in theſe places ſhould underſtand ſome occupation, that might prevent their being chargeable, whilſt they were waiting for their trial. In order to excite and maintain the greater horror even of involuntary bloodſhed, the law puniſhed it by a kind of baniſhment, for the accuſed perſon was to remain in this city, without departing from it, till the death of the high-prieſt, but after the high prieſt's death, he might ſafely go wherever he pleaſed.

REFUGEES, French Proteſtants, who, by the revocation of the edict of Nantes, in 1685, have been conſtrained to quit their country, and retire for refuge into Holland, Germany, England, &c. to ſave themſelves from the neceſſity of abandoning their religion.

REFUGIO, El, in *Geography*, a harbour in one of the iſlands of Mayorga, where Maurelle was ſupplied with water in 1781, and which, he ſays, affords ſhelter from the moſt furious winds. S. lat. 18° 36′. E. long. 177° 32′.

REFVINGE, a town of Sweden, in the province of Halland; nine miles N.N.W. of Helmſtad.

REFUSAL, in *Law*, is where one hath by law a right and power of having or doing ſomething of advantage to him, and he declines it. An executor may refuſe an executorſhip: but the refuſal ought to be before the ordinary; if an executor be ſummoned to accept or refuſe the executorſhip, and he doth not appear upon the ſummons and prove the will, the court may grant adminiſtration, &c. which ſhall be good in law till ſuch executor hath proved the will; but no man can be compelled to take upon him the executorſhip, unleſs he hath intermeddled with the eſtate. (1 Leon. 154. Cro. Eliz. 858.) Where there are ſeveral executors, and they all refuſe, none of them ſhall adminiſter afterwards; but if there is a refuſal by one, and the other proves the will, the refuſing executor may adminiſter when he will, during the life of his co-executor. (1 Rep. 28.) If there is but one executor, and he adminiſters, he cannot refuſe afterwards, and if once he refuſe, he cannot adminiſter afterwards.

There is a refuſal of a clerk preſented to a church, for want of literature, &c. and if a biſhop once refuſes a clerk for inſufficiency, he cannot accept of him afterward, if a new clerk is preſented. (5 Rep. 58. Cro. Eliz. 27.) In action of trover and converſion, a demand of the goods, and refuſal to deliver them muſt be proved, &c. 10 Rep. 56.

REFUTATION, Refutatio, in *Rhetoric*, that part of the anſwer made to an opponent, which diſproves what had been advanced by him.

REGA, in *Geography*, a river of Pomerania, which riſes three miles N.W. of Dramburg, paſſes by Regenwalde, Plate, Grieffenberg, Treptow, &c., and then runs into the ſea, 12 miles S.W. of Colberg.

REGAH, a town of Egypt, on the left bank of the Nile; ſix miles N. of Atfieh.

REGAL, Regius, or *Regalis*, ſomething belonging to a king. Regal is of the ſame import with royal; the former being formed of the Latin *rex*; the other of the French *roy*, *king*.

Regal, Fr., a muſical term, which the Encyclopédie defines, "*firſt*, an ancient inſtrument compoſed of many ſticks of ſonorous wood of different lengths, forming a ſcale, played upon by an ivory ball faſtened to the end of a ſtick." This is exactly the deſcription of the ſticcado, ſaid to be invented by the brother of Bremner, the late muſicſeller in the Strand, who publiſhed a book of inſtructions for playing upon it.

"Regal is, *ſecondly*, a ſpinet organized, or rather a ſmall organ of two or three ſtops placed under a keyed inſtrument, very common in Spain and Italy. In France this kind of inſtrument is called a *poſitif*." Craing, an organbuilder in London about the middle of the laſt century, furniſhed organs of this kind to many harpſichords and ſpinets in a virginal form. Snetzler, when he firſt came hither from Straſburg, was employed by Shudi to organize his harpſichord.

But regal in all Roman Catholic countries is a portable organ uſed in proceſſions, carried by one perſon and played by another. We have ſeen that uſe made of this kind of organ at Naples. The pipes are of reeds, for the lightneſs of carriage.

In the liſt of Edward VI. and queen Elizabeth's muſical eſtabliſhments in the Sloane MSS. at the Britiſh Muſeum, among the inſtrument-makers, the regal-maker is allowed 20*l.* yearly. And in our own memory there was an office in the chapel royal under the title of "tuner of the regals;" but it was aboliſhed, and united to ſome more uſeful officer in the chapel.

In the ſupplement to the folio Encyclopédie, we are told that the regal is a portable organ, which has no pipes, or at moſt ſuch as are very ſhort, the tones being produced by reeds. This we believe to be the truth. The inſtrument is ſometimes ſo ſmall as to be ſet on a table.

Regal *Fiſh*. See Royal *Fiſh*.

Regal *Suit*. See Suit.

REGALE, in the French *Juriſprudence*, is a right belonging to the king over all benefices in that kingdom.

The regale conſiſts in enjoying the revenues of biſhoprics, during the vacancy of their ſees, and of preſenting to the benefices dependent on them, which become vacant during that time, and till ſuch a ſucceſſor have taken the oath of fidelity, and have procured letters patent, to ſecure him from the regale.

The enjoyment of the fruits of the fee is called the *temporal* regale; that of preſenting the benefices, the *ſpiritual* regale.

Some refer the origin of the regale to the time of Clovis; and ſay, the clergy granted this privilege to the king upon his defeating the Viſigoths; others allege, that pope Hadrian I. gratified Charlemagne with it, in a council held at Rome. It is obſerved by others, that the regale was originally no more than a ward, or adminiſtration; and that the kings were only depoſitaries of the fruits of the vacant biſhoprics; and appointed œconomi to look to them during the vacancy.

It is added, that the kings of the firſt and ſecond race never enjoyed any ſuch privilege; and that it was only introduced in the twelfth century, in favour of inveſtitures.

Whatever was the origin of the regale, it occaſioned a very

very important and warm debate between Lewis XIV. and pope Innocent XI. which began about the year 1678, and was carried on with great animoſity and contention for ſeveral years after. Lewis was deſirous, that all the churches in his dominion ſhould be ſubject to the regale. Innocent pretended, on the contrary, that his claim could not be granted with ſuch univerſality; nor would he conſent to any augmentation of the prerogatives of this nature that had formerly been enjoyed by the kings of France. Lewis ſummoned, for ſettling this diſpute, the famous aſſembly of thirty-five biſhops, and as many deputies of the ſecond order, which met at Paris in the year 1682, and which extended the regale to all the churches in France, without exception. In this convocation the ancient doctrine of the Gallican church, that declares the power of the pope to be merely ſpiritual, and alſo inferior to that of a general council, was drawn up in four propoſitions, which were ſolemnly adopted by the whole aſſembly, and were propoſed to the whole body of the clergy, and to all the univerſities through the kingdom, as a ſacred and inviolable rule of faith.

REGALE, *Regalia*, a magnificent treat, or entertainment, given to ambaſſadors, or other perſons of diſtinction, to entertain or do them honour.

In Italy it is uſual at the arrival of any traveller of eminence, to ſend him a regale, that is, a preſent of fruits, ſweetmeats, &c. by way of refreſhment.

REGALIA, in *Law*, the royal rights or prerogatives of a king.

Theſe are reckoned by civilians to be ſix. 1. Power of judicature. 2. Power of life and death. 3. Power of war and peace. 4. Maſterleſs goods, as waifs, eſtrays, &c. 5. Aſſeſſments. 6. Minting of money.

REGALIA is alſo uſed for the ſeveral parts of the apparatus of a coronation: as the crown, the ſceptre with the croſs, ſceptre with the dove, St. Edward's ſtaff, four ſeveral ſwords, the globe, and the orb with the croſs, &c. uſed at the coronation of our kings.

REGALIA *of the Church*, are thoſe rights and privileges which cathedrals, &c. enjoy by grants, and other conceſſions of kings.

Regalia is ſometimes alſo uſed for the patrimony of a church; as, *regalia Sancti Petri.* And more particularly, for ſuch lands and hereditaments as have been given by kings to the church.

"Cæpimus in manum noſtram baroniam et regalia quæ archiepiſcopus Eborum de nobis tenet." Pryn. Lib. Ang.

Theſe regalia, while in poſſeſſion of the church, were ſubject to the ſame ſervices as all other temporal inheritances; and after the death of the biſhop they reverted to the king, till he inveſted another with them; which, in the reigns of William the Conqueror, and ſome of his immediate ſucceſſors, was frequently delayed, and as oft did the biſhops make complaint of it, as appears from Malmſbury, Neubrigenſis, &c.

This laſt author ſays, that great complaint was made againſt Henry II. "Quod epiſcopatus vacantes, et provenientia perciperet commoda, diu vacare voluit, et eccleſiaſticis potius uſibus applicanda in fiſcum redegit."

REGALIA *Facere* is uſed for the biſhop's doing homage, or fealty, to the king, when he is inveſted with the regalia. Thus Malmſbury, in Anſelm: "Regalia pro more iſtius temporis faciens principi vii. kalend. Octobris Cantuariæ aſſedit."

REGALITIES. See ROYALTIES.

REGAN, in *Geography*, a town of Perſia, in the province of Kerman, and diſtrict of Nurmanſheer, on the frontier of Kerman to the eaſt, which diſtrict is about 90 miles in length, and in breadth from 30 to 80. This diſtrict is bounded on the N. and S. by a range of mountains, thoſe to the S. being covered with ſnow during the greater part of the year. The ſoil is fertile, the diſtrict populous, and well watered by ſtreams from the mountains, and the climate hot in the plain, but cold on the mountains. The Afghans were lately expelled from this diſtrict by the Perſians, who invited different tribes of Balouches to occupy the deſerted villages.

Regan is a neat little town, ſurrounded by a mud wall, within which the cattle of the inhabitants are driven every night for protection. The fort is quadrangular, the walls high and in good repair, and flanked with baſtions, with one gate, conſtantly guarded for preventing the entrance of ſtrangers. The capital of Nurmanſheer is Krook, which is the reſidence of the governor, and built in the ſame ſtyle as Regan, but larger, and ſurrounded by a deep ditch. Before the expulſion of the Afghans, a city, called Bumm, was conſidered as the frontier town of Perſia in this quarter. This city is ſtrongly fortified by a high mud wall, flanked with towers, ſurrounded by a deep and broad dry ditch, with one gate; and it has a bazar tolerably ſupplied with dates, milk, and fruit. The ruins of Bumm teſtify that it was formerly of much greater extent than it is at preſent. The fountains are ſaid to have thrown water to an amazing height, and the gardens, which appear to have been walled in, and adorned with elegant ſummer-houſes, produce the moſt delicious pomegranates. Kinneir's Geog. Memoir of the Perſian Empire, 1813.

REGARD *of the Foreſt*, the overſight, or inſpection, of it; or the office and province of the regarder; which is, to go through the whole foreſt, and every bailiwick of it, before the holding of the ſeſſions of the foreſt, or juſtice-ſeat, to ſee and enquire of the treſpaſſes in it, and for the ſurvey of dogs. A court for this purpoſe is to be holden every third year. See EXPEDITATION, and FOREST.

"Ad vivendum, ad inquirendum, ad certificandum, &c." See REGARDER.

REGARD is alſo uſed for the extent of the regarder's charge, *i. e.* for the whole foreſt; or all the ground that is parcel of it.

REGARDANT, in *Heraldry*, is underſtood of a lion, or other beaſt of prey, borne in a poſture of looking behind him, with his face towards his tail.

Others apply it to a beaſt, which only ſhews the head, and ſome part of the neck, as moving from out of ſome diviſion of the coat into another. He bears azure, three bends, or, in a chief, argent, charged with a lion regardant, gules.

REGARDANT *Villain*, or *Regardant to the Manor*, denotes an ancient ſervant or retainer to the lord; thus called, becauſe charged to do all baſe ſervices within the manor, to ſee the ſame freed of all filthy and loathſome things that might annoy it, &c. Coke upon Littleton, fol. 120.

REGARDER *of a Foreſt*, *Regardator Foreſtæ*, an ancient officer of the king's foreſt, whoſe buſineſs was every year, upon oath, to make a regard, *i. e.* to take a view of the foreſt limits; alſo to enquire of all offences and defaults committed by the foreſters within the foreſt, and of all the concealments of them; and whether all the other officers did execute their reſpective duties or not.

Manwood refers this inſtitution to king Henry II. but Spelman thinks the name, at leaſt, was given ſince; and that they were the ſame with thoſe officers called *cuſtodes venationis*.

REGATTA is a name given at Venice to a kind of exhibition on the water, in which the gondoliers conteſt for ſuperiority in the art of rowing their gondolas.

A ſplendid entertainment, under this appellation, was exhibited on the Thames in 1775.

REGAU, in *Geography*, a town of Auſtria; 12 miles W. of Steyr.

REGE INCONSULTO, in *Law*, is a writ iſſued from the king to the judges, not to procced in a cauſe which may prejudice the king, until he is adviſed. A *rege inconſulto* may be awarded, not only for the party to the plea, but upon ſuggeſtion of a ſtranger, on cauſe ſhewn that the king may be prejudiced by the proceeding, &c.

REGE *Querela Coram*. See QUERELA.

REGEL, or RIGEL, in *Aſtronomy*, a fixed ſtar of the firſt magnitude, in Orion's left foot.

REGELSBRUN, in *Geography*, a town of Auſtria; ſeven miles N. of Brugg.

REGEN, a river which riſes on the borders of Bohemia, and runs into the Danube, near Ratiſbon.—Alſo, a town of Bavaria, on the above-named river; 40 miles E. of Ratiſbon.

REGENERATED TARTAR. See TARTAR, *Regenerated*.

REGENERATION, in *Theology*, the act of being born again by a ſpiritual birth, or becoming a child of God: or it is that change of heart and life experienced by a perſon, who forſakes a courſe of vice, and ſincerely embraces a life of piety and virtue.

When an infidel is converted, baptiſm is always adminiſtered as a ſign of regeneration.

The term is alſo uſed to ſignify the change of ſtate that takes place at the reſurrection. Matt. xix. 28.

REGENSBERG, in *Geography*, a town of Switzerland, in the canton of Zurich, ſituated on a mountain, and ſurrounded with walls in the year 1687: it is the principal place of a bailiwick formerly ſubject to the dukes of Auſtria; 6 miles E. of Baden.

REGENSBURG. See RATISBON.

REGENSTAUF, a town of Bavaria, in the principality of Neuburg; ſeven miles N. of Ratiſbon.

REGENSTEIN, a town of Weſtphalia, in the biſhopric of Halberſtadt; ſeven miles W. of Quedlinburg.

REGENSTORF, or *Old Regenſberg*, a bailiwick of Switzerland, in the canton of Zurich, which derives its name from that of an ancient caſtle, deſtroyed in 1443.

REGENT, REGENS, a perſon who governs a kingdom during the minority or abſence or incapacity of a king.

In France, the queen-mother has the regency of the kingdom, under the title of *queen-regent*, while the king is a minor. Some have urged, that women, being incapable of ſucceeding to that crown, were incapable of the regency; but cuſtom has declared in their favour.

REGENT is alſo uſed for a profeſſor of arts and ſciences, who holds a claſs, or ſet of pupils, in a college.

The foreign univerſities are generally compoſed of doctors, profeſſors, and regents. Regent and ſcholar are relative terms. See TUTOR.

Regent is generally reſtrained to the lower claſſes, as regent of rhetoric, regent of logic, &c.; thoſe of philoſophy are rather called profeſſors.

REGENWALDE, in *Geography*, a town of Hinder Pomerania, on the Rega; 30 miles N.N.E. of Stargard. N. lat. 53° 49'. E. long. 15° 24'.

REGERENDARIUS, among the Romans, an officer who ſubſcribed and kept a regiſter of all petitions preſented to the præfect. Pitiſc. in voc.

REGESTOLA, in *Ornithology*, a name uſed by ſome authors for the mattageſs, or larger butcher-bird, a very ſmall hawk, not exceeding the ſize of a common thruſh, but very fierce and voracious. See LANIUS *Excubitor*.

REGETZ, in *Geography*, a town of Hungary; 18 miles S. of Caſchau.

REGGE, a river of Holland, which riſes near Enſchede, and after paſſing by Ghoer, Ryſen, &c. joins the Vecht near Ommens.

REGGIO, PIETRO, in *Biography*, a native of Genoa, who ſeems to have been the firſt Italian who gave our country a taſte for the vocal refinements of his country. Before his arrival here, he had been in Spain, Germany, Sweden, and France. Beſides refinements in florid ſong, he was much admired for his exquiſite manner of accompanying himſelf on the lute. His firſt reſidence in England was at Oxford, where he publiſhed, in 1677, a ſmall tract, entitled "A Treatiſe to ſing well any ſong whatever." In 1684 his book of ſongs, in folio, the words chiefly from Cowley, appeared. We know not what were the taſte and expreſſion which rendered his vocal powers ſo captivating; but his airs are very dry and monotonous, and in as old an Italian taſte as thoſe of Lulli.

REGGIO, in *Geography*, a city of Italy, capital of the department of the Croſtolo, and formerly of the duchy of Modena, the ſee of a biſhop, ſuffragan of Bologna. It was founded by the Tuſcans, and became a Roman colony under Lepidus the triumvir. It was deſtroyed by Alaric, and rebuilt by Charlemagne. Its number of convents is 16, and of inhabitants about 18,000. The cathedral contains many capital pictures and ſculptures. The inhabitants of this city were the firſt of all the Italians, who in 1794 renounced their allegiance to their own ſovereign, Hercules III., who fled to Venice, afterwards took up arms, and ſolicited the protection of Bonaparte. He took poſſeſſion of the city, proclaimed the liberty of the inhabitants, and inſtituted a legiſlative committee, who took the oath of allegiance to the French republic. Reggio is the native place of the poet Arioſto; 14 miles W.N.W. of Modena. N. lat. 44° 41'. E. long. 10° 38'.

REGGIO, a ſea-port town of Naples, in Calabria Ultra, ſituated on the ſtraits of Meſſina. The inhabitants carry on manufactures of ſtockings, gloves, and waiſtcoats of thread or ſilk. This place is the ſee of an archbiſhop, founded by the patriarch of Conſtantinople, and contains two colleges and ſeven convents. The environs abound in oranges, citrons, mulberries, and grapes, with ſome ſugar-canes. This town was called by the Greeks *Rhegion*, derived according to Diodorus from the Greek word ῥηγνυμι, to break or tear, becauſe Sicily was torn from Italy, either by the ſea or an earthquake. It is very ancient, founded as ſome ſay by Jocaſtrus, ſon of Æolus, king of Lipari, who entertained Ulyſſes; or, according to others, by the Chalcidians, who came hither from Eubœa. The territory of the Rhegini was free and powerful, though ſometimes governed by tyrants. In the Peloponneſian war they ſuffered much from their neighbours the Epizephyrian Locri, and were diſtracted by internal contentions. In the time of Dionyſius the elder they were very powerful and aſſerted their liberty, refuſing an alliance with that tyrant, who demanded a daughter of the city. When Pyrrhus waged war againſt the Romans, the latter ſent a legion for the protection of Rhegium; but the ſoldiers murdered the citizens and ſeized on the city. After the war the inſurgents were taken by the Romans, and put to death for their treachery and cruelty. St. Paul, on his journey to Rome, paſſed through this city. In the year 1783 it was almoſt totally deſtroyed

by an earthquake; 10 miles S.E. of Meſſina. N. lat. 38° 6'. E. long. 16° 53'.

REGGIOLO, a town of Italy, in the department of the Mincio; ſix miles E. of Guaſtalla.

REGHABILLE, a town of Africa, in the country of Wangara, ſituated on a lake. N. lat. 12° 47'. E. long. 18° 19'.

REGIA AQUA. See AQUA.

REGIA *Via*. See VIA.

REGIA *Villa*. See VILLA.

REGICIDE, REGICIDA, *a king-killer*. The term is alſo uſed for the act itſelf of murdering a king; of *rex*, *king*, and *cædo*, *I ſlay*.

Regicide is chiefly uſed with us in ſpeaking of the perſons concerned in the trial, condemnation, and execution, of king Charles I.

REGIFUGE, REGIFUGIUM, a feaſt held in ancient Rome on the ſixth of the calends of March, *i. e.* on our 24th of February, in memory of the expulſion of their kings, particularly of Tarquin's flying out of Rome on that day. Some will have the feaſt to bear this name from the *rex ſacrorum*, *king of the ſacrifices*, flying out of the comitia, or place of aſſembly, as ſoon as the ſacrifice was over, in imitation of the flight of Tarquin the Proud.

Some critics and antiquaries will have Regifugium the ſame with Fugalia; others hold them to be different.

REGIMEN, in *Medicine*, from *rego*, *I rule* or *govern*, a rule or courſe of living, with regard to eating, drinking, clothing, and the like, accommodated to ſome diſeaſe, or particular courſe of medicine which the patient is under, or intended as a prevention of ſome threatening malady.

In many diſeaſes, eſpecially thoſe of the acute or febrile claſs, the regimen is often of equal, and ſometimes of more importance than medicine: and there can be no doubt that the humoral phyſicians, by the introduction of a *hot* regimen in the treatment of febrile complaints, contributed to render theſe diſeaſes more ſevere and fatal; and that the ſubſtitution of a cool regimen has of late years very materially diminiſhed the danger and mortality of theſe maladies. This change in medical practice has been, in fact, but a return to nature, and to Hippocrates, who taught this ſimple, but clear and rational principle, "contraria contrariis medentur;" remedies ſhould be of an oppoſite nature to diſeaſes: that is to ſay, if the body is morbidly hot, cold is the remedy; if it is cold, the application of heat is neceſſary; if there is over-diſtention, inflammation, or plethora, evacuation muſt be reſorted to: if depletion, we muſt ſupply nouriſhment: if there is thirſt, the remedy is the free uſe of drink, and ſo forth. The clear inſtincts of nature (where they can be diſtinguiſhed) are commonly infallible guides, as to the regimen to be purſued: but let not morbid habits and prejudices be miſtaken for them. Thus in *all fevers*, ſmall-pox, meaſles, ſcarlet-fever, catarrh, typhus, and the plague itſelf, the natural bias is for freſh air, coolneſs, light bed-clothes, clean linen, cold drink, light and merely liquid nouriſhment, in ſmall quantities, or abſolute abſtinence, quietneſs of mind and body, relief from noiſe, ſtrong light, and every ſpecies of excitement; and this is preciſely the regimen, which experience has proved to be moſt beneficial in ſuch diſeaſes. Under the influence of ſuch a regimen, where proper medicines are alſo employed, every ſymptom is rendered comparatively mild; the diſtreſs of the ſick is diminiſhed, by the ſoothing of every morbid ſenſation; and the derangements, which would otherwiſe enſue, or be aggravated, in the more vital organs, as in the brain, lungs, and alimentary canal, are frequently altogether prevented.

It is ſufficient to contraſt the effects of the hot regimen, in febrile diſeaſes, to be convinced of the truth of theſe obſervations. When a perſon afflicted with any ſpecies of fever, is confined in a cloſe and heated apartment, in which the free circulation of air is prevented by cloſed doors and windows, curtains, &c. and is kept at the ſame time under a load of bed-clothes, and ſupplied with hot drinks, or even cordials of vinous and fermented liquors, with the view of inducing perſpiration, the conſequences are as follow. The whole train of ſymptoms is aggravated. The heat of the patient is raiſed conſiderably above the natural ſtandard, notwithſtanding the profuſe perſpirations that are conſtantly bathing him; the pulſe is excited to the higheſt febrile ſtandard; the thirſt becomes inceſſant to ſupply the unnatural waſte of fluids; the mouth and lips become parched and furred; the head is in conſtant pain, with confuſion of ideas, preventing all ſound ſleep, and occaſioning diſtreſſing dreams, and at length delirium; the whole powers of the frame become proſtrate, with diſpoſition to fainting, on being moved, or on paſſing an evacuation by ſtool; and from this ſituation the recovery is extremely precarious. In caſes of contagious fever, ſuch as ſmall-pox, meaſles, ſcarlet-fever, &c., the eruption is always greatly multiplied by this hot regimen, and all the ſymptoms are changed to what has been called a putrid type; the tongue, teeth, and lips, become coated with a black, clammy, and immoveable fur; purple ſpots appear on the ſkin; and the whole diſeaſe aſſumes the character of malignancy. There is one diſeaſe, indeed, which is ſolely the reſult of this hot regimen, which has made a conſiderable figure in the writings of phyſicians, who never dreamt that it was of their own creation; we allude to the *miliary* fever. See MILIARIA.

The above may perhaps be conſidered as the extreme of the picture, which is ſcarcely ever to be ſeen in the preſent day. But the greateſt difficulty which a phyſician has even now to overcome, in the majority of caſes of feveriſh diſeaſes, is to counteract the tendency of nurſes and parents to the adoption of more or leſs of this pernicious ſyſtem. The ſalutary *chill* muſt be taken away from all liquids, whether uſed internally or externally; the cheering breeze is deemed a death-bringing *draught;* and though the patient may die from the ſeverity of a malignant fever, he muſt on no account run the ſlighteſt riſk of *catching cold;* that is to ſay, the poſſible occurrence of a ſlight ſore-throat, or a running at the noſe, is to be avoided religiouſly, at the expence of aggravating both the ſufferings and the danger, under a more formidable diſeaſe. The uſe of wine and cordials, in theſe diſeaſes, is now confined to the poor and ignorant, and it is to be hoped, that the other parts of the hot regimen will not long be reſorted to, at leaſt among the more intelligent claſſes of ſociety. See COLD *as a remedy*.

REGIMEN, in *Chemiſtry* and *Alchemy*, is the method of ordering and conducting any thing, that it may anſwer its intention.

Thus, regimen of fire is the method of making and ordering fire, and the degrees of it.

REGIMEN *of the Work*, that is, of the philoſopher's ſtone, called the *work of patience*, is the rule and conduct to be obſerved to obtain protection.

There are three things, they ſay, to be chiefly regarded in the regimen of the work. The firſt, to adminiſter a gentle eaſy heat at the beginning of the coction.

The ſecond, to continue this external heat according to the ſeaſon of the work, always obſerving four ſeaſons, as in the common and aſtronomical year; the beginning being the winter, the progreſs the ſpring, then ſummer, and laſtly autumn, which is the time of maturity and perfection of the ſtone;

ſtone; in all which the heat is to be augmented in proportion to the augmentation obſerved in nature.

It is to be added, that the work may not be begun in any ſeaſon; but regard is to be had to the ſeaſons of nature, leſt the winter of the work be found in the ſummer of the year, &c. Which, however, is to be underſtood of the day in which the mercury is put in the ovum philoſophicum, not of that when it is begun to be ſet at liberty from the priſons which nature had incloſed it in.

The third is, that in augmenting the fire, the augmentation be not of a whole degree at once, the ſpirits being unable to bear ſuch violence; but a degree is to be divided into four parts, and one part is to be taken at a time.

All the operations of the firſt regimen are occult and inviſible: in the ſecond regimen comes putrefaction, which, they ſay, is the firſt ſenſible change, ſhewing itſelf by its black colour.

Regimen, or *Government*, in *Grammar*, is that part of ſyntax or conſtruction, which regulates the mutual dependency of words, and the alterations which one part of ſpeech occaſions in another, with regard to its mood, tenſe, or caſe, and thus it differs from concord, or the agreement which one word has with another, in gender, number, caſe, or perſon. See Concord.

The regimen, or government, is entirely arbitrary, and differs in all languages; one language forming its regimen by caſes, as the Latins and Greeks; others by particles in lieu of them, as the Engliſh by *of*, *to*, &c. the French, Spaniards, and Italians, by *de*, *a*, *da*, &c.

There are, however, ſome general maxims which hold good in all languages; as, 1. That there is no nominative caſe in any ſentence but has a reference to ſome verb, either expreſſed or underſtood. Sometimes, indeed, the infinitive mood, or part of a ſentence, is put as the nominative caſe to the verb; as in Engliſh, "to ſee the ſun is pleaſant." Theſe ſentences, or clauſes, thus conſtituting the ſubject of an affirmation, may be termed "nominative caſes."

2. That there is no verb, except in the infinitive mood, or the participle, but has its nominative caſe, either expreſſed or underſtood. Indeed, in languages which have proper accuſatives, as the Latin, before infinitives there is an accuſative, not a nominative caſe; as *Scio Petrum eſſe doctum*. The nominative caſe is commonly placed before the verb; but ſometimes it is put after the verb, if it is a ſimple tenſe; and between the auxiliary and the verb, or participle, if a compound tenſe.

3. Two or more nouns, &c. in the ſingular number, joined together by one or more copulative conjunctions, expreſſed or underſtood, muſt have verbs, nouns, and pronouns, agreeing with them in the plural number. The conjunction disjunctive, however, has an effect contrary to that of the conjunction copulative; for as the verb, noun, or pronoun, is referred to the preceding terms, taken ſeparately, it muſt be in the ſingular.

4. A noun of multitude, or ſignifying many, may have a verb or pronoun agreeing with it, either of the ſingular or plural number; but not without regard to the import of the word, as conveying unity or plurality of idea. In the application of this rule, we ought to conſider whether the term immediately ſuggeſts the idea of the number it repreſents, or whether it exhibits to the mind the idea of the whole as one thing. In the former caſe, the verb ought to be plural; in the latter, it ought to be ſingular.

5. Pronouns muſt always agree with their antecedents, and the nouns for which they ſtand, in gender and number.

6. The relative is the nominative caſe to the verb, when no nominative comes between it and the verb; but when a nominative comes between the relative and the verb, the relative is governed by ſome word in its own member of the ſentence; *e. gr.* "he *who* preſerves me, to *whom* I owe my being, *whoſe* I am, and *whom* I ſerve, is eternal."

7. When the relative is preceded by two nominatives of different perſons, the relative and verb may agree in perſon with either, according to the ſenſe.

8. Every adjective, and every adjective pronoun, belongs to a ſubſtantive, expreſſed or underſtood. Adjective pronouns muſt agree in number with their ſubſtantives; nevertheleſs this rule admits of exceptions; *e. gr.* the word *means* in the ſingular number, and the phraſes "by this means," "by that means," are uſed by our beſt and moſt correct writers, *viz.* Bacon, Tillotſon, Atterbury, Addiſon, Steele, Pope, &c. Campbell, in his "Philoſophy of Rhetoric," has this remark on the ſubject before us: "No perſons of taſte will, I preſume, venture ſo far to violate the preſent uſage, and conſequently to ſhock the ears of the generality of readers, as to ſay 'by this *mean*,' 'by that *mean*.'" Lowth and Johnſon ſeem alſo to be againſt the uſe of *means* in the ſingular number. The diſtributive adjective pronouns, *each*, *every*, *either*, agree with the nouns, pronouns, and verbs of the ſingular number only. Adjectives are ſometimes improperly applied as adverbs. An adjective pronoun, in the plural number, will ſometimes properly aſſociate with a ſingular noun. Although the adjective always relates to a ſubſtantive, it is, in many inſtances, put as if it were abſolute, eſpecially where the noun has been mentioned before, or is eaſily underſtood, though not expreſſed. Subſtantives are often uſed as adjectives: in this caſe, the word ſo uſed is ſometimes unconnected with the ſubſtantive to which it relates; ſometimes connected with it by a hyphen; and ſometimes joined to it, ſo as to make the two words coaleſce. Sometimes the adjective becomes a ſubſtantive, and has another adjective joined to it. When an adjective has a prepoſition before it, the ſubſtantive being underſtood, it takes the nature of an adverb, and is conſidered as an adverb.

9. One ſubſtantive governs another, ſignifying a different thing, in the poſſeſſive or genitive caſe; inaſmuch as that caſe always expreſſes the poſſeſſor, which muſt be governed by the poſſeſſed: as, "my father's houſe," "virtue's reward," &c. When the annexed ſubſtantive ſignifies the ſame thing as the firſt, and ſerves merely to explain or deſcribe it, there is no variation of caſe; as "George, king of Great Britain, elector of Hanover, &c." Nouns thus circumſtanced are ſaid to be *in appoſition* to each other: and nouns are not unfrequently ſet in appoſition to ſentences, or clauſes of ſentences. This rule does not hold ſo apparently in the modern as it does in the ancient languages; becauſe the particles *of*, *de*, &c. which are the proper ſigns of the genitive caſe, are frequently uſed as prepoſitions. (See Genitive.) Subſtantives govern pronouns as well as nouns in the poſſeſſive caſe; as "every tree is known by *its* fruit." Sometimes a ſubſtantive in the genitive or poſſeſſive caſe ſtands alone, the latter one by which it is governed being underſtood. The Engliſh genitive has often an unpleaſant ſound, ſo that we make more uſe of the particle *of* to expreſs the ſame relation: and in ſome caſes, we uſe both the genitive termination and the prepoſition *of*; as "it is a diſcovery of ſir Iſaac Newton's:" but when this double genitive, as ſome grammarians call it, is not neceſſary to diſtinguiſh the ſenſe, and eſpecially in a grave ſtyle, it is generally omitted. Except to prevent ambiguity, it ſeems to be allowable only in caſes which ſuppoſe the exiſtence of a plurality of ſubjects of the ſame kind, as "a ſubject of the emperor's." But after all that can be ſaid for the double genitive, as it is termed,

termed, it is the opinion of ſome grammarians, that it would be better to avoid the uſe of it altogether, and to give the ſentiment another form of expreſſion.

10. Active verbs govern the objective (or accuſative) caſe, as "Virtue rewards her followers." In Engliſh, the nominative caſe, denoting the ſubject, uſually goes before the verb; and the objective caſe, denoting the object, follows the verb active; and it is this order that determines the caſe in *nouns*; as, "Alexander conquered the Perſians:" but the *pronoun* having a proper form for each of thoſe caſes, is ſometimes, when it is in the objective caſe, placed before the verb; and when it is in the nominative caſe, follows the object and verb; as "*whom* ye ignorantly worſhip, *him* declare I unto you." Verbs neuter do not act upon, or govern, nouns and pronouns. Part of a ſentence, as well as a noun or pronoun, may be ſaid to be in the objective caſe, or to be put objectively, governed by the active verb; and ſentences or phraſes under this circumſtance may be termed "objective ſentences or phraſes." The verb *to be*, through all its variations, has the ſame caſe after it as that which next precedes it; ſo that this ſubſtantive verb has no government, or caſe, but ſerves, in all its forms, as a conductor to the two caſes, inſomuch that the two caſes which, in the conſtruction of the ſentence, are the *next* before and after it, muſt always be alike. Paſſive verbs which ſignify *naming*, and others of a ſimilar nature, have the ſame caſe before and after them; as "*he* was called *Cæſar*." It is evident alſo, that certain other neuter verbs, beſides the verb *to be*, require the ſame caſe, whether it be the nominative or the objective, before and after them; ſuch verbs are, to become, to wander, to go, to return, to appear, to die, to live, to look, to grow, to ſeem, to roam, and ſeveral others. The auxiliary *let* governs the objective caſe; as "let *him* beware."

11. One verb governs another that follows it, or depends upon it, in the infinitive mood; as, "ceaſe *to do* evil," "learn *to do* well;" and the prepoſition *to*, though generally uſed before the latter verb, is ſometimes properly omitted; as "I heard him ſay it," inſtead of "*to* ſay it." This irregularity extends only to active or neuter verbs: for many other verbs, when made paſſive, require the prepoſition *to* before the following verb; as "He was ſeen *to go*." The infinitive is frequently governed by adjectives, ſubſtantives, and participles; and this mood has much of the nature of a ſubſtantive, expreſſing the action itſelf which the verb ſignifies, as the participle has the nature of an adjective, ſo that the infinitive mood does the office of a ſubſtantive in different caſes, as in the nominative, "*to play* is pleaſant," and in the objective, "boys love *to play*." The infinitive mood is often made abſolute, or uſed independently on the reſt of the ſentence, ſupplying the place of the conjunction *that* with the potential mood, as "to confeſs the truth, I was in fault." The prepoſition *to*, ſignifying *in order to*, was anciently preceded by *for*, as "what went ye out *for to ſee*;" but the word *for* before the infinitive, is now, in almoſt every caſe, obſolete.

12. In the uſe of words and phraſes which, with reſpect to time, relate to each other, a due regard to that relation ſhould be obſerved. Thus, inſtead of ſaying, "the Lord *hath given*, and the Lord *hath taken* away," we ſhould ſay, "the Lord *gave*, and the Lord *hath taken* away." To preſerve conſiſtency in the time of verbs, and alſo of words and phraſes, ſays Mr. L. Murray, in his excellent treatiſe on Grammar, we muſt recollect that, in the ſubjunctive mood, the preſent and the imperfect tenſes often carry with them a future ſenſe; and that the auxiliaries *ſhould* and *would*, in the imperfect time, are uſed to expreſs the preſent and future, as well as the paſt. With regard to verbs in the infinitive mood, ſays the ſame popular author, the practice of many writers, among whom are ſome of the moſt reſpectable, appears to be erroneous. They ſeem not to advert to the true principles which influence the different tenſes of this mood. The following rules will, according to our author's judgment, be found perſpicuous and accurate. "All verbs expreſſive of hope, deſire, intention, or command, muſt invariably be followed by the preſent, and not the perfect of the infinitive." Inſtead of the phraſe, "the laſt week I intended to *have written*," though common, the infinitive being in the paſt time, as well as the verb which it follows, it ought to be, "the laſt week I intended *to write*:" for how long ſoever it now is ſince I thought of writing, "to write" was then preſent to me, and muſt ſtill be conſidered as preſent, when I bring back that time, and the thoughts of it. Some writers on grammar, however, maintain that the former ſentence is correct and grammatical, becauſe, as they aſſert, it ſimply denotes the ſpeaker's intention to be hereafter in poſſeſſion of the finiſhed action of writing; but this reaſoning admits of the following anſwers, according to the ſtatement of Mr. Murray. The phraſe "to have written" is, in Engliſh grammars, the eſtabliſhed paſt tenſe of the infinitive mood, and as incontrovertibly the paſt tenſe of the infinitive in Engliſh, as *ſcripſiſſe* is the paſt tenſe of the infinitive in Latin; nor can any writers be warranted in taking ſuch liberties with the language, as to contradict its plaineſt rules, for the ſake of ſupporting an hypotheſis. Moreover, theſe writers might, on their own principles, and with equal propriety, contend, that the phraſe "I intended *having written*," is proper and grammatical; but by admitting ſuch violations of eſtabliſhed grammatical diſtinctions, confuſion would be introduced, the language would be diſorganized, and the moſt eccentric ſyſtems of grammar might be advanced, and plauſibly ſupported. In ſhort, ſays our author, the phraſe "I intended to have written," appears to involve the following abſurdity; "I intended to produce hereafter an action or event, which has been already completed." Some may haſtily infer from the rule above ſtated, and from the near relation between the verbs *to deſire*, and *to wiſh*, that the latter verb, like the former, muſt invariably be followed by the preſent of the infinitive. But when any one conſiders, that the act of *deſiring* always refers to the future, and that the act of *wiſhing* refers ſometimes to the paſt, as well as ſometimes to the future, he will perceive the diſtinction between them, and that, conſequently, the following modes of expreſſion are ſtrictly juſtifiable: "I wiſhed *that I had written* ſooner," "I wiſhed *to have written* ſooner;" and he will be perfectly ſatisfied, that the following phraſes muſt be improper: "I deſired that I had written ſooner," "I deſired to have written ſooner." Mr. Murray, having conſidered and explained the ſpecial rule, reſpecting the government of verbs, expreſſive of hope, deſire, intention, or command, proceeds to ſtate and elucidate the general rule, on the ſubject of verbs in the infinitive mood. "This rule," he ſays, "is founded on the authority of Harris, Lowth, Campbell, Pickbourn, &c.; and we think, too, on the authority of reaſon and common ſenſe. "When the action or event, ſignified by a verb in the infinitive mood, is *contemporary* or *future*, with reſpect to the verb to which it is chiefly related, the preſent of the infinitive is required; when it is *not* contemporary, *nor* future, the perfect of the infinitive is neceſſary." To comprehend and apply this rule, the ſtudent has only to conſider, whether the infinitive verb refers to a time antecedent, contemporary, or future, with regard to the governing or related verb. When this ſimple point is aſcertained, there will be no doubt in his mind, reſpecting the

form

form which the infinitive verb ſhould have. A few examples may illuſtrate theſe poſitions. If I wiſh to ſignify, that I rejoiced at a particular time, in recollecting the ſight of a friend, ſome time having intervened between the *ſeeing* and the *rejoicing*, I ſhould expreſs myſelf thus: "I rejoiced *to have ſeen* my friend." The *ſeeing*, in this caſe, was evidently antecedent to the *rejoicing*; and therefore the verb which expreſſes the former, muſt be in the perfect of the infinitive mood. The ſame meaning may be expreſſed in a different form: "I rejoiced *that I had ſeen* my friend;" or, "*in having ſeen* my friend:" and the ſtudent may, in general, try the propriety of a doubtful point of this nature, by converting the phraſe into theſe two correſpondent forms of expreſſion. When it is convertible into both theſe equivalent phraſes, its legitimacy muſt be admitted.—If, on the contrary, I wiſh to ſignify, that I rejoiced at the ſight of my friend, that my joy and his preſence were contemporary, I ſhould ſay, "I rejoiced *to ſee* my friend;" or, in other words, "I rejoiced *in ſeeing* my friend." The correctneſs of this form of the infinitive may alſo, in moſt caſes, be tried, by converting the phraſe into other phraſes of a ſimilar import.

The ſubject may be ſtill further illuſtrated, by additional examples. In the ſentence which follows, the verb is with propriety put in the perfect tenſe of the infinitive mood: "It would have afforded me great pleaſure, as often as I reflected upon it, *to have been* the meſſenger of ſuch intelligence." As the meſſage, in this inſtance, was antecedent to the pleaſure, and not contemporary with it, the verb expreſſive of the meſſage muſt denote that antecedence, by being in the perfect of the infinitive. If, on the contrary, the meſſage and the pleaſure were referred to as contemporary, the ſubſequent verb would, with equal propriety, have been put in the preſent of the infinitive: as, "it would have afforded me great pleaſure, *to be* the meſſenger of ſuch intelligence." In the former inſtance, the phraſe in queſtion is equivalent to theſe words; "*if I had been* the meſſenger;" in the latter inſtance, to this expreſſion; "*being* the meſſenger."

To aſſert, as ſome writers do, that verbs in the infinitive mood have no tenſes, no relative diſtinctions of preſent, paſt, and future, is inconſiſtent with juſt grammatical views of the ſubject. That theſe verbs aſſociate with verbs in all the tenſes, is no proof of their having no peculiar time of their own. Whatever period the governing verb aſſumes, whether preſent, paſt, or future, the governed verb in the infinitive always reſpects that period, and its time is calculated from it. Thus, the time of the infinitive may be before, after, or the ſame as, the time of the governing verb, according as the thing ſignified by the infinitive, is ſuppoſed to be before, after, or preſent with, the thing denoted by the governing verb. It is, therefore, with great propriety, that tenſes are aſſigned to verbs of the infinitive mood. The point of time from which they are computed is of no conſequence; ſince preſent, paſt, and future, are completely applicable to them.

It may not be improper to obſerve, that though it is often correct to uſe the perfect of the infinitive after the governing verb, yet there are particular caſes, in which it would be better to give the expreſſion a different form. Thus, inſtead of ſaying, "I wiſh to have written to him ſooner," "I then wiſhed to have written to him ſooner," "He will one day wiſh to have written ſooner;" it would be more perſpicuous and forcible, as well as more agreeable to the practice of good writers, to ſay; "I wiſh that I had written to him ſooner," "I then wiſhed that I had written to him ſooner," "He will one day wiſh that he had written ſooner."

13. Participles have the ſame government as the verbs from which they are derived; as, "I am weary with *hearing him*," &c. It ſhould be conſidered, however, that participles are ſometimes governed by the article; for the preſent participle, with the definite article *the* before it, becomes a ſubſtantive, and muſt have the prepoſition *of* after it. This rule ariſes from the nature and idiom of our language, and from as plain a principle as any on which it is founded; namely, that a word which has the article before it, and the poſſeſſive prepoſition *of* after it, muſt be a noun; and, if a noun, it ought to follow the conſtruction of a noun, and not to have the regimen of a verb. It is the participial termination of this ſort of words that is apt to deceive us, and make us treat them as if they were of an amphibious ſpecies, partly nouns and partly verbs.

The ſame obſervations, which have been made reſpecting the effect of the article and participle, appear to be applicable to the pronoun and participle, when they are ſimilarly aſſociated. When a ſubſtantive is put abſolutely, and does not agree with the following verb, it remains independent on the participle, and is called the "caſe abſolute," or the "nominative abſolute;" but when the ſubſtantive preceding the participle agrees with the ſubſequent verb, it loſes its abſolutenefs, and is like every other nominative.

14. Adverbs, though they have no government of caſe, tenſe, &c. require an appropriate ſituation in the ſentence, *viz.* for the moſt part, before adjectives, after verbs active or neuter, and frequently between the auxiliary and the verb.

15. Prepoſitions govern the objective caſe. Under this rule we may remark, that the prepoſitions *to* and *for* are often underſtood, chiefly before the pronouns, as "give *me* the book," for *to me*, &c. The prepoſition is often ſeparated from the relative which it governs; as "whom will you give it to?" for "to whom will you give it?" Some writers ſeparate the prepoſition from the noun or pronoun which it governs, in order to connect different prepoſitions with the ſame word; but this kind of conſtruction is always inelegant, and ſhould generally be avoided. Different relations, and different ſenſes, muſt be expreſſed by different prepoſitions, though in conjunction with the ſame verb or adjective. Thus we ſay, "to converſe *with* a perſon, *upon* a ſubject, *in* a houſe, &c." When prepoſitions are ſubjoined to nouns, they are generally the ſame that are ſubjoined to the verbs from which the nouns are derived. Many writers, as Dr. Prieſtley has obſerved, affect to ſubjoin to any word the prepoſition with which it is compounded, or the idea of which it implies, in order to point out the relation of the words, in a more diſtinct and definite manner, and to avoid the more indeterminate propoſitions *of* and *to*: but general practice, and the idiom of the Engliſh tongue, ſeem to oppoſe the innovation. Thus many writers ſay, "averſe *from* a thing;" but others uſe "averſe *to* it," which is more truly Engliſh: "Averſe *to* any advice," Swift. "The words *averſe* and *averſion*," ſays Dr. Campbell, "are more properly conſtrued with *to* than with *from*. The examples in favour of the latter prepoſition are beyond compariſon outnumbered by thoſe in favour of the former. The argument from etymology is here of no value, being taken from the uſe of another language. If, by the ſame rule, we were to regulate all nouns and verbs of Latin original, our preſent ſyntax would be overturned. It is more conformable to Engliſh analogy with *to*; the words *diſlike* and *hatred*, nearly ſynonimous, are thus conſtrued."

16. Conjunctions connect the ſame moods and tenſes of verbs,

verbs, and cafes of nouns and pronouns, as "Candour is *to be approved and practifed.*"

17. Some conjunctions require the indicative, fome the fubjunctive mood, after them. Thofe that are of a pofitive and abfolute nature belong to the former clafs; *e. g.* "*As* virtue *advances, fo* vice *recedes.*" When fomething contingent or doubtful is implied, the fubjunctive ought to be ufed, as "*If I were* to write, he would not regard it." See SUBJUNCTIVE.

18. When the qualities of different things are compared, the latter noun or pronoun is not governed by the conjunction *than* or *as*, but agrees with the verb, or is governed by the verb or the prepofition, expreffed or underftood; as "Thou art wifer than I," that is, "than I am."

19. For the purpofe of avoiding difagreeable repetitions, and of expreffing our ideas in few words, an ellipfis, or omiffion of fome words, is frequently admitted; *e. g.* inftead of faying "He was a learned man, he was a wife man, and he was a good man," we fay, availing ourfelves of the ellipfis, "He was a learned, wife, and good man."

20. All the parts of a fentence fhould correfpond to each other; fo that a regular and dependent conftruction may, throughout, be carefully preferved. The following fentence is inaccurate; "He was more beloved, but not fo much admired, as Cinthio," it fhould be, "He was more beloved than Cinthio, but not fo much admired."

21. The regimen of verbs is frequently laid on different kinds of relations, according to cuftom or ufage; which yet does not change the fpecific relation of each cafe, but only fhews, that cuftom has made choice of this or that, according to fancy. Thus the Latins fay, *juvare aliquem*, and *opitulari alicui, to help one.* So the French fay, *fervir quelqu'un*, and *fervir à quelqu'un, to ferve one.* Thus the Engliih fay, *fight one*, or *fight with one.* And thus, in Spanifh, moft of the verbs active govern indifferently either a dative or an accufative. Sometimes, alfo, the verb admits of feveral regimens; as *præftare aliquem*, or *alicui; eripere morti aliquem*, or *aliquem à morte.*

Indeed, the different regimen fometimes makes an alteration in the fenfe; in which, particular regard is to be had to the ufage of the language. Thus, the Latin *cavere alicui* fignifies *to watch*, or *be careful of the preservation of any one; cavere aliquem* fignifies *to beware of him.*

There is one very common fault in regimen, which our accurate writers fhould be careful to avoid; *viz.* the ufing of two verbs that require different cafes together, as only governing one cafe; as in this example; after *embracing and giving his bleffing to his fon;* where *embracing* requiring an accufative, and *giving* a dative cafe, the regimen or conftruction of the firft verb with the noun is irregular; *embrace to a fon.*

The fame may be obferved in nouns; as, *I conjured him by the memory and the friendfhip he bore my father;* where *memory* does not agree with *he bore.*

For an ample illuftration of thefe rules by appropriate examples, and alfo of the exceptions which pertain to each refpectively, we refer to Mr. Murray's Engliih Grammar, vol. i. ch. 12. See CONCORD and SYNTAX.

REGIMEN, or *Conftruction, State of, Status regiminis*, a phrafe ufed by Hebrew grammarians in contradiftinction to the *abfolute ftate*, or *ftatus abfolutus.* A noun in *ftatu abfoluto* is that which does not govern either a genitive or any oblique cafe; and it is faid to be *in regimine* or *in conftructione*, when it does govern fuch cafe. Nouns of the former kind feldom undergo any change in the letters that form them, as מלכים צדקים, juft kings, whereas the latter either lofe one of their letters, or undergo a change of one into another; but thefe latter admit of excepted cafes; *e. gr.* fingular mafculine nouns undergo no change *in regimine* מלך ארץ, king of the land, and plurals throw off the final letter, as מלכי ארץ, kings of the earth, for מלכים ארץ. This is alfo the cafe with participles, as פעלי און, working iniquity, and פעל און, workers of iniquity. Singular feminine nouns ending in ה change the ה *in regimine* into ת, as תורת יהוה, the law of the Lord; others, and efpecially plural nouns, undergo no change מלכת שמים, the kingdom of heaven. We fhall here obferve, that the change which takes place on account of the ftate of regimen is made in the governing noun, and not in that which is governed, contrary to the practice in other languages. For other particulars referring to regimen in Hebrew, as well as in Latin, Greek, and other learned languages, we refer to the article SYNTAX.

REGIMENT, derived from the Fr. *regie*, of *regere*, to govern, or from the Fr. *regime*, denoting fyftem or adminiftration, in *War*, a body confifting of feveral troops of horfe, or companies of foot, commanded by a colonel, lieutenant-colonel, and major; or, as fir James Turner defines it, a certain number of companies joined in one body, under one head. A regiment of cavalry confifts of one or more fquadrons; and a regiment of infantry of one or more battalions.

The number of men in a regiment is as undetermined as that of the men in a troop, or company; in a fquadron or battalion.

A battalion in each regiment of foot is divided into companies, but the number of companies is various; though, in England, our regiments are generally ten companies; two of which are called the flanks; one on the right, confifting of grenadiers, and another on the left, formed of light troops. The fquadrons in cavalry, or in regiments of horfe, are divided, fometimes into fix, and fometimes into nine troops. Each regiment has a chaplain, quarter-mafter, adjutant, and furgeon. It has been fuggefted, that every regiment of foot fhould confift of 2400 men, making three battalions of 800 each.

Some German regiments confift of 2000 foot; and the regiment of Picardy in France confifted of 120 companies, or 6000 men.

The French have diftinguifhed between the commanding officer of a regiment of cavalry, and the commanding officer of a regiment of infantry; the former having been called "maître de camp," and the latter "colonel," as with us. According to the prefent eftablifhment of the French army, the term "regiment" is confined to the cavalry and artillery, and the name of half brigade is given to the infantry, fo that "chef de brigade," chief of brigade, correfponds with our colonel of a regiment of infantry. In the French cavalry the term colonel is ftill retained.

Some obferve, that there were no regiments of horfe before the year 1637. Till then the troops were loofe and independent of each other, and not incorporated into a body or regiment.

Regiments, it is faid, were firft formed in France, under the reign of Charles IX. though F. Daniel refers them to the time of Henry II. and in England to the year 1660. Grofe obferves, that we may, without being very much miftaken, place the introduction of regiments and colonels about the reign of king Henry VIII.

We fhall here annex a brief account of fome of the principal regiments of the old corps. The firft and fecond regiments of life-guards claim priority of notice. The life-

guards ſucceeded that body under the ſame denomination which was raiſed by Charles II., ſoon after the reſtoration, the privates of whom were taken from the cavalier gentlemen, who had adopted the profeſſion of arms, and followed the fortunes of his father during the civil wars. As they were for the moſt part men of family, they poſſeſſed certain privileges, ſimilar to thoſe of the houſhold troops in France, after whom they were modelled; and theſe privileges were continued long after the time when they ceaſed to be compoſed of the ſame claſs of men. It was, therefore, found neceſſary to reduce the privates, and to form a new corps, compoſed almoſt entirely of recruits under the old officers, and to place them nearly on the ſame footing with the reſt of the cavalry; reſerving for them, however, the advantages ariſing out of a higher pay, and an exemption from ſtoppages on the part of the privates, whoſe clothing is furniſhed by government. The life-guards claim the privilege, that their officers are not liable to be tried by any court-martial, unleſs the members are compoſed of their own regiment, or of officers of the other houſhold troops. The firſt regiment of life-guards, conſiſting of very fine men, about 6 feet high at an average, was formed in 1788. The uniform is ſcarlet, faced with blue, and gold lace. The commiſſioned officers are a colonel, one lieutenant-colonel, one ſupernumerary lieutenant-colonel, two majors, five captains, ſix lieutenants, one adjutant and lieutenant, five cornets, one ſurgeon, and one veterinary ſurgeon. The non-commiſſioned officers conſiſt of quarter-maſters and corporals. The privates are about 260 in number. Their quarters are permanent at Knightſbridge barracks. The ſecond regiment is on the ſame footing with the firſt, and of the ſame eſtabliſhment. The average height of the men is 5 feet 11¾ inches; the horſes are from 16 to 18 hands high, of a black colour, with long tails. In this regiment, as well as the other, there are five troops; each troop conſiſting of one captain, one lieutenant, one cornet, one quarter-maſter, three corporals, 49 privates, including a farrier, and one trumpeter. Each regiment has one kettle drummer. The officers uſually ride bay-horſes; the kettle drummers and trumpeters, grey. There are two "gold-ſticks," one appertaining to each regiment: their duty is to attend alternately every month on his majeſty. See *Life*-GUARDS.

A body of foot-guards was not regularly organized on the preſent plan till after the reſtoration. The regiment of general Monk, created duke of Albemarle, was, in compliment to him, retained on the eſtabliſhment, when moſt of the other troops were diſbanded. This regiment had been raiſed about ten years before the period alluded to, at Coldſtream, in Scotland; and from this circumſtance it aſſumed the name, which it has borne ever ſince. The year 1660 may thus be conſidered as the era of the formation of the foot-guards; and though other regiments were added, the Coldſtream had the priority. The guards poſſeſs many peculiar honours and privileges: they have precedency of all others; their officers poſſeſs a higher rank in the army; and without expence to themſelves, when on guard at St. James, they have a plentiful table kept for them by the public, and voted annually in the extraordinaries of the army. The king's perſon, the royal family, the Tower, and, in times of danger, the bank of England, are in a particular manner under their protection. Their uniforms are royal, with blue facings, and their pay ſuperior to that of the marching regiments. See *Foot*-GUARDS.

The corps, denominated the royal regiment of horſe-guards, blue, commonly called Oxford blues, derives its appellation from the noble family of Oxford, who was its firſt colonel in 1661. This regiment has diſtinguiſhed itſelf on a variety of occaſions. The following circumſtances are peculiar to this corps. It is the only regiment, denominated "horſe," at preſent on the Britiſh eſtabliſhment. The promotions, that of colonel excepted, are reſtricted to the regiment. The quarter-maſters' commiſſions are ſigned by the king, ſo that they are properly termed commiſſion-officers; whereas in all the other cavalry, or dragoon regiments, quarter-maſters are only warrant-officers. The average height of the men is 5 feet 10½ inches. The uniform of the officers is blue, faced with ſcarlet, gold lace, and buff lining; of the privates, blue, with plain red lappets, very broad buff croſs-belts, and gloves of the ſame colour. The troopers' horſes are black, with long tails. The corps conſiſts of nine troops; and to each troop belong four commiſſioned officers, five non-commiſſioned officers, and 54 private men: there are, beſides, the colonel, one lieutenant-colonel, one major, an adjutant, a regimental ſurgeon and aſſiſtant, and a veterinary ſurgeon. See *Horſe*-GUARDS.

The eſtabliſhment of a royal regiment of artillery took place early in the laſt century; the firſt commiſſion of colonel having been iſſued, as it is ſaid, in the firſt year of the reign of George II. In a ſhort time, the number of companies was augmented from four to eight. The uniform was blue, turned up with red; and waiſtcoats and breeches of the colour of the facings were then worn by the officers. The artillery take the right of foot on all parades, and likewiſe of dragoons, when diſmounted. Each battalion conſiſts of one colonel commandant, one ditto en-ſecond, one firſt lieutenant-colonel, two ſecond lieutenant-colonels, one major, ten captains, ten captain-lieutenants, thirty lieutenants, one adjutant, one quarter-maſter, one ſurgeon, and one aſſiſtant ſurgeon. The eſtabliſhment of each company is 120 rank and file. The ſtandard height of the men is 5 feet 9 inches, and upwards. The uniform of the officers is blue, faced with ſcarlet, gold epaulets, no lace, white waiſtcoat and breeches, boots, yellow breaſtplate on a white buff ſhoulder-belt. The uniform of the privates is blue, with red cuffs and collar, no facings, yellow lace, and buttons impreſſed with the ordnance arms. The ſerjeants wear frogged gold lace. The arms of the officers and ſerjeants are yellow-hilted ſwords; of the corporals, bombardiers, and privates, carbine and bayonet. The horſe artillery have ſwords and piſtols. The officers riſe in a regular gradation by ſeniority. See ARTILLERY.

The firſt or royal regiment of foot claims a high degree of antiquity. It is undoubtedly the oldeſt regiment in the ſervice. It is ſaid to have been the body-guard of the Scottiſh kings, whence it has derived its name of the royal Scots, and to have been put upon the Engliſh eſtabliſhment in 1633. The firſt colonel was nominated during the reign of Charles I.; but on the fatal iſſue of the civil wars to that monarch, this corps ſeems to have been diſbanded. At the reſtoration of Charles II., this regiment was re-eſtabliſhed. It conſiſts of two battalions, both commanded by the ſame colonel: in every other reſpect they are conſidered as ſeparate corps. The uniform of the officers is ſcarlet, faced with blue, gold lace embroidered; that of the private ſoldiers red, faced with blue and white lace.

The ſecond, or queen's royal regiment of foot, was raiſed in the year 1661. The regiment being royal, the facings for the whole are blue; the lace for the privates white, with a blue ſtripe.

The third regiment of foot, called the "Buffs," was put upon the regular eſtabliſhment of the army in the year 1665. It was denominated the "Buffs," from being the firſt whoſe accoutrements were made of leather prepared from the buffalo, after the manner of ſhamois. The waiſtcoats, breeches,

and facings of the coat, were afterwards directed to be made of a correſponding colour. When other regiments aſſumed this part of their appointment, the third acquired the name of the "Old Buffs." This regiment has the excluſive privilege of marching through the city of London by beat of drum. Its uniform is red, with buff facings; buff waiſtcoats and breeches. The 31ſt regiment, which has the ſame uniform, is commonly called the "Young Buffs."

The fourth, or king's own regiment of foot, was raiſed in the year 1680, by Thomas earl of Plymouth. This regiment was the firſt that joined king William, on his landing at Torbay; on which occaſion his majeſty honoured it with the title of the king's own regiment; and directed it to bear in its colours the lion of England, which ſtill continues the badge of the regiment, and is worn on the breaſt-plate, buttons, cap, and pouch. The uniform of the regiment, at the beginning of the laſt century, was red, faced with blue velvet, and large velvet cuffs, richly embroidered with gold. The preſent uniform is red, with plain blue facings, ſilver buttons and epaulet, white waiſtcoat and breeches. On the epaulet, buttons, and breaſt-plate, are the crown and garter, and round the latter "The King's own Infantry." In the centre is the lion of England, and under it the number IV in ſmall Roman figures.

The fifth regiment of foot was raiſed by James II.; but it followed the fortunes of the prince of Orange. When the 4th, 5th, and 6th regiments were firſt raiſed, they were not placed upon the Britiſh eſtabliſhment, but ſent by James II. for the ſervice of the ſtates-general. On the abdication of that monarch, and the ſubſequent election of William, prince of Orange, they were numbered and taken into the line, according to the periods at which they landed from Holland. Thus the 4th, which had originally been raiſed after the 5th, arrived in England before it, and took precedence. The 6th, which had been levied before the 5th, returned at a later period than either, and was conſequently placed according to that date. The 5th regiment has been augmented to two battalions, by drafts from the militia; its uniform goſling green facings. The 24th, 54th, and 69th regiments are alſo faced with light green.

The ſixth regiment of foot derives its origin from the ſeven years' war, in the courſe of which the United Provinces of Holland threw off their ſubjection to Spain. Its regular eſtabliſhment did not take place until the year 1673; but it had previouſly ſerved under the three firſt princes of Orange. This was one of the three regiments intended, on their formation, to ſerve in Holland; and, therefore, it was paid by the Dutch republic. It came over to this country with king William, at the revolution in 1688, and was incorporated in our military eſtabliſhment, being numbered as the 6th in the Britiſh line. Its uniform is deep yellow facings, white lace, with yellow and red ſtripes. The 9th, 10th, 12th, 13th, 15th, 16th, 20th, 25th, 26th, 28th, 29th, 30th, 34th, 35th, 37th, 38th, 44th, 46th, 57th, 62d, and 67th regiments have alſo yellow facings and white lace; and are diſtinguiſhed from each other by the variations of the ſtripes, the tinge of the colour, &c.

The ſeventh regiment of foot, or "Royal Fuſileers," was raiſed, with nine others of infantry, and eight of cavalry, under James II., in the year 1685, three years before his abdication. As a fuſileer regiment, the men wear caps, ſimilar to thoſe of the grenadiers, but ſomewhat ſhorter. In all other reſpects they are dreſſed and appointed as the ſoldiers of other battalions. Three years after this, another regiment was raiſed, under the denomination of "Royal Welſh Fuſileers." This partiality for cap regiments is ſaid to have been cauſed by the celebrity of the Britiſh grenadiers, who were eaſily diſtinguiſhed by their caps. (By a regulation in 1800, all the regiments of the line, as well as the guards, are to wear a kind of caps.) The officers in theſe regiments never carried ſpontoons, as the others did, till the late change, but had fuſils, like the officers of the flank companies throughout the army. The other regiments of fuſileers have ſecond lieutenants, inſtead of enſigns. This regiment is peculiar in having none but firſt lieutenants, under the field-officers and captains. The uniform is royal, blue facings, with white lace, and a blue ſtripe. The 8th, 18th, 21ſt, 23d, 42d, and 60th regiments have alſo blue or royal facings, but different lace.

The firſt, or king's regiment of dragoon-guards, was raiſed and entered on the eſtabliſhment on the 6th of June 1685. The eſtabliſhment of this regiment, called, during its ſervices in Germany in the courſe of the ſeven years' war, "Bland's dragoons," from the name of the officer who was then at the head of it, is ten troops, each conſiſting of one captain, one lieutenant, one cornet, one quarter-maſter, four ſerjeants, four corporals, one trumpeter, and ſeventy-one rank and file. The average height of the men is 5 feet 10 inches; of the horſes, 15 hands $1\frac{1}{2}$ inch. The uniform of the officers is ſcarlet and gold lace, blue cuffs and collar; no facings on the ordinary uniform. The uniform of the troopers, red jacket, faced half-lappel, blue, white lace, buttons marked K. D. G. The ſerjeants wear gold lace. The ſecond, or queen's dragoon-guards, is one of the eight cavalry regiments raiſed in 1685, the ſecond year after the acceſſion of king James II. to the throne. Five of theſe remain on the Engliſh eſtabliſhment, and three on the Iriſh: of the former five, three are diſtinguiſhed as "Dragoon-guards," the other two as "Dragoons;" the firſt of which is denominated "the king's own regiment." The uniform of the officers red, faced with black velvet and ſilver lace; and that of the troopers red jacket, black collar and cuffs, royal lace, white buttons, marked Q. D. G. The ſerjeants wear ſilver lace. The third, or prince of Wales's dragoon-guards, is the laſt of the three regiments diſtinguiſhed as dragoon-guards upon the Britiſh eſtabliſhment. The uniform is ſcarlet, faced with white, and yellow buttons. The fourth, or royal Iriſh regiment of dragoon-guards, was raiſed, with ſeven others of the cavalry, in the year 1685, ſoon after James II. aſcended the throne. It was originally called "the Prince of Wales's," or firſt regiment of horſe; and, with the other three of horſe upon the ſame eſtabliſhment, it was, in the year 1788, put upon a new one, and called "Dragoon-guards," numbering on to ſeven; ſo that the fourth of horſe, formerly ſo called, is now the ſeventh dragoon-guards. The uniform is royal, with ſilver lace. The fifth regiment of dragoon-guards, commonly called the "Green Horſe," was originally the ſecond of horſe, and raiſed in England in the reign of king James II., in the month of July 1685. It was at that time put upon the regular Britiſh eſtabliſhment. It went over with king William to Ireland in 1689, and remained more than 100 years upon the Iriſh eſtabliſhment. It is now on the Engliſh eſtabliſhment; and conſiſts of nine troops, of the ſame ſtrength with thoſe of the fourth regiment of dragoon-guards; each troop conſiſting of one quarter-maſter, four ſerjeants, four corporals, one trumpeter, and ſeventy-one privates. The uniform of the regiment is green facings with gold lace for the officers, and yellow for the private men. The height of theſe men is in general from 5 feet 8 inches to 6 feet. The firſt, or royal regiment of dragoons, was raiſed for the ſervice of Charles II. in 1683. Their badge is a horſe-ſhoe, incloſing 1ſt D., encircled with a wreath of laurels; the regiment conſiſts of nine troops, of the uſual number. The colour of the horſes is black. The

ſecond, or royal North Britiſh dragoons, called the "Scots Greys," were raiſed in Scotland during the reign of James II. The uniform is red, with gold lace, no facings, but blue collar and cuff. The horſes are of an iron-grey colour, except thoſe of the officers and trumpeters, which are of a light grey, approaching to white. The fifth, or royal Iriſh regiment of dragoons, was raiſed in or about the year 1688. In conſequence of the good behaviour of this regiment at the battle of Hochſtet, in Auguſt 1704, three additional troops were put upon the eſtabliſhment, making its ſtrength to conſiſt of nine troops. Again this regiment, aſſiſted by the Scots greys, diſtinguiſhed itſelf at the battle of Ramillies in 1706; and both corps were diſtinguiſhed from other cavalry regiments, by being permitted to wear grenadier caps. The permanency of the nine troops was ſecured by an order, dated in 1798. At this time there was an inſurrection of the rebels in the diſaffected parts of Ireland, and this regiment was ordered to reſiſt and ſuppreſs it. In order to ſupply the loſs it ſuſtained in ſeveral conflicts with the rebels, its officers were inſtructed to receive eligible recruits. Many were enliſted, who, as the event afterwards proved, were rebel-partiſans, who entered into a deſperate plot for ſeizing the garriſon at Lehaunſtoun and maſſacring every officer and loyal ſoldier. The conſpirators were ſeized, and ſuffered according to their deſerts. The regiment, however, had the mortification to find it announced in the public papers, that ſeveral privates belonging to the fifth or royal Iriſh dragoons, had been found guilty by a general court-martial of joining the rebels. In conſequence of this the regiment was, on the 10th of April following, diſbanded by an order from his majeſty, dated April 8th, 1799. See Groſe's Mil. Ant. vol. ii. appendix.

REGIMENTAL *Court-martial.* See COURT-*Martial.*

REGIMENTAL *Staff.* See STAFF.

REGIMENTALS, the uniform clothing of the army, conſiſting of a hat, coat, waiſtcoat, breeches, ſhirts, ſtocks, ſhoes, ſtockings, ſpats, ſpatterdaſhes, &c.

REGINA, in *Geography*, a town of Naples, in Calabria Citra; 12 miles N. of Coſenza.

REGINA *Aurarum*, in *Ornithology*, a name given by Nieremberg to a bird called by the Mexicans *cozcacoauhtli*. It has obtained its name from its being able to fly againſt the ſtrongeſt winds. It is of the bigneſs of an eagle, and its whole body is of a blackiſh purple, variegated with a brownish-yellow and deep black; its wings are variegated with black, yellow, and grey; its legs are red; its claws very ſtrong and ſharp; and its beak like that of a parrot; it has ſome rugoſe ſkin on the forehead, and about the beak; and its tail is black above, and grey underneath. It feeds on ſnakes, rats, and other vermin, but will alſo eat human dung; it flies very high; it is a native of Mexico, and breeds in ſpring; its feathers are ſaid to be a remedy for many diſeaſes; but the truth of this account is much to be doubted. Ray.

REGINA, *Salve.* See SALVE.

REGINELLI, NICOLA, in *Biography*, an Italian opera ſinger, renowned for his knowledge and the purity of his taſte. He arrived in London in the autumn of 1746, an old but great ſinger, whoſe voice as well as perſon were in ruin. He firſt appeared on our ſtage in a paſticcio, called "Annibale in Capua." This performer was now turned of fifty; his voice a *ſoprano*, but cracked, and in total decay; his figure tall, raw-boned, and gawky; but there were fine remains of an excellent ſchool in his taſte and manner of ſinging; indeed, he had ſome refinements in his embelliſhments and expreſſion, that cannot be deſcribed, and which we have not ſince heard in any other ſinger. In a *cantabile*, his taſte, to thoſe who had places near enough to hear his *riffioramenti*, was exquiſite; but the imperfections of his voice and figure diſguſted thoſe at a diſtance, to whoſe ears only the worſt part of his performance arrived.

REGINO, a celebrated German eccleſiaſtical writer and chronicler, who flouriſhed in the ninth and tenth centuries. He embraced the monaſtic life at the Benedictine abbey of Prum, in the dioceſe of Treves, and by his conduct gained ſuch general reſpect among the fraternity, that in the year 892 he was made abbot, which office, however, from the jealouſy of his rivals, he was obliged to reſign in 899. After this he probably retired and ſpent the remainder of his days in the abbey of St. Maximin at Treves. He died about the year 908. He was author of "A Chronicon," extending from the birth of Chriſt to the year 907, which is ſaid to be very uſeful in illuſtrating the hiſtory of his time, and particularly that of the Franks and Germans. This chronicon was publiſhed at Frankfort in 1583, with an appendix by another hand, continuing it from the year 907 to 972, and it is to be found in Piſtorius's collection, entitled, "Scriptores de Rebus Germanicis." Regino was author likewiſe of "De Diſciplinis Eccleſiaſticis et Religione Chriſtiana," in two books, of which the firſt contains thoſe canons which relate to eccleſiaſtical perſons, and the ſecond, thoſe which regard the laity. This work was undertaken by him about the year 906, at the deſire of the archbiſhop of Treves, for the ſpecial benefit of his dioceſe. It was firſt publiſhed, with an appendix, by Joachim Hildebrand, at Helmſtadt, in 1659, from a manuſcript of Flacius Illyricus; and afterwards by M. Baluſe, with additions, and a learned preface and notes, in 1671. Trithemius pronounces Regino to have been the beſt German writer of his age.

REGINO, in *Geography*, a town of Golo, or the iſland of Corſica, in the department of Calvi; the canton of which contains 3913 inhabitants.

REGIO ASSENSU, in *Law*, is a writ by which the king gives his royal aſſent to the election of a biſhop.

REGIOMONTANUS, in *Biography*. See MULLER.

REGION, in *Anatomy*, denotes a diviſion of the human body. Some anatomiſts have divided the body into three regions, or venters.

The upper region is that of the head, reaching as low as the firſt vertebra, and comprehending the animal organs, the brain, &c. See HEAD, &c.

The middle region is that of the thorax or breaſt, which Hippocrates calls the upper venter, and which reaches from the clavicles to the diaphragm: in this are contained the vital parts, as the heart, lungs, &c. See HEART, LUNGS, &c.

The third, or lower region, is the abdomen or belly, &c. containing the natural parts, deſtined for digeſtion, purgation, and generation. See ABDOMEN.

REGION, *epicolic*, *epigaſtric*, and *umbilical*. See the adjectives.

REGION, *Regio*, in *Geography*, a country, or particular diviſion of the earth; or a tract of land inhabited by people of the ſame nation.

The modern aſtrologers divide the moon into ſeveral regions, or provinces, to each of which they give its proper name. See MOON.

REGION, in *Phyſiology*. Authors divide the atmoſphere into three ſtages, called the *upper*, *middle*, and *lower* regions. See ATMOSPHERE.

The loweſt region is that in which we breathe, and is bounded by the reflexion of the ſun's rays, that is, by the height to which they rebound from the earth.

The middle region is that in which the clouds reſide, where

meteors are formed, &c. extending from the extremity of the loweſt to the tops of the higheſt mountains.

The upper region commences from the tops of the mountains, and reaches to the utmoſt limits of the atmoſphere. In this reigns a perpetual, equable calmneſs, clearneſs, and ſerenity.

Region, *Elementary*. See Elementary.

Region, *Etherial*, is uſed for the whole extent of the univerſe, including the orb of the fixed ſtars, &c.

Regions *of the Sea*. As ſome naturaliſts, in their deſcriptions of the ſubterraneous parts of the globe, diſtinguiſh the earth into three regions of different depths, in which different temperatures are obſerved; ſo in deſcribing the ſea, they allow it two regions; the one extending from the ſurface of the water, down ſo low as the rays of the ſun can pierce, and extend their influence; and the other, from the loweſt bounds of that to the bottom. It is eaſy to ſee that theſe regions rather regard quality than ſpace, and that their boundaries are far from being regular, or equal in all places, and at all times. The places expoſed to the hotteſt ſunſhine will have the largeſt upper region; thoſe where the ſun has leaſt power will have the ſmalleſt; and the ſame part of the ſea will have its upper region more or leſs deep, according to the ſeaſon of the year. This upper region of the ſea is always more or leſs hot; the lower region, except in ſome few particular places, is every where cold; and the water, where the upper region is large, is always remarkably ſtill and quiet in the lower. Boyle of Coſmical Qualities.

Region, *Subterranean*. The earth is not only divided on its ſurface into regions and countries, but philoſophers, who have had occaſion to diſcourſe of its inner parts, have alſo divided them into three diſtinct regions, according to their different depths from the ſurface. The temperature of the ſubterranean parts of the globe is diſtinguiſhed according to the diviſion of theſe regions, but is not ſo regular and preciſe as ſome have ſuppoſed. The firſt region of the earth is very variable, both as to bounds and temperature. The ſecond region ſeems for the moſt part cold, in compariſon of the other two; but in ſeveral places, which, by reaſon of their diſtance from the ſurface of the earth, it would be natural to call the middle region, the temperature of the air is very different at the ſame ſeaſons of the year, which ſhews that it depends on ſomething more than bare depth from the ſurface. The third region of the earth is univerſally obſerved to be warm, but by no means regularly or uniformly: the ſame depth in ſome places, giving only a moderate warmth, while in others it gives a very conſiderable heat.

Borrichius tells us of a certain abbé, fond of chemiſtry, and particularly curious in the matter of long digeſtions by regular heat, who found a way of making a furnace perpetually warm, by piercing the earth to a certain depth, and uſing the heat of this third region of it. His method, we are told, was to bore a hole with a pike twenty feet deep, and pour into it ten or twelve pounds of quickſilver; this made its way into the ſtrata, and through them in a body into the chambers of heat in this third region, where the heat, having a vent upwards, made by this opening, never failed to aſcend in a perpetual and regular ſtream, and gave that regular and digeſting heat that no artificial fire could equal. But this is an alchemical ſtory. Boyle of Coſmical Qualities. Borrich. de Ortu Chem.

Region, in ancient Rome, a part or diviſion of the city. Romulus divided his little city into three tribes, and Servius Tullius added a fourth; which diviſion continued till Auguſtus's time, who firſt divided the city into fourteen regions, over each of which he ſettled two ſurveyors, called *curatores viarum*, who were made annually, and took their diviſions by lot. Theſe fourteen regions contained 424 ſtreets, 31 of which were called great or royal ſtreets, which begun at the gilt pillar that ſtood at the entry into the open place in the middle of the city.

The extent of theſe diviſions varied greatly, ſome being from 12,000 or 13,000 to 33,000 feet and upwards in circumference. Authors, however, are not agreed as to the exact limits of each.

According to Kennet, who formed his diviſion on the authority of the accurate Panvinius, the different regions were as follow: The *firſt* region, called "Porta Capena," contained 9 ſtreets, 3 luci, or conſecrated groves, 4 temples, 6 ædes, or ſacred buildings, 6 public baths, 4 arches, 14 granaries, 12 mills for grinding corn, and 121 domi, or great houſes. The whole compaſs of this region, or ward, was 13,223 feet. The *ſecond* region, denominated "Cœlimontium," included 12 ſtreets, 2 luci, 5 temples, the public baths of the city, 80 private baths, the great ſhambles, 23 granaries, 23 mills, and 133 great houſes. Its compaſs was 13,200 feet. The *third* region, or Iſis and Serapis, contained 8 ſtreets, 2 temples, the amphitheatre of Veſpaſian, the baths of Titus, Trajan, and Philip, 19, or, as ſome ſay, 29 granaries, 23 mills, 160 great houſes. Its compaſs was 12,450 feet. The *fourth* region, Via Sacra, or Templum Pacis, comprehended 8 ſtreets, 10 temples, the coloſſus of the ſun, 120 feet high, the arches of Titus, Severus, and Conſtantine, 75 private baths, 18 granaries, 24 mills, and 138 great houſes. Its compaſs, according to ſome, was only 8000, but, according to others, 14,000 feet. The *fifth* region, or Eſquilina, included 15 ſtreets, 8 luci, 6 temples, 5 ædes, 75 public baths, 18 granaries, 22 mills, and 180 great houſes. Its compaſs was 15,950 feet. The *ſixth* region, Acta Semita, contained 12 or 13 ſtreets, 15 temples, 2 porticos, 2 circi, 2 fora, 75 private baths, 19 granaries, 23 mills, 155 great houſes. Its compaſs was 15,600 feet. The *ſeventh* region, Via lata, included 40 ſtreets, 4 temples, 75 private baths, 3 arches, 17 mills, 25 granaries, and 120 great houſes. Its compaſs was 23,700 feet. The *eighth* region, Forum Romanum, included 12 ſtreets, 21 temples, 66 private baths, 10 ædes, 9 porticos, 4 arches, 7 fora, 4 curiæ, 7 baſilicæ, 6 columns, 18 granaries, 30 mills, and 150 great houſes. Its compaſs was 14,876 feet. The *ninth* region, Circus Flamininus, comprehended 20 ſtreets, 8 temples, 20 ædes, 12 porticos, 2 circi, 4 theatres, 3 baſilicæ, 2 curiæ, 5 baths, 2 arches, 2 columns, 32 mills, 32 granaries, and 189 great houſes. Its compaſs was 30,560 feet. The *tenth* region, Palatium, contained 7 ſtreets, 10 temples, 9 ædes, 1 theatre, 4 curiæ, 15 private baths, 12 mills, 16 granaries, and 109 great houſes. Its compaſs was 11,600 feet. The *eleventh* region, Circus Maximus, included 8 ſtreets, 22 ædes, 15 private baths, 16 granaries, 12 mills, and 189 great houſes. Its compaſs was 11,600 feet. The *twelfth* region, Piſcina Publica, contained 12 ſtreets, 2 ædes, 68 private baths, 28 granaries, 25 mills, and 128 great houſes. Its compaſs was 12,000 feet. The *thirteenth* region, or Aventinus, included 17 ſtreets, 6 luci, 6 temples, 74 private baths, 36 granaries, 30 mills, and 155 great houſes. Its compaſs was 16,300 feet. The *fourteenth* region, Tranſtiberina, contained 23 ſtreets, 6 ædes, 136 private baths, 20 granaries, 32 mills, and 150 great houſes. Its compaſs was 33,409 feet.

REGIONARY, Regionarius, in *Eccleſiaſtical Hiſtory*, a title given, from the fifth century, to perſons who had the charge and adminiſtration of the church affairs within a certain diſtrict or region.

At Rome there were anciently ſeven regionary deacons, who

who preſided over a kind of hoſpitals, and looked to the diſtribution of alms.

There were alſo regionary ſubdeacons, and regionary notaries, as alſo regionary biſhops, &c.

A regionary biſhop was properly a miſſionary inveſted with an epiſcopal character, but without being attached to any particular ſee, that he might be at liberty to go to preach, and perform other functions of his miniſtry, whitherſoever the Spirit of God and the wants of the people ſhould call him.

REGIS, Peter-Sylvan, in *Biography*, a celebrated French philoſopher, was born at Salvetat de Blanquefort, in the Agenois, in the year 1632. After having been inſtructed in claſſical learning and the belles lettres, by the Jeſuits, at Cahors, he entered himſelf a ſtudent of divinity at the univerſity of that city, intending to qualify himſelf for the clerical profeſſion. This, however, he abandoned, in order to devote himſelf to the ſtudy of the Carteſian philoſophy, which at that time was taught with great ſucceſs by Rohault. With this view he went to Toulouſe in 1605, and read a courſe of lectures upon the principles of Deſcartes, and was attended by perſons of all ranks and characters, who inliſted themſelves in the number of his diſciples. Among theſe were to be found the magiſtrates, clergy, and even the women of Toulouſe, who affected to be the zealous converts to the new philoſophy, in oppoſition to the old. To expreſs their gratitude to the man who had been the inſtrument of diffuſing this light over their city, the inhabitants granted him a penſion; a circumſtance which, it has been obſerved, correſponded more with the ſpirit and uſages of ancient Greece, than of modern times. In 1680 he came to Paris, conſidering that as the moſt proper ſcene for the exhibition of his talents. Here he was extremely popular, and the friends to the Ariſtotelian ſyſtem began to be alarmed at his ſucceſs, and complained againſt him to the archbiſhop of Paris, who prohibited him from continuing his lectures, and they were accordingly ſuſpended. But after a ſhort time, the prelate withdrew his interdict, and Regis devoted the remainder of his life to the propagation of the Carteſian philoſophy, as well by his writings as his lectures. In 1699 he was admitted a member of the Academy of Sciences, but his infirmities prevented him from attending its meetings. He died in the year 1707, at the age of 75, highly eſteemed by perſons of the firſt diſtinction for talents and rank. He was author of a great number of works, of which the following may be mentioned: "A Syſtem of Philoſophy, containing Logic, Metaphyſics, and Morals;" "An Anſwer to the Book of M. Huet, entitled 'Cenſura Philoſophiæ Carteſianæ,'" which is mentioned by Bayle as a model for every writer on the ſame ſide of the queſtion; "An Anſwer to the Critical Reflections of Du Hamel on the Syſtem of Philoſophy."

Regis, in *Geography*, a town of Saxony, in the biſhopric of Nuremburg; 14 miles S. of Leipſic.

Regis, *St.*, a village of Upper Canada, on the St. Lawrence, half a mile N. from the N. line of the United States. It is ſeated on a beautiful elevated plain, in the angle between the mouth of St. Regis river and the St. Lawrence. It conſiſts of about 80 houſes of hewn logs, inhabited by about 100 Indian families, of the Caghnowaya tribe, who have lived here more than half a century. They are peaceable, honeſt, and induſtrious. Their diverſions are footraces, playing at ball, and dancing. They are Roman Catholics, and have a handſome ſtone church, with a ſpire, and generally a miniſter. Theſe Indians have 30,000 acres of land reſerved to them S. of the village. They keep a great number of horſes and cattle, and raiſe plenty of corn on the fertile iſlands in St. Lawrence. From St. Regis there is a good road to Plattſburg, on Champlain; the diſtance being 72 miles.—Alſo, a river of Canada, which riſes from lakes near Racket river, and enters the St. Lawrence at the village above-mentioned.

Regis *Pondus*. See Pondus.

Regis *Villa*. See Villa.

REGISTAN, or *Sandy Deſert of Agimere*, in *Geography*, a ſandy deſert, forming the weſtern boundary of Hindooſtan, between the country of Agimere and the Indus. The northern extreme of this deſert bounds the dominions of the Seiks on the ſouth.

REGISTER, Registrum, a public book ſerving to enter and record memoirs, acts, and minutes, to be had recourſe to occaſionally, for the juſtifying of matters of fact.

Menage derives the word, by corruption, from *regeſtum*, a book containing extracts of ſeveral books, &c. collected together: "Dicitur regeſtum quaſi iterum geſtum." Others derive it from the old French *giſter*, *to lie down in a bed*, &c.

The law of Scotland is rendered very eaſy and regular, by means of the great number of regiſters, for recording the conveyances of lands, &c. of private perſons. Of theſe there are two kinds: the one general, fixed at Edinburgh, under the direction of the lord regiſter, who, before the Union, was the fifth officer of the ſtate, and, beſides the regiſtry, was clerk of the parliament, treaſury, exchequer, and ſeſſion.

The other is particularly kept in the ſeveral ſhircs, ſtewarties, and regalities. The clerks of it are obliged to tranſmit the regiſters of their reſpective courts to the general regiſter; and the notaries their protocols: and here they are ſo diſpoſed, that, on demand, the lieges can have a view of any writs which the law requires to be regiſtered, or which parties, for their ſecurity, have thought fit to record.

The regiſters were firſt ſet on foot by act of parliament, under king James VI., to the unſpeakable advantage of the ſubject.

No man can have a right to any eſtate, but it muſt be regiſtered within forty days of his becoming ſeiſed of it, otherwiſe it is null; and by this means all ſecret conveyances are cut off.

By a law in 1704, it was enacted, that a memorial of all deeds and conveyances, and of all wills and deviſes in writing, by which any honours, manors, &c. in the Weſt Riding of Yorkſhire, might be any way affected in law or equity, may, at the election of the party or parties concerned, be regiſtered: and that, after ſuch regiſter, every ſubſequent deed or conveyance of the ſaid honours, manors, &c. ſo regiſtered, or any part of it, ſhall be adjudged fraudulent and void, unleſs a memorial of it ſhall be alſo regiſtered: and the like of wills, &c. But this act did not extend to copyhold eſtates, nor to leaſes at rack-rent, nor to any leaſe not exceeding twenty-one years.

In the year 1708, a ſimilar ſtatute was paſſed for the regiſtering of deeds, conveyances, wills, deviſes, mortgages, &c. in the Eaſt Riding of Yorkſhire: and all the proviſions and clauſes in this act were hereby extended to the honours, manors, lands, and tenements, in the Weſt Riding of the ſame county.

In 1709, a law was made for the public regiſtering of deeds, conveyances, wills, &c. in the county of Middleſex; which may be done for the fee of one ſhilling: and every deed or conveyance, which ſhall hereafter be executed, ſhall be adjudged fraudulent and void, againſt any ſubſequent purchaſer or mortgagee for valuable conſideration, unleſs ſuch memorial of it be regiſtered according to the direction of

of this act, before the regiſtering of the memorial of the deed or conveyance, under which ſuch ſubſequent purchaſer or mortgagee ſhall claim; and the like as to memorials of wills not regiſtered.

In 1735, a ſimilar regiſter of mortgages, &c. was legally enacted for the North Riding of the county of York; whence York and Middleſex are regiſter counties. (2 & 3 Ann. cap. 4. 6 Ann. cap. 35. 7 Ann. cap. 20. 8 Geo. II. cap. 6.) Theſe ſtatutes do not extend to copyhold eſtates, leaſes at a rack-rent, or to any leaſes not exceeding 21 years, where the poſſeſſion goes with the leaſe; nor to any chambers in the inns of court.

Many have wiſhed that the ſame regulation was extended to all the counties of England and Wales; but judge Blackſtone obſerves, that, however plauſible theſe proviſions may appear in theory, it hath been doubted, by very competent judges, whether more diſputes have not ariſen in thoſe counties, by the inattention and omiſſion of parties, than prevented by the uſe of regiſters.

Register, more correctly *Regiſtrer*, *Regiſtrarius*, is alſo uſed for the clerk, or keeper of a regiſter, or regiſtry.

Of theſe we have ſeveral, denominated from the regiſters they keep; as regiſter of the high court of delegates, regiſters of the arches court of Canterbury, regiſter of the court of admiralty, regiſter of the prerogative court, regiſters of the province of Canterbury, regiſter of the archdeaconry of Middleſex, &c. regiſter of the faculty office, and regiſter of the garter, who is always dean of Windſor, and deputy regiſters.

There are alſo, in the court of chancery, the principal regiſter, the lord chancellor's regiſters, the regiſters of the maſter of the rolls, entering regiſters, and regiſter of the affidavits.

The appellation of regiſter or regiſtrarius is alſo given to a notary. See Notary, and Notary, *Public*.

Register, *City*. See Town-*Clerk*.

Register of a pariſh church, is a book in which the yearly baptiſms, marriages, and burials, of each pariſh, are orderly regiſtered. See Marriage.

This practice was laudably inſtituted by that great but unfortunate perſon Thomas Cromwell, earl of Eſſex, anno 1538, while he was vicar-general to king Henry VIII.; and it was continued in the reigns of king Edward VI. and of queen Elizabeth.

Theſe pariſh regiſters are to be kept in a coffer, provided by the churchwardens, with three locks and keys, one of which is to remain with the miniſter, and the other two with the churchwardens ſeverally, ſo that neither the miniſter without the two churchwardens, nor the churchwardens without the miniſter, ſhall at any time take that book out of the ſaid coffer. Theſe pariſh regiſters are to be ſubſcribed by the miniſter and churchwardens; and the names of the perſons ſhall be tranſmitted yearly to the biſhop; and it has been enforced by canon 70, and by ſtatute, &c.

By 26 Geo. II. c. 33. to make a falſe entry in a marriage regiſter, to alter it when made, to forge or counterfeit ſuch entry or a marriage licence, or aid and abet ſuch forgery, to utter the ſame as true knowing it to be counterfeit, or to deſtroy or procure the deſtruction of any regiſter, in order to vacate any marriage, or ſubject any perſon to the penalties of this act; all theſe offences, knowingly and wilfully committed, ſubject the party to the guilt of felony, without benefit of clergy.

By the 30 C. II. c. 5. for burying in woollen, it is enacted, that the miniſter of every pariſh ſhall keep a regiſter in a book to be provided at the charge of the pariſh, and make a true entry of all burials within his pariſh, and of all affidavits of perſons being buried in woollen brought unto him according to the ſaid act; and where no ſuch affidavit ſhall be brought to him within the time therein limited, he ſhall enter a memorial thereof in the ſaid regiſtry, againſt the name of the party interred, and of the time when he notified the ſame to the churchwardens or overſeers of the poor according to the ſaid act.

An approved regiſter of births, conſiſting of certificates ſigned by two perſons who were preſent at the ſaid births, and entered in a book ſigned by the regiſter or ſecretary, is kept with great accuracy, and authenticated by a committee, for the benefit of Proteſtant diſſenters and others. This book is depoſited and carefully preſerved at Dr. Williams's library, Red-croſs Street, Cripplegate, to which any perſon may have free acceſs at the ſtated hours, under the direction of the ſecretary of the ſaid library, whoſe attention to his office entitles him to public reſpect.

Register is alſo a title of a book, containing the forms of moſt of the writs, original and judicial, uſed in common law. This is called the *regiſter of writs*, or *regiſtrum omnium brevium*. This regiſter, Coke on Littleton obſerves, is one of the moſt ancient books of the common law. And judge Blackſtone obſerves concerning it, that it is the moſt ancient and highly venerable collection of legal forms, upon which Fitzherbert's Natura Brevium is a comment, and in which every man, who is injured, will be ſure to find a method of relief, exactly adapted to his own caſe, deſcribed in the compaſs of a few lines, and yet without the omiſſion of any material circumſtance.

Register, in *Antiquity*, a book or table at Athens, belonging to each particular φρατρια, or ward, in which all fathers were obliged to enrol their ſons, making oath, at the ſame time, that every ſon, ſo regiſtered, was either born to them in lawful wedlock, or lawfully adopted. The adopted ſons were regiſtered in the feſtival Thargelia; the natural, upon the third day of the feſtival Apaturia.

At what age children were thus regiſtered is not agreed. Some are of opinion, that at every return of the Apaturia it was cuſtomary to regiſter all the children that had been born that year. Others affirm, that they were commonly three or four years old before they were regiſtered.

There were two other ſeaſons when young Athenians were enrolled in a public regiſter: one, when they arrived at the age of eighteen years, and were admitted into the number of the εφηβοι, and was performed on the third day of the feſtival Apaturia; and the other, before the feſtival Panathenæa, when thoſe who were twenty years old were entered in a regiſter, called ληξιαρχικον γραμματειον, in which the names of all perſons of that borough, who were of age to ſucceed in the ληξις, or inheritance of their fathers, were entered. This was termed *to be regiſtered among the men*: and the perſons, thus enrolled, became their own maſters, and free from the government of their guardians. Potter's Arch. Græc. vol. i. p. 48.

Registers *of Eſtates*, the accounts of particular things which belong to them, as thoſe of rentals, valuations of fields, names, admeaſurements, different portions of land, cottages, and other buildings diſtinct from the farms, and any other ſeparate parts. In theſe regiſters the valuations are to be inſerted in columns, as they ariſe from ſurveys or other ways, and afford the means of fixing the real values in re-letting the lands or for other purpoſes.

Alſo, a general regiſter of the *timber trees* which are growing on the ſeveral diviſions of the eſtates, ſhould always be kept; in which the number contained in each ſeparate wood, grove, hedge-row, or any other part, muſt be entered,

tered, with their kinds, and the admeaſurement of each, for the uſe of the proprietor and wood managers.

A great many other ſorts of particulars regarding the eſtates may likewiſe be uſefully and conveniently put down in theſe regiſters.

REGISTER *of Seamen*. See MANNING *the Fleet*.

REGISTER *Ships*, or *Ships of Regiſter*, in *Commerce*, were veſſels to which the king of Spain, or the council of the Indies, granted permiſſion to go and traffic in the ports of Spaniſh America.

They were thus called, becauſe the ſhips were to be regiſtered before they ſet ſail from Cadiz, which was the place where they uſually loaded for Bueuos Ayres.

Theſe veſſels, by the tenor of the cedula or permit, were not to exceed three hundred tons; but there ſubſiſted that good underſtanding between the merchants and the council of the Indies, that ſhips of five or ſix hundred tons frequently paſſed unnoted.

Theſe regiſter ſhips, which were firſt introduced in order to furniſh America with a regular and timely ſupply, and thus to prevent a contraband trade with the Engliſh, French, and Dutch iſlands, were fitted out, during the intervals between the ſtated ſeaſons, when the galleons and flota ſailed, by merchants in Seville or Cadiz, upon obtaining a licence from the council of the Indies, for which they paid a very high premium, and were deſtined for thoſe ports where any extraordinary demand was foreſeen or expected. In proportion as experience manifeſted the advantages of carrying on trade in this mode, the number of regiſter ſhips increaſed, and at length, in the year 1748, the galleons, after having been employed upwards of two centuries, were finally laid aſide. From that period there has been no intercourſe with Chili and Peru, but by ſingle ſhips diſpatched from time to time, as occaſion requires, and when the merchants expect a market will open. Theſe ſail round Cape Horn, and convey directly to the ports in the South ſea the productions and manufactures of Europe, for which the people ſettled in thoſe countries were formerly obliged to repair to Porto Bello or Panama.

But as all the regiſter ſhips deſtined for the South ſeas were obliged to take their departure from Cadiz, and were under a neceſſity of returning thither, this branch of the American commerce, even in its new and improved form, continued ſubject to the reſtraints of a ſpecies of monopoly, and felt its pernicious effects.

The intercourſe between Spain and her colonies has in later times been much improved and facilitated. In the year 1764, Charles III. appointed packet-boats to be diſpatched on the firſt day of each month from Corunna to the Havanna or Porto Rico. From thence letters are conveyed in ſmaller veſſels to Vera Cruz and Porto Bello, and tranſmitted by poſt through the kingdom of Tierra Firmé, Granada, Peru, and New Spain. Packet-boats alſo ſail with the ſame regularity, once in two months, to Rio de la Plata, for the accommodation of the provinces to the eaſt of the Andes.

With this new arrangement for facilitating intercourſe a ſcheme of extending commerce has been more immediately connected. Each of the packet-boats, which are veſſels of ſome conſiderable burden, is allowed to take in a loading of ſuch commodities as are the product of Spain, and moſt in demand in the ports whither they are bound. In return for theſe, they may bring home to Corunna an equal quantity of American productions. This regulation may be conſidered as the firſt relaxation of thoſe rigid laws, which confined the trade with the new world to a ſingle port, and the firſt attempt to admit the reſt of the kingdom to ſome ſhare in it. This meaſure of relaxation was ſoon followed by another more deciſive. In the year 1765, Charles III. laid open the trade to the windward iſlands, Cuba, Hiſpaniola, Porto Rico, Margarita, and Trinidad, to his ſubjects in every province of Spain. This ample privilege was ſoon after extended to Louiſiana, and to the provinces of Yucatan and Campeachy. As ſoon as this general liberty was permitted, it produced the moſt beneficial effects: and it has been computed, that ſuch a number of ſhips was ſoon employed in the free trade, that the tonnage of them far exceeded that of the galleons and flota, at the moſt flouriſhing era of their commerce. This arrangement extended its good effects through every province of the kingdom; and by opening a new market for their various productions and manufactures, encouraged and added avidity to the induſtry of the farmer and artificer. Spain has alſo permitted a free trade between the colonies themſelves. In the year 1774 Charles III. publiſhed an edict, granting to Peru, New Spain, Guatimala, and Granada, the privilege of a free trade with each other. See Robertſon's Hiſt. of America, vol. iii.

REGISTER, among *Letter Founders*, is one of the inner parts of the mould in which the printing types are caſt. Its uſe is to direct the joining of them juſtly together again, after opening them to take out the new-caſt letter.

REGISTER, in *Printing*, the diſpoſing of the forms of the preſs, ſo as that the lines and pages printed on one ſide of the ſheet meet exactly againſt thoſe on the other; which is done by means of two points in the greater or outward tympan.

REGISTER, in *Organ-building*, is another word for a ſtop in that inſtrument; but is in fact only a lath pierced with holes, correſponding with thoſe in the ſound-board, which by drawing out the ſtops opens the holes, and putting them in ſhuts them. By theſe ſliders each ſtop ſpeaks or is ſilent. Regiſter is figuratively uſed by muſicians in ſpeaking of a voice, in which real and falſet notes are not well united. Mr. Braham's *high* notes, for example, are ſaid to be of a different regiſter from the *low*.

REGISTERS, in *Chemiſtry*, are holes, or chinks, with ſtopples to them, contrived in the ſides of furnaces, to regulate the fire; *i. e.* to make the heat immediately more intenſe, or remiſs, by opening them to let in the air, or keeping them cloſe to exclude it. See FIRE-*places* and FURNACE.

REGISTRY, REGISTRUM, comprehends the office, books, and rolls, in which the proceedings of chancery, or any ſpiritual court, are regiſtered or recorded.

REGISTRY *of Shipping*, in *Commerce*. The regiſtering of ſhips appears to have been firſt introduced into this country by the NAVIGATION *Act*, 12 Car. II. c. 18. § 10. By this ſtatute, however, foreign ſhips only, "Britiſh owned," were required to be regiſtered. By ſtat. 7 & 8 W. III. c. 22. § 17, Britiſh or plantation built ſhips, Britiſh owned, if intended to be employed in the plantation trade, and alſo all "prize ſhips," were required to be regiſtered; and in conſequence of a regulation at the admiralty, ſhips for which Mediterranean paſſes were wanted, were alſo to be regiſtered. The proviſions in the acts requiring regiſtry are founded upon the wiſeſt policy, and are not leſs calculated to prevent the commiſſion of private fraud upon individuals, than to advance the public policy of the ſtate. By ſtat. 26 Geo. III. c. 60. (lord Hawkeſbury's act), no ſhip or veſſel foreign built (except ſuch as have been condemned as lawful prize in any court of admiralty), nor any ſhips or veſſels built or rebuilt upon any foreign made keel or bottom, although owned by Britiſh ſubjects, and navigated according

according to law, ſhall be entitled to the privileges of a Britiſh built ſhip, or of a ſhip owned by Britiſh ſubjects; and all the privileges and advantages allowed ſhall be confined to ſuch ſhips only as are wholly of the built of Great Britain or Ireland, Guernſey, Jerſey, and the Iſle of Man, or ſome of the plantations in Aſia, Africa, or America, now belonging, or which may hereafter belong to his majeſty, except ſuch foreign built veſſels as before the 1ſt of May 1786 did truly and wholly belong to Britiſh ſubjects, navigated according to law, and duly regiſtered, which ſhall continue to enjoy the privileges to which ſuch ſhip or veſſel is by law entitled; nor ſhall this act prevent any ſuch veſſel which may have been begun to be repaired or rebuilt before the 1ſt of May 1786 from being regiſtered, provided it ſhall appear upon oath, to the ſatisfaction of the commiſſioners of the cuſtoms, that ſuch veſſel was ſtranded by the act of Providence, and was at the time of being ſo ſtranded the ſole property of ſome foreigner, or a droit of the admiralty; and if it ſhall appear that ſuch veſſel, from the damage received, was rendered unfit to proceed to ſea without undergoing a thorough repair in this kingdom, and that ſhe was neceſſarily ſold for the benefit of the foreign owners, or under an order or commiſſion from the court of admiralty, and that ſhe was fairly and openly purchaſed by a Britiſh ſubject, and being the ſole and entire property of ſuch Britiſh ſubject, that ſhe had been ſo much repaired, that two-thirds of her at leaſt are of Britiſh built, ſhe may be regiſtered. ſ. 1.

No veſſel ſhall be deemed Britiſh built, or enjoy the privileges belonging to Britiſh built veſſels, which ſhall be rebuilt or repaired in any foreign port, if ſuch repairs ſhall exceed 15*s.* for every ton, unleſs ſuch repairs ſhall be rendered neceſſary by extraordinary damage, and abſolutely neceſſary to enable her to perform the voyage, and to return in ſafety to ſome place or port within his majeſty's dominions; and before ſuch veſſel ſhall be ſo repaired, the maſter ſhall report her ſtate and condition upon oath to the Britiſh conſul or other chief officer at the port where ſuch repairs may be neceſſary, and cauſe the ſame to be ſurveyed by two perſons to be approved of by ſuch conſul or chief Britiſh officer, and ſhall deliver to ſuch conſul or officer, in writing, the particulars of the damage ſuſtained, and verify upon oath the particulars and amount of the repairs, and that the ſame were become neceſſary in conſequence of damage ſuſtained during her voyage, to enable the ſame veſſel to proſecute her intended voyage, and to return to ſome port within his majeſty's dominions, which muſt be certified under the hand and ſeal of the chief conſul or other officer; or if no ſuch conſul, &c. ſhall be there reſident, the ſurvey ſhall be made by two perſons to be approved of by two known Britiſh merchants reſiding at or near ſuch port. And the maſter of ſuch ſhip ſhall produce to ſuch merchants vouchers of the particulars and amount of the repairs, and their certificate ſhall be of the ſame effect as that of the Britiſh conſul or chief officer. And the maſters of veſſels repaired in any foreign port ſhall make oath before the collector and comptroller, or other principal officer of the cuſtoms in the firſt port of arrival (if required ſo to do), deſcribing the nature and amount of ſuch repairs; and if ſuch expence ſhall exceed 15*s.* *per* ton, and the maſter or commander of ſuch ſhip ſhall neglect or refuſe to deliver to ſuch collector or comptroller, or other principal officer of the cuſtoms, the certificate by this act required to be produced, ſuch veſſels ſhall to all intents and purpoſes be deemed foreign built. ſ. 2.

Ships above 15 tons Britiſh owned ſhall be regiſtered in the manner hereinafter mentioned, and the perſons claiming property therein ſhall cauſe the ſame to be regiſtered, and obtain a certificate of ſuch regiſtry from the collector or comptroller of the cuſtoms of Great Britain, or the Iſle of Man, or from the governor, lieutenant-governor, or commander-in-chief and principal officer of the cuſtoms reſident in the iſlands of Guernſey or Jerſey, or in any of the ſaid colonies, plantations, or iſlands reſpectively.

By § 4, no regiſtry is to be made except in the port to which the veſſel belongs.

The port to which any ſhip or veſſel ſhall hereafter be deemed to belong, ſhall be the port from or to which the ſame ſhall uſually trade, or being a new ſhip, ſhall intend ſo to trade, and at or near which the huſband or acting owners uſually reſide.

No American veſſel ſhall be entitled to be regiſtered, or to any of the privileges of a Britiſh built ſhip or veſſel, unleſs ſuch ſhip ſhall have been taken and condemned as lawful prize, or having been ſtranded, ſhall have been built or rebuilt, and regiſtered in the manner before practiſed and allowed. ſ. 7.

No regiſtry ſhall be made or certificate granted until oath be taken and ſubſcribed before the perſons herein before authoriſed to make ſuch regiſtry and grant ſuch certificate, by the owner of ſuch ſhip or veſſel, if the ſame belong to one perſon only; or, in caſe there ſhall be two joint-owners, then by both of them, if both be reſident within 20 miles of the port where ſuch regiſtry required, or by one of ſuch owners, if one or both be reſident at a greater diſtance; or if the number of ſuch owners ſhall exceed two, then by the greater number of them, if the greater number ſhall be reſident within 20 miles of ſuch port, not exceeding three of ſuch owners, or by one of ſuch owners, if all ſhall be reſident at a greater diſtance. ſ. 9 and 10.

In caſe the owners ſhall amount to three or more, and three of ſuch owners ſhall not perſonally attend to take and ſubſcribe the oath directed, then ſuch owner or owners as ſhall attend and take and ſubſcribe the oath, ſhall further make oath that the part-owner or part-owners abſent, is or are not reſident within 20 miles, and hath or have not, to his or their knowledge or belief, wilfully abſented himſelf or themſelves to avoid taking the ſaid oath, or is or are prevented by illneſs. ſ. 11.

By way of identifying the veſſel to which a certificate of regiſtry is alleged to be granted, the ſurveying officer ſhall go on board ſuch ſhip or veſſel as is to be regiſtered, and ſtrictly admeaſure the ſame in the preſence of the maſter, or any other perſon appointed for that purpoſe on the part of the owners, or by the ſaid maſter, and ſhall deliver a true account in writing of all ſuch particulars of the built, deſcription, and admeaſurement of ſuch ſhip or veſſel as are ſpecified in the certificate, to the perſon authoriſed to make ſuch regiſtry; and the ſaid maſter or ſuch perſon as ſhall attend on the part of the owners, is to ſign his name to the certificate of ſuch ſurveying officer, provided ſuch maſter or other perſon ſhall conſent and agree to the ſeveral particulars ſet forth in the ſaid certificate. ſ. 12.

Surveying officers making or granting falſe certificates to forfeit 100*l.*, and be for ever incapable of holding any office under his majeſty. ſ. 13.

The tonnage of any veſſel when afloat is to be aſcertained by the following method, *viz.* drop a plumb line over the ſtern of the ſhip, and meaſure the diſtance between ſuch line and the after part of the ſtern poſt at the load water mark; then meaſure from the top of the ſaid plumb line, in a parallel direction with the water, to a perpendicular point immediately over the load water mark, at the fore part of the main ſtem: ſubtracting the above diſtance from ſuch admeaſure-

admeaſurement, the remainder will be the ſhip's extreme length, from which are to be deducted three inches for every foot of the load draught of water for the rake abaft, and alſo three-fifths of the ſhip's breadth for the rake forward; the remainder ſhall be eſteemed the juſt length of the keel to find the tonnage; and the breadth ſhall be taken from outſide to outſide of the plank in the broadeſt part of the ſhip, either above or below the main-wales, excluſive of all manner of ſheathing or doubling, that may be wrought upon the ſide of the ſhip; then multiplying the length of the keel for tonnage by the breadth ſo taken, and that product by half the breadth, and dividing by 94, the quotient ſhall be deemed the true contents of the tonnage. Nothing in this act to be conſtrued to alter the manner of admeaſuring the tonnage of any ſhip which has heretofore been practiſed for the purpoſe of aſcertaining the light duties, or any other duties or impoſts payable according to the tonnage of any veſſel. ſ. 14.

At the time of obtaining the certificate of regiſtry, bonds ſhall be given to his majeſty by the maſter, and ſuch of the owners who ſhall attend, in the following penalties:

If a decked veſſel, or from 15 to 50 tons, 100*l.*; 50 to 100 tons, 300*l.*; 100 to 200 tons, 500*l.*; 200 to 300 tons, 800*l.*; 300 and upwards, 1000*l.*

The condition of every bond given upon regiſtry ſhall be, that ſuch certificate ſhall not be ſold, lent, or otherwiſe diſpoſed of to any perſon or perſons whomſoever, and that the ſame ſhall be ſolely uſed for the ſervice of the ſhip or veſſel for which it was granted; and that in caſe ſuch veſſel ſhall be taken by the enemy, burned or broken up, or otherwiſe prevented from returning to the port to which ſhe belongs, the certificate, if preſerved, ſhall be delivered up within one month after the arrival of the maſter in any port or place in his majeſty's dominions, to the collector or comptroller of ſome port in Great Britain, or the Iſle of Man, or of the Britiſh plantations, or to the governor, lieutenant-governor, or commander-in-chief for the time being, of the iſlands of Guernſey or Jerſey; and that if any foreigner, or any perſon or perſons for his uſe and benefit, ſhall purchaſe, or otherwiſe become entitled to the whole or any part or ſhare of, or any intereſt in ſuch veſſel, and the ſame ſhall be within the limits of any port in Great Britain, Guernſey, Jerſey, Man, or the Britiſh colonies, plantations, iſlands, or territories aforeſaid, then in ſuch caſe the certificate of regiſtry ſhall, *within ſeven days after ſuch purchaſe or transfer of property* in ſuch ſhip or veſſel, be delivered up to the perſon or perſons authoriſed by this act to make regiſtry and grant certificates thereof at ſuch port and place reſpectively; and if ſuch ſhip or veſſel ſhall be in any foreign port when ſuch purchaſe or transfer ſhall take place, then that the ſame ſhall be delivered up to the Britiſh conſul or other chief Britiſh officer reſident at or neareſt to ſuch foreign port; or if ſuch veſſel ſhall be at ſea, at the time of ſuch transfer of intereſt and property, then the ſaid certificate of regiſtry ſhall be delivered up to the Britiſh conſul or other chief Britiſh officer at the foreign port or place in or at which the maſter or other perſon having or taking the command of ſuch ſhip or veſſel ſhall firſt arrive after ſuch purchaſe or transfer of property at ſea, immediately after his arrival at ſuch foreign port; but if ſuch maſter above-mentioned in the caſe above-mentioned ſhall not arrive at a foreign port, but ſhall arrive at ſome port of Great Britain, Guernſey, Jerſey, Man, or his majeſty's ſaid colonies, plantations, iſlands, or territories, then the ſaid certificate ſhall be delivered up in manner above-mentioned, within 14 days after the arrival of ſuch ſhip or veſſel, or of the perſon who had the command thereof, in any port of Guernſey, Jerſey, Man, or any of his majeſty's ſaid colonies, plantations, iſlands, or territories. And if any paſs, called a Mediterranean paſs, ſhall have been obtained and procured by any ſuch ſhip or veſſel, then and in ſuch caſe the ſame ſhall be delivered up at the ſame time, and in like manner with the certificate of regiſtry, to the perſons hereinbefore authorized to receive ſuch certificate of regiſtry: and ſuch certificates ſo delivered up, ſhall be tranſmitted forthwith to the commiſſioners of the cuſtoms in England and Scotland reſpectively; and ſuch Mediterranean paſſes ſhall alſo be tranſmitted to the admiralty of Great Britain, by the perſon or perſons authorized to receive ſuch certificate and paſſes, that the ſame may be cancelled. ſ. 15.

In caſe of any alteration of property in the ſame port by the ſale of any ſhare or ſhares in any ſhip or veſſel after regiſtering thereof, ſuch ſale or transfer of property ſhall always be acknowledged by indorſement in the certificate of regiſtry, before two witneſſes, in order to prove that the entire property in ſuch ſhip is veſted in ſome of the ſubjects of Great Britain. In caſe any diſpute ſhould ariſe concerning the ſame, the above indorſement to be ſigned by the perſon transferring the property in ſuch ſhip or veſſel, or by ſome perſon legally authoriſed for that purpoſe. 7 & 8 W. III. c. 22. ſ. 21. 34 Geo. III. c. 68. ſ. 15, and by ſtat. 26 Geo. III. c. 60. ſ. 16.

In addition to the above indorſement there ſhall alſo be indorſed on the certificate of regiſtry, before two witneſſes, the town, place, or pariſh, where all perſons to whom the property in any ſhip or veſſel ſhall be transferred ſhall reſide; or if ſuch perſons uſually reſide abroad, but in ſome Britiſh factory, then the name of ſuch factory of which ſuch perſons are members; or if ſuch perſons reſide in any foreign town or city, the name of ſuch foreign town or city, and alſo the names of the houſe or copartnerſhip in Great Britain or Ireland for or with whom ſuch are agents or partners; and the perſon to whom the property of ſuch ſhip or veſſel ſhall be ſo transferred, or his agent, ſhall deliver a copy of ſuch indorſement to the perſon authoriſed to make the regiſtry, who is to cauſe an entry to be indorſed on the oath or affidavit upon which the original certificate of regiſtry of ſuch ſhip or veſſel was obtained; and alſo to make a memorandum in the book of regiſters, and forthwith give notice to the commiſſioners of the cuſtoms in England or Scotland, under whom they reſpectively act.

The certificate of regiſtry of ſuch veſſel ſhall be recited in words at length in the bill or inſtrument of ſale thereof, otherwiſe ſuch bill of ſale ſhall be utterly void. ſ. 17.

As often as the maſter or commander of any regiſtered veſſel ſhall be changed, the maſter or owner thereof ſhall deliver to the perſon authoriſed to make ſuch regiſtry at the port where ſuch change ſhall take place, the certificate of regiſtry belonging to ſuch ſhip or veſſel, who ſhall indorſe and ſubſcribe a memorandum of ſuch change, and ſhall give notice to the proper officer of the port where ſuch ſhip or veſſel was laſt regiſtered; who ſhall likewiſe make a memorandum of the ſame in the regiſter book, and give notice to the commiſſioners of the cuſtoms in England and Scotland. ſ. 18.

No owner of any ſhip or veſſel ſhall be permitted to give any other name thereto than that by which ſhe was firſt regiſtered. And all owners of regiſtered veſſels ſhall, within one month from the regiſtry, paint in white or yellow letters, of a length not leſs than four inches, upon a black ground, on ſome conſpicuous part of the ſtern (provided there ſhall be ſufficient ſpace, but if not, then in letters as large as ſuch ſpace will admit), the name by which ſuch ſhip or veſſel ſhall have been regiſtered, and the port to which

which ſhe belongs, and ſo keep and preſerve the ſame. And if ſuch owner, or maſter or commander of ſuch ſhip or veſſel ſhall wilfully alter, eraſe, or conceal, or permit the ſame to be done, unleſs in the caſe of ſquare rigged veſſels in time of war, or ſhall in any written or printed paper deſcribe ſuch ſhip by any other name than that by which ſhe was firſt regiſtered, or ſhall verbally deſcribe ſuch ſhip or veſſel by any other name to any officer of the revenue in the due execution of his duty, ſuch owner or commander thereof ſhall forfeit the ſum of 100*l.* ſ. 19.

By ſtat. 26 Geo. III. c. 60, all perſons who ſhall apply for a certificate of regiſtry in Great Britain, Guernſey, Jerſey, or the Iſle of Man, for any ſhip which ſhall be built, or whoſe building ſhall be completed after the 1ſt of Auguſt 1786, ſhall produce to the perſon authoriſed to grant ſuch certificate a true account under the hand of the builder of the ſame, of the proper denomination, the time when, and the place where ſuch ſhip or veſſel was built, and an exact account of the tonnage, together with the name of the firſt purchaſer; and alſo make oath before the perſon authoriſed to grant ſuch certificate, that the ſhip or veſſel for which ſuch certificate is required is the ſame with that ſo deſcribed by the builder. And every perſon applying for a like certificate in any of his majeſty's colonies, plantations, or territories, ſhall, before ſuch certificate is granted, produce the like account, under the builder's hand, and take the like oath as is required to be produced and taken by perſons applying in Great Britain. ſ. 20, 21.

If any certificate of regiſtry ſhall have been loſt, a regiſter and certificate *de novo*, in the form herein directed, ſhall be granted for ſuch veſſel, according to 15 Geo. II. c. 31; but in all ſuch caſes ſuch ſecurity ſhall be given as is directed in this act, and in lieu of the oath preſcribed by 15 Geo. II. the like oath ſhall be taken and ſubſcribed as hereinbefore directed, by the owner or owners of ſuch ſhips and veſſels as are required to be regiſtered by this act. ſ. 22, 23.

If any ſhip or veſſel ſhall, after regiſtry, be altered, either in form or burthen, or in any manner whatſoever, ſuch ſhip or veſſel ſhall be regiſtered *de novo* as ſoon as ſhe returns to her port, or to any other port in which ſhe may be regiſtered by virtue of this act; on failure whereof ſuch ſhip or veſſel ſhall be conſidered as a foreign veſſel. ſ. 24.

The owners of all ſuch ſhips as ſhall be condemned as lawful prize, ſhall, upon regiſtry thereof, before any certificate of regiſtry ſhall be obtained, produce to the proper officer of the cuſtoms a certificate of the condemnation of ſuch veſſel, and alſo a true account in writing of all the particulars contained in the certificate herein-before ſet forth, to be made and ſubſcribed by one or more ſkilful perſons to be appointed by the court to ſurvey ſuch ſhip or veſſel; and ſhall alſo make oath before the ſaid officer, that ſuch ſhip or veſſel is the ſame ſhip or veſſel mentioned in the certificate. ſ. 25.

No ſhip condemned as prize ſhall be regiſtered in the iſlands of Guernſey, Jerſey, or the Iſle of Man, although belonging to his majeſty's ſubjects reſident in thoſe iſlands; but the ſame ſhall be regiſtered either at Southampton, Weymouth, Exeter, Plymouth, Falmouth, Liverpool, or Whitehaven, by the collector and comptroller at ſuch port reſpectively. 26 G. III. c. 60. ſ. 26.

In all caſes where any ſhip or veſſel taken and condemned in any of his majeſty's colonies, plantations, or iſlands aforeſaid, ſhall be regiſtered, and obtain a certificate, an exact account ſhall be ſubjoined thereto of the ſum for which ſuch ſhip or veſſel ſhall have been ſold, verified upon the oath of the perſon applying for ſuch certificate of regiſtry. ſ. 27.

All certificates, hereafter to be granted in purſuance of this act, ſhall diſtinguiſh whether ſuch ſhips or veſſels be of the built of Great Britain, Guernſey, Jerſey, or the Iſle of Man, or of the colonies, plantations, iſlands, or territories aforeſaid, or of any foreign country; and ſhall, if Britiſh built, be entitled "Certificate of Britiſh plantation regiſtry," and if foreign built, ſhall be entitled "Certificate of foreign ſhip's regiſtry for the European trade, Britiſh property," as the caſe may be. ſ. 28.

No ſhip or veſſel, directed by this act to be regiſtered, ſhall be permitted, after the firſt arrival at the port to which ſhe belongs, at the expiration of the notice by this act directed, to clear outwards for foreign parts, or coaſtwiſe, or to proceed to ſea for the purpoſe of fiſhing on the coaſts, or for any other purpoſe, as a Britiſh ſhip or veſſel, unleſs the owners thereof ſhall have obtained a certificate; and in caſe ſuch ſhip or veſſel depart from ſuch port without being regiſtered, and without having obtained a certificate, every ſuch ſhip or veſſel, with all her guns, furniture, ammunition, tackle, and apparel, ſhall be ſubject to forfeiture. ſ. 32.

If, after the expiration of the before-mentioned notice, any ſhip or veſſel (being ſquare rigged) ſhall be found in any port within 20 leagues by water from the port to which ſhe belongs, or if any veſſel, not ſquare rigged, be found within any port other than that to which ſhe belongs, without having a certificate of regiſtry hereinbefore directed, it ſhall be lawful for the principal officer of ſuch port, and he is hereby required to detain ſuch until the maſter or commander ſhall, if ſuch ſhip or veſſel be under 50 tons, give ſecurity by bond in 50*l.* in manner hereinafter directed; and if the ſame ſhall exceed 50 and not exceed 100 tons, ſhall give ſecurity by bond in 100*l.*; and if the ſame ſhall exceed 100 tons, then until the maſter or commander ſhall with one ſecurity give bond in 200*l.*, with condition that ſuch maſter or commander ſhall forthwith repair with her to the port to which ſhe belongs, and there cauſe her to be regiſtered, procure a certificate, and deliver to ſuch officer ſuch certificate within the time limited in the condition of ſuch bond; which time is to be fixed according to the diſtance of the veſſel from the port to which ſhe belongs, and the nature of the voyage in which ſhe may be engaged; and on failure of producing ſuch certificate, ſuch bond ſhall be forfeited; but if the certificate be produced within the time ſo limited, ſuch bond ſhall be void. And in caſe any ſquare rigged veſſel ſhall be found in port, after the expiration of the aforeſaid notice, more than 20 leagues diſtant by water from the port to which ſhe belongs, or that the water at the entrance of the port to which ſhe belongs ſhall be ſo ſhallow as not to admit her entrance, the maſter or commander ſhall, within 48 hours after his arrival at ſuch port, make known his arrival to the collector and comptroller of the cuſtoms, or other principal officer of ſuch port; and ſhall require ſuch collector and comptroller to cauſe his ſhip or veſſel to be ſurveyed by the proper officer, who ſhall accordingly make a perfect ſurvey, and certify the ſeveral particulars thereof; and ſuch collector and comptroller ſhall immediately tranſmit the ſaid certificate of ſurvey to the perſon authorized to regiſter ſhips and veſſels at the port to which ſuch veſſel belongs, who ſhall regiſter ſuch veſſel, and grant certificate of regiſtry; and it ſhall be lawful for the collector and comptroller, or other principal officer of the cuſtoms, in the port where ſuch ſhip or veſſel ſhall be ſo found, to detain her until a perfect and accurate ſurvey, in the manner herein-before directed, can be made.

The remaining ſections of this act relate to penalties upon the

the miſconduct of officers, forging or altering certificates of regiſtry, mode of recovering penalties, &c.

By 27 G. III. c. 19. ſ. 4, no oath taken for the ſole purpoſe of acquiring the rights of a citizen or burgher in any foreign city or town in Europe, to be enjoyed during the time that ſuch perſon taking ſuch oath ſhall reſide in ſuch city or town, and for a limited time after ſuch reſidence ſhall have expired, ſhall be deemed an oath of allegiance to a foreign ſtate, nor inconſiſtent with the form of the oath upon regiſtry preſcribed by 7 & 8 W. III.

Ships belonging to the Eaſt India company, or any other body corporate, are to be regiſtered upon the oath ſubſcribed by the ſecretary of the ſaid company or other body corporate, or by any other officer properly authorized. ſ. 7.

No veſſel whatſoever, not exceeding the burthen of 30 tons, and not having a whole or fixed deck, and being employed ſolely in the Newfoundland fiſhery, or on the banks or ſhores of the provinces of Quebec, Nova Scotia, or New Brunſwick, adjacent to the gulf of St. Lawrence, and to the north of cape Canſo, or of the iſlands within the ſame, or in trading coaſtwiſe within the ſaid limits, ſhall be ſubject to be regiſtered in purſuance of the ſaid act. ſ. 8.

Ships built in Newfoundland, and thoſe parts of the provinces of Quebec, Nova Scotia, and New Brunſwick, adjacent to the gulf of St. Lawrence, and to the north of cape Canſo, or in the iſlands within the ſaid limits, on account of owners reſiding in his majeſty's European dominions, ſhall be regiſtered in the above places, upon the huſbands or principal agents of the ſaid ſhips taking the oath required; and ſuch certificates ſhall be of the ſame effect as if granted upon the oath of the owners, until ſuch time as they ſhall arrive in port in any of his majeſty's European dominions, where they may be reſpectively regiſtered upon the oath of the reſpective owners, but no longer. And whenever ſuch ſhip ſhall arrive at any ſuch port in his majeſty's European dominions, the certificates of regiſtry, granted in purſuance of this act, ſhall be null and void, and ſhall be delivered up to be cancelled; and ſuch ſhips are hereby required to be reſpectively regiſtered *de novo* conformably to the requiſitions of the preceding act. ſ. 9.

By 27 G. III. c. 19. ſ. 13, all ſhips not regiſtered according to the directions and regulations of the ſaid act, although ſuch ſhips may be owned by his majeſty's ſubjects, ſhall be held and deemed as alien ſhips, and ſhall in all caſes be liable to ſuch and the ſame penalties and forfeitures as alien ſhips are by law liable to in ſimilar caſes.

By 34 G. III. c. 42, foreign ſhips and veſſels heretofore owned by ſubjects of the late French king, which in conſequence of any capitulation may be put under his majeſty's protection at the time of, or in conſequence of the ſurrender of any foreign colony, may be regiſtered as ſhips condemned as lawful prize, and ſhall become entitled to the privileges of Britiſh ſhips, under the regulations and reſtrictions hereafter mentioned. Provided always, that no ſhip ſhall be ſo regiſtered but upon producing a certificate under the hand and ſeal of the perſon who commanded in chief, by ſea or land, at the time when ſuch foreign colony was ſurrendered (or in caſe of the death or departure of any ſuch officer before ſuch certificate ſhall have been ſo given, then upon a like certificate under the hand and ſeal of the perſon who ſhall command in chief, by ſea or land, at ſuch colony), teſtifying that ſuch ſhip or veſſel was put under the protection of his majeſty at the ſaid time; and upon oath, hereinafter directed, being taken and ſubſcribed before the perſon authoriſed to make ſuch regiſtry, by the owner of ſuch ſhip, if ſhe belong to one perſon only; or in caſe there ſhall be two joint owners, then by both of ſuch joint owners, if both be reſident within 20 miles of the place where ſuch regiſtry is required, or by one of ſuch owners, if one or both of them ſhall be reſident at a greater diſtance; or if the number of ſuch owners ſhall exceed two, then by the greater part of them, if the greater number of them ſhall be reſident within 20 miles, not in any caſe exceeding three of ſuch owners, or by one of ſuch owners, if all ſhall be reſident at a greater diſtance. Provided that ſuch regiſtry ſhall, for the iſland of St. Domingo, be made at the port of Kingſton in the iſland of Jamaica, and for any of the French Leeward iſlands, in the port of Roſeau in the iſland of Dominica; and the ſaid ports of Kingſton and Roſeau ſhall reſpectively, for the purpoſe of ſuch regiſtry, be deemed to be the port to which ſuch ſhip belongs. ſ. 1.

His majeſty, by the advice of his privy council, may at any time, on the arrival of any ſuch ſhip in Great Britain, upon application made to him, authoriſe any ſuch ſhip (without payment of any duty whatever for the ſaid ſhip, or the ſails and other neceſſary tackle, apparel, and furniture thereof) to be regiſtered, as in the caſe of a prize-ſhip, in any port of Great Britain. ſ. 4.

No perſon heretofore a ſubject of the late French king, being a white perſon, a mulatto, or free negro, ſhall be employed to navigate any veſſel bound from ſuch foreign colony, to any part of his majeſty's dominions, or be conveyed as a paſſenger on board thereof, unleſs ſuch perſon ſhall produce a certificate under the hand and ſeal of the perſon who commands in chief in ſuch foreign colony, or at the place therein whence ſuch ſhip ſhall ſail, teſtifying that ſuch perſon has taken the oath of fidelity and allegiance to his majeſty; and no negro-ſlave belonging to any perſon whatſoever, heretofore a ſubject of the late French king, ſhall be ſo conveyed or employed, but upon a certificate under the hand and ſeal of his maſter (which maſter ſhall have taken the oath of fidelity and allegiance as aforeſaid), certifying the good character of ſuch negro-ſlave, and teſtifying that his conduct has been ſuch that he may be ſafely admitted into the ports of his majeſty's dominions; which certificate ſhall be indorſed by the perſon who commands in chief his majeſty's troops or veſſels at the place from whence ſuch ſhip ſhall ſail, ſignifying that he has no reaſon to doubt of the truth thereof; upon pain that the maſter or commander of ſuch ſhip ſhall forfeit 50*l.* for every perſon reſpectively employed or conveyed in ſuch ſhip without having ſuch certificate. ſ. 5.

By 34 G. III. c. 68, no goods, wares, or merchandizes whatever ſhall, from the expiration of ſix months after the concluſion of the preſent war, be imported into, or exported from, any port or place in Great Britain, or Guernſey, Jerſey, Alderney, Sark, or Man, to any other port or place of the ſame, on board any ſhip or veſſel which, by law, is or ſhall be required to be regiſtered as a Britiſh ſhip or veſſel, unleſs ſuch ſhip or veſſel ſhall be navigated by a maſter and three-fourths at leaſt of the mariners Britiſh ſubjects. Nor, from the expiration of ſix months from the concluſion of the preſent war, ſhall any ſhip or veſſel, which by law is or ſhall be required to be regiſtered as a Britiſh ſhip or veſſel, be navigated but by a maſter and three-fourths of the mariners at leaſt Britiſh ſubjects, except as hereinafter provided. ſ. 1, 2, 3.

No goods, wares, or merchandizes whatever ſhall be carried from any port in Great Britain, or Guernſey, Jerſey, Alderney, Sark, or Man, to any other port or place of the ſame, nor ſhall any ſhip be permitted to ſail in ballaſt from or to any of the aforeſaid ports, nor be employed in fiſhing on the ſaid coaſts, unleſs ſuch ſhip ſhall be wholly and ſolely

manned with and navigated by a maſter and mariners all Britiſh ſubjects. The commiſſioners of the cuſtoms may, however, by licence under their hands, authoriſe any ſuch ſhip or veſſel employed in fiſhing on the coaſt of Great Britain, or of the iſlands of Guernſey, Jerſey, Alderney, Sark, or Man, to have on board any foreign mariners for the purpoſe of inſtructing the Britiſh mariners thereof in the art of fiſhing; ſuch foreign mariners not exceeding one-fourth of the number of mariners on board ſuch veſſel, except in caſes of ſickneſs, death, deſertion, or capture. ſ. 5.

By ſtat. 34 G. III. c. 68, no perſon ſhall hereafter be deemed to be qualified to be the maſter of a Britiſh ſhip, or to be a Britiſh ſailor, ſeaman, or mariner, except the natural-born ſubjects of his majeſty, or perſons naturalized by any act of parliament, or made denizens by letters of denization; or except perſons who have become his majeſty's ſubjects by virtue of conqueſt or ceſſion of ſome newly acquired country, and who ſhall have taken the oath of allegiance to his majeſty, or the oath of fidelity required by the treaty of capitulation, by which ſuch newly acquired country came into his majeſty's poſſeſſion, except as is hereinafter provided. ſ. 6.

But every foreign ſeaman ſerving on board any of his majeſty's ſhips in time of war, for the ſpace of three years, who ſhall alſo take the oath of allegiance, ſhall be entitled to be employed as a maſter of a Britiſh ſhip or veſſel, or as a Britiſh mariner on board any Britiſh ſhip, upon delivering certificates from the captains under whom he ſerved, of the time he ſhall have ſerved, and of his faithful ſervice and good behaviour, and a certificate of his having taken the oath of allegiance. ſ. 7.

No perſon who has taken an oath of allegiance to any foreign ſtate ſhall be deemed qualified to be the maſter of a Britiſh ſhip or veſſel, or a Britiſh ſailor, unleſs ſuch perſon ſhall have taken ſuch oath of allegiance before he became ſo qualified; and any perſon who ſhall, after having become diſqualified by taking ſuch oath of allegiance, take the charge or command of any Britiſh ſhip or veſſel, ſhall for every ſuch offence forfeit one hundred pounds; and if ſuch perſon ſhall engage to ſerve as a Britiſh ſeaman or mariner on board any ſuch ſhip, he ſhall forfeit ten pounds, unleſs the owners ſhall ſhew that ſuch diſqualifications were unknown to them or their agents at the time of engaging ſuch maſter or ſailor to ſerve on board ſuch ſhip or veſſel. Except in the navigation on the ſeas of America and the Weſt Indies, any negroes belonging to his majeſty's ſubjects, and in the ſeas to the eaſtward of the Cape of Good Hope, Laſcars and other natives of any of the countries to the eaſtward of the Cape of Good Hope, may be employed as Britiſh ſailors, ſeamen, or mariners, in manner heretofore practiſed. Provided nevertheleſs, that no negro belonging to any perſon who has become a ſubject of his majeſty, in manner before deſcribed, in any of the iſlands or colonies late under the dominion of the French, ſhall be entitled to be employed in manner before mentioned as a Britiſh ſailor, ſeaman, or mariner, unleſs all the conditions required by the 34th G. III. c. 42, ſhall have been complied with during the continuance of the ſaid act.

By the 13th G. II. c. 3, his majeſty in time of war may permit merchant ſhips to be navigated by foreigners, provided one-fourth of the crew be Britiſh ſubjects.

If any goods, wares, or merchandize whatever ſhall be imported or exported, or carried coaſtwiſe, contrary to the proviſions of this act, or any of them, all ſuch goods, wares, and merchandize, and alſo the ſhip or veſſel, with all her guns, furniture, ammunition, tackle, and apparel, ſhall be forfeited; and if any ſhip ſhall ſail in ballaſt, or ſhall ſail to be employed in fiſhing along the coaſt in manner herein before mentioned, or, being required to be manned and navigated with a maſter and a certain proportion of Britiſh mariners, in manner herein before directed, ſhall not be manned and navigated accordingly, ſuch ſhip or veſſel, with all her guns, furniture, ammunition, tackle, and apparel, and all the goods, wares, and merchandize on board, ſhall be forfeited. ſ. 10.

All goods, wares, and merchandize, and all veſſels, forfeited by this act, may be ſeized by the commander of any of his majeſty's ſhips of war, or any commiſſioned, warrant, or petty officer ſpecially appointed, or by any officer or officers of his majeſty's cuſtoms or exciſe.

If any Britiſh ſhip ſhall be found at ſea, having on board a greater number of foreign mariners than is allowed by this act, or any law in force or hereafter to be made, and the maſter of ſuch veſſel ſhall produce a certificate of the actual neceſſity of engaging ſuch foreign mariners in ſome foreign port, by occaſion of the ſickneſs, death, or deſertion of the like number of Britiſh mariners, or of the ſame having been taken priſoners during his voyage, and that Britiſh mariners could not be engaged at ſuch foreign port to ſupply their place, and that for the ſafe navigation of ſuch ſhip or veſſel, it became neceſſary to engage and employ ſuch foreign mariners, under the hand of his majeſty's conſul at the foreign port where the mariners are ſo engaged, or, if there be no ſuch conſul there, under the hands of two known Britiſh merchants at ſuch foreign port, no ſeizures ſhall be made by the perſons authoriſed under this act, nor ſhall ſuch ſhips be moleſted or detained at ſea; but ſuch perſons ſhall indorſe the certificate ſo produced, teſtifying the production thereof, and when and where met with at ſea, and that the number of foreign mariners correſpond with the certificate of ſuch Britiſh conſul, or ſuch known Britiſh merchants, for the conſideration and inveſtigation of the commiſſioners of his majeſty's cuſtoms in England and Scotland reſpectively.

By 34 G. III. c. 68. ſ. 14, no transfer, nor agreement for transfer, of the property in any ſhip or veſſel, either in whole or in part, ſhall be made but by a bill of ſale or inſtrument in writing, which ſhall contain a recital in words at length of the certificate of regiſtry.

If a ſhip be at ſea at the time when the transfer is made, ſo that an indorſement and certificate cannot be immediately made, the ſale, or contract for ſale, ſhall, notwithſtanding, be made by ſome inſtrument in writing, and a copy thereof ſhall be delivered to the perſon authoriſed to make regiſtry, who is to indorſe an entry thereof on the oath or affidavit, make a memorandum in the book of regiſters, and give notice to the commiſſioners of the cuſtoms as before directed: and within ten days after the ſhip returns to port, an indorſement ſhall be made on the certificate of regiſtry, and a copy thereof delivered as before-mentioned; otherwiſe ſuch ſale ſhall, to all intents and purpoſes, be void. ſ. 16.

Where the owner of any ſhip ſhall, at the time of transferring the property in any ſhips, be abroad, ſo that an indorſement, &c. or ſuch bill of ſale, cannot be immediately made, the ſame may be done at any time within ſix months after ſuch transfer, in which caſe, within ten days after the arrival of the owner or his agent in this kingdom, (if the ſhip be in any port thereof, and if not, within ten days after ſuch ſhip's arrival) an indorſement on the certificate of regiſtry ſhall be made, &c. as before directed. ſ. 17.

Maſters of ſhips refuſing to deliver up the certificate of regiſtry to the proper perſon empowered to make regiſtry, upon being required ſo to do by the owner or owners, or the major part of the owners, (if ſuch maſter have not any property

perty therein,) or by the other owner or owners, or major part thereof, (if ſuch maſter have any ſhare therein,) and upon oath being made by ſuch owner, owners, or major part thereof, before any juſtice of the peace near where ſuch refuſal ſhall be, ſuch juſtice may grant his warrant to bring the maſter before him; and if it ſhall appear that the ſaid certificate is *wilfully* detained, ſuch maſter ſhall pay one hundred pounds, and on failure of payment ſhall be committed to the common gaol, for not leſs than ſix months, nor more than twelve. ſ. 18.

Upon the juſtice's certifying the above *wilful* refuſal of the maſter of any veſſel to deliver up the certificate to the perſon authoriſed to make regiſtry, he ſhall regiſter the ſaid ſhip *de novo*, the terms and conditions of the law being complied with. ſ. 19.

When property in any ſhip or veſſel belonging to any of his majeſty's ſubjects ſhall be transferred by ſale, and ſuch veſſel ſhall be required to be regiſtered *de novo*, it ſhall not be done unleſs there be produced to the regiſter, the bill or other inſtrument of ſale. Provided always, that the commiſſioners of cuſtoms, and the governor, lieutenant-governor, or commander-in-chief for the time being of the iſlands of Guernſey or Jerſey, or of any colony, plantation, iſland, or territory belonging to his majeſty, may, upon due conſideration of the particular circumſtances of the caſe, give directions for the regiſtering ſuch veſſel *de novo*, and granting a certificate of ſuch regiſtry, notwithſtanding ſuch bill or other inſtrument of ſale ſhall not have been produced as aforeſaid; and ſuch regiſtry ſhall be made, and ſuch certificate thereof ſhall be accordingly granted, if all the other regulations required by the laws in force concerning the regiſtry of ſhips *de novo* be complied with. ſ. 20.

If there ſhall be any alteration of property at the ſame port, and the owner ſhall be deſirous of having the ſhip regiſtered *de novo*, ſuch ſhip may be ſo regiſtered, provided all the rules, regulations, and conditions are complied with relative to veſſels regiſtered *de novo*. ſ. 21.

In caſe of any transfer of property in any ſhip whilſt at ſea, ſuch ſhip ſhall proceed directly to the port for which the cargo then on board is deſtined, and ſhall ſail from thence to the port of his majeſty's dominions to which ſhe belongs, or to any other ſuch port in which ſhe may be legally regiſtered; and ſuch ſhip may take on board in the port for which her original cargo was deſtined, or in any other port in the courſe of her voyage home, ſuch cargo as may be legally carried to ſuch port of his majeſty's dominions where ſhe may be ſo regiſtered *de novo*. And if ſuch transfer of property ſhall be made while ſuch ſhip is in any foreign port, as ſoon as the maſter of ſuch ſhip ſhall become acquainted therewith, ſuch ſhip, after having delivered the cargo then on board at the port for which ſhe is deſtined, ſhall ſail thencefrom to the port to which ſhe belongs, or to any other ſuch port in which ſhe may be legally regiſtered; and may take on board at the port for which her original cargo was ſo deſtined, or at any other port in the courſe of her voyage home, ſuch cargo as may be legally carried to ſuch port of his majeſty's dominions where ſhe may be ſo regiſtered *de novo*. And if ſuch transfer of property ſhall be made while ſuch ſhip is on a fiſhing voyage, as ſoon as the maſter of ſuch ſhip ſhall become acquainted therewith, ſuch ſhip, after having finiſhed ſuch fiſhing voyage, without touching at any foreign port, except for the purpoſe of repairs or refreſhments, or for delivering any part of her cargo, ſhall ſail to the port of his majeſty's dominions to which ſhe belongs, or to any other ſuch port where ſhe may be legally regiſtered, and may take on board at the foreign port or ports laſt deſcribed, or at any other ports in the courſe of her voyage home, ſuch cargo as may be legally carried to ſuch port of his majeſty's dominions; and every ſuch ſhip as aforeſaid ſhall be regiſtered *de novo*, as ſoon as ſhe returns to the port of his majeſty's dominions to which ſhe belongs, or to any ſuch port in which ſhe may be legally regiſtered by virtue of the ſaid act; on failure whereof ſuch ſhip ſhall be deemed from thenceforth to be a foreign ſhip or veſſel, and ſhall not again be regiſtered, or be entitled to the privilege of a Britiſh ſhip or veſſel, unleſs upon ſpecial repreſentation of the circumſtances of the caſe to the commiſſioners of cuſtoms, or to the governor, lieutenant-governor, or commander-in-chief for the time being of the iſlands of Guernſey or Jerſey, or of any colony, plantation, iſland, or territory to his majeſty belonging, as the caſe may be: provided nevertheleſs, that in no caſe the ſhip or veſſel of which the property is ſo transferred, ſhall be entitled to the privileges of a Britiſh ſhip or veſſel, unleſs ſhe ſhall return to the port to which ſhe belongs, or to ſuch other port in which ſhe may be regiſtered *de novo*, within the period of twelve months after the date of ſuch transfer of property, if ſuch ſhip ſhall not be on a voyage to the eaſt of the Cape of Good Hope, or to the weſt of cape Horn; or within two years, if the ſhip is on the above voyages at the time ſuch transfer of property ſhall take place, except by the order of the ſaid commiſſioners, governor, lieutenant-governor, or commander-in-chief reſpectively. ſ. 22. See *Marine* INSURANCES, and POLICY.

REGIUS PROFESSORS. King Henry VIII. founded five lectures in each of our univerſities: *viz.* of Divinity, Hebrew, Greek, Law, and Phyſic; the readers of which lectures are in the univerſity ſtatutes called *regii profeſſores*.

REGIUS, in *Medicine*. See JAUNDICE.

REGLE *de l'Octave*, Fr., a rule for accompanying the octave aſcending and deſcending in the baſe; giving to each note of the ſcale its appropriate harmony in every key. This rule, well known and practiſed in the 24 keys, major and minor, will enable ſtudents in thorough-baſe to figure a baſe themſelves, and to accompany modern muſic without figures.

It is diſputed in France who was the inventor of this rule: Rameau and Rouſſeau aſſign it to De Laire, M. Laborde to Campion. "This formula," ſays Rouſſeau, "was firſt publiſhed by De Laire in 1700." If this date could be aſcertained, it would remove all doubts concerning the author of the rule; as Campion's "Treatiſe of Accompaniment" is not pretended to have appeared till after 1705.

This rule aſcertains what chords or harmony belong to every diatonic movement of the baſe, aſcending and deſcending. See ACCOMPANIMENT, or THOROUGH-BASE; where the baſe will be figured, and the chords written over it. We confine the infallibility of this rule to modern muſic, as no proviſion is made for 4ths and 9ths, which ſo frequently occur in Corelli, Geminiani, and Handel. But theſe diſcords, and ſeveral other combinations, are conſidered in the articles COUNTERPOINT and ACCOMPANIMENT, or *Thorough-baſe*; which ſee.

By this formula it will appear, that to the key-note there is always a common chord; to the 2d of the key, a $\frac{6}{4}_{3}$; to the 3d of the key, a 6th; to the 4th of the key, a $\frac{6}{5}$; to the 5th of the key, a common chord. Thus far the chords are rigorouſly in one key; but in order to connect the 6th to the 5th, Rameau gives the chord of the $\frac{6}{4}_{3}$ to the 6th, as in deſcending, which makes it the 2d of a new key; but then to recover the modulation into the original key, he gives $\frac{6}{5}$♮ to the 7th or *note ſenſible* of the key, and then terminates

minates the ſcale by a common chord to the octave of the key-note.

In deſcending, it is neceſſary to imagine the harmony in the 5th of the key for the four firſt notes: as, ſuppoſing the ſcale to be in C major, after repeating the common chord to the octave, the 7th of C muſt be regarded as 3d of the key of G, and be only accompanied by the 6th. A, as 2d of G, by a $\frac{5}{3}$, as in aſcending; and the 5th of the key by a common chord, or cloſe in G. The 4th of the key in deſcending has a $\frac{6}{2}$, or chord of the 5th of the key repeated; the next three chords are the ſame as in aſcending.

In minor keys, in all which ſuppoſing A natural to be the archetype, the chords are much the ſame; only whenever the 7th of the key is wanting in the aſcending ſcale, it muſt be accidentally ſharp: as to A, a common chord minor; to B, the 2d of the key, a $\frac{6}{3}$; to the 3d of the key, a 6th; to the 4th, a $\frac{6}{5}$; to the 5th, a common chord, with a ſharp 3d; to the 6th, if natural, a 6th; if ſharp, a $\frac{6}{3}$; to the 7th ſharp, $\frac{6}{5}$, and a common chord to the octave.

In deſcending, to the 7th natural, a 6th; to the minor 6th, a $\frac{3}{3}$, or 6 doubling the 3d; to the 5th of the key, a ſharp 3d; to the 4th of the key, the ſame chord, or $\frac{6}{2}+$; and to the three laſt, the ſame as in aſcending.

Theſe chords will be more clearly comprehended in notation on the thorough-baſe plates, to which we refer.

Though the regle de l'octave only provides for the regular aſcent and deſcent of the baſe in plain counterpoint, we know, by long experience, that it teaches more thorough-baſe and counterpoint in a ſhort time, than any other rule that has been propoſed ſince the laws of harmony were ſettled. See THOROUGH-BASE, ACCOMPANIMENT, and COMPOSITION.

REGLET, or RIGLET, in *Architecture*, a little flat narrow moulding, uſed chiefly in compartiments, and pannels, to ſeparate the parts or members from one another, and to form knots, frets, and other ornaments.

The word is a diminutive of the French, *regle*, *rule*.

The reglet, according to Daviler, differs from the *fillet* and *liſtel*, in that it projects equally, like a ruler.

REGLETS, or *Riglets*, in *Printing*, are thin rulers, or ſlips of wood, of different dimenſions, placed in the chaſe, between the pages, and at the extremes of them, to keep them aſunder, and to hold them tight.

The reglets make the chief part of what they call *the furniture of the chaſe*. See CHASE.

They are particularly denominated from the place they hold in reſpect of the pages, *head-ſticks*, *gutter-ſticks*, &c.

The term reglets is alſo uſed abroad for a ruler of metal, three quarters of an inch long, but which may be lengthened out by joining ſeveral together; uſed to ſeparate the columns, in books that have ſeveral in the ſame page; as alſo for lines to place the notes on, in printing of muſic. See PRINTING.

Reglet is alſo uſed for a little thin ſlip of wood, occaſionally, though ſeldom, uſed by compoſitors for the preſs to take off the lines from the compoſing-ſtick, and place them on the galley, where the lines are of an extraordinary length: and where the lines are at great diſtances, thoſe diſtances are made by leaving a reglet between each line, when printed.

REGMALARD, in *Geography*, a town of France, in the department of the Orne; 9 miles E.N.E. of Belleſme.

REGNANO, a town of Naples, in Capitanata; 16 miles from Manfredonia.

REGNANT QUEEN. See QUEEN.

REGNARD, JOHN-FRANCIS, in *Biography*, a French poet and writer of comedy, was born of a good family, at Paris, in 1647. His earlieſt paſſion was that for travelling, and he firſt made the tour of Italy. On his return, in an Engliſh ſhip, the veſſel was taken by the Algerines, and the crew made ſlaves at Algiers. Regnard, by his ſkill in cookery, ingratiated himſelf with his maſter: he poſſeſſed another art, which had nearly proved fatal to him. His perſon and manners recommended him to the attention of the ladies, whoſe advances he encouraged, and being diſcovered, the alternative was given him of being burnt to death or becoming a diſciple of the Koran. He was, however, releaſed from this difficulty by the interpoſition of the French conſul, and the proper application of a conſiderable bribe. He gained his liberty, and returned to France, and in 1681 departed upon a new tour to the northern countries of Europe. After an abſence of three years he came back to Paris, and ſettled quietly, with the view of cultivating his taſte for literary purſuits. He compoſed a number of comedies for the French theatre, which were acted with ſucceſs, and which, in the general opinion, placed him next to Moliere in true comic humour. Gaiety is the predominant character of Regnard's comedies, which is ſometimes maintained at the expence of morality. He excelled not leſs in the elevated or genteel comedy, than in the low, or familiar. His two beſt pieces are ſaid to be "Le Joueur," and "Le Legataire;" for deſcribing, to the life, the ſcenes of the firſt, he was extremely qualified, being himſelf a lucky gameſter. He wrote eight comedies, ſome pieces for the Italian theatre, and an opera. He alſo publiſhed miſcellaneous poems, conſiſting of ſatires, epiſtles, &c. In proſe he gave a relation of his travels, of which the only part that excited much intereſt was his account of Lapland. Regnard died at the age of 62. His works have been printed collectively, of which the beſt edition is that of Paris, in 1790, in 4 vols. 8vo.

REGNAVADSOE, in *Geography*, a ſmall iſland in the North ſea, near the coaſt of Norway. N. lat. 69° 50'.

REGNI, in *Ancient Geography*, a name given to the ancient inhabitants of Surrey and Suſſex, and perhaps of part of Hampſhire. They were ſeated E. of the Belgæ, and S. of the Atrebatii. As theſe people poſſeſſed ſo large a tract of the ſea-coaſt in the ſouth part of this iſland, it is very probable that they had come from the continent, and ſettled here not very long before the Roman invaſion, perhaps at the ſame time with their neighbours the Belgæ. The Belgæ and the Regni had been near neighbours on the continent; the one having migrated from the country of the Sueſſiones, now Soiſſons, and the other from the country of the Rhemi, now Reims. The Regni, like all the other Belgic Britons, early ſubmitted to the Roman power, and continued ſteady in their obedience, without engaging in any revolt. It is not known who was ſovereign of the Regni when they ſubmitted to the Romans, but ſoon after their ſubmiſſion, they were put under the government of Cogidunus, king of the Dobuni. For this prince, who was then very young, had got ſo much into favour with the emperor Claudius, and his miniſters, that he was not only allowed to keep his own dominions, but he had ſeveral other neighbouring ſtates put under his authority. It ſeems probable, from a famous inſcription diſcovered at Chicheſter, that Cogidunus governed the Regni in quality of the emperor's lieutenant, or legatus Auguſti; for in that inſcription he is ſo ſtyled. He continued a faithful and uſeful friend and ally to the Romans above 60 years, and thus he was ſo much endeared to them,

that,

that, according to their cuſtom in other countries, they permitted his poſterity to ſucceed him, perhaps for ſeveral generations. Although the Regni were very early and very obedient ſubjects of the Roman empire, yet as they were long after under the immediate government of Britiſh princes, few of the Romans ſeem to have ſettled among them. This is, without doubt, the reaſon that we meet with ſo few veſtiges of thoſe great and active people in thoſe countries which were anciently inhabited by the Regni. Chicheſter was certainly a conſiderable place in the time of the Romans, and probably the capital of the Regni, which led the Romans to call it Regnum. However, Camden, Gale, Baxter, and others, are unanimous in fixing Regnum, the capital of the Regni, at Ringwood; but Mr. Horſley has produced ſeveral reaſons for ſuppoſing it to have been ſituated where Chicheſter now ſtands. The Neomagus of Ptolemy, and the Noviomagus of the Itinerary, was a city of the Regni, and it is generally placed at Woodcote, near Croydon, in Surrey; though Mr. Baxter and ſome other antiquaries contend for Ravenſham, in Kent. In the moſt perfect ſtate of the Roman government in Britain, the country of the Regni made a part of the province called Flavia Cæſarienſis, and was governed by the preſident of that province.

REGNIER, Mathurin, in *Biography*, a French poet, was born at Chartres in 1573. He is ſaid to have diſplayed, at a very early period, a great propenſity to ſatire, which his father in vain attempted to repreſs by chaſtiſement. The exerciſe of his ſatirical talents procured him patrons, among whom were the cardinal Francis de Joyeuſe, and Philip de Bethune, both of whom he accompanied to Rome. By the intereſt of theſe great men he received conſiderable preferment in the church, but the dignity and gravity of the clerical character was no reſtraint upon his pleaſures, and he died at the age of forty, worn out with licentious practices. The works of Regnier conſiſt of ſatires, epiſtles, elegies, ſtanzas, odes, &c.: of theſe his ſatires are moſt eſteemed, and they were thought to make a kind of epoch in French poetry. The poems of Regnier have been frequently printed; the beſt editions are thoſe of Rouen, 1729, and of London, 1734, with remarks.

REGNIER-DESMARAIS, Francis-Seraphin, a French author of conſiderable reputation, was born at Paris in 1632, of a family originally from Saintonge. Being the younger ſon of a numerous family, he had to depend ſolely upon his own exertions for making his way in the world, and he ſucceſſively attached himſelf to ſeveral perſons of rank, whom he accompanied in their travels. Making a proper uſe of his opportunities, he acquired a knowledge of the Italian and Spaniſh languages, and he became ſo much a maſter of the former, that when he attended the duke of Crequi on his embaſſy to Rome, in 1662, he wrote the official letters in Italian with ſo much purity, that they were not known to be the compoſitions of a foreigner. But he obtained a ſtill greater triumph, by paſſing upon the academicians of Della Cruſca one of his own odes for a newly diſcovered piece of Petrarch. In conſequence of this he was elected, in 1667, a member of that celebrated academy. At the age of thirty-ſix he took eccleſiaſtical orders, for the purpoſe of enjoying a priory given him by Lewis XIV., as a recompence for his public ſervices, and in 1670 he was admitted a member of the French Academy, in the hope that he might become a contributor in the compilation of their dictionary. Soon after this, at the requeſt of the Jeſuits, he tranſlated from the Spaniſh language a treatiſe "On Chriſtian Perfection." In his capacity of academician, Regnier diſplayed ſo much activity and zeal, that on the death of Mezerai, in 1684, he was appointed to ſucceed him as ſecretary. When the dictionary was completed, the ſecretary by order of the Academy, drew up a preface, and an epiſtle dedicatory to the king; but, during his abſence, other members, who were inſpired with the deſire of emulating him in this honour, procured a preference for their own productions. This diſappointment drew from Regnier ſome critical remarks upon the rival performances, tinged with that cavilling and diſputatious ſpirit, to which it appears he ſo often gave way, that he obtained the title of the abbè Pertinax. He was ſo attached to his own opinion, that he could ſeldom be prevailed upon to give up his point, or to drop a diſpute. Fontenelle, being once preſent at an academical diſcuſſion, in which Regnier was warmly engaged, exclaimed, "this is a diſpute that might be prevented from ever ending, and therefore it ought to be ended immediately." Regnier obtained ſeveral benefices, and would probably have been promoted to the very higheſt dignity in the church, had he not been ſuſpected of tranſlating a ſcene in the "Paſtor Fido," which ſeems to inculcate a licentious morality, and likewiſe ſuſpected of writing a ſtill more objectionable copy of verſes. He was occaſionally employed in public buſineſs. He died at Paris in 1713, at the age of 81. He had drawn up a great many of the moſt important articles in the dictionary of the French academy, and he publiſhed, as the reſult of his long ſtudy of the principles of the French language, his "Grammaire Françoiſe," in 2 vols. 12mo., which is conſidered as a very valuable performance. His other works in proſe were "L'Hiſtoire des Dèmeles de la France, avec la Cour de Rome, au Sujet de l'Affaire des Corſes." Tranſlations of ſeveral of Cicero's pieces. In verſe he gave an Italian verſion of the Odes of Anacreon, and miſcellaneous poems in Latin, French, Italian, and Spaniſh. His French poems are varied, ingenious, and well turned, but they are allowed not to poſſeſs much fire or force. We have alluded to the abbe's unyielding diſpoſition: but it muſt be added, that he was ſtedfaſt in his friendſhips, inflexibly upright, and ſcrupulouſly veracious. The laſt quality, ſays his biographer, he nobly expreſſed, when, on being urged to violate the truth in favour of a man in power, and under the penalty of loſing his friendſhip, he ſaid, "I had rather quarrel with him than myſelf."

REGNO, in *Geography*, a town of Sweden, in Eaſt Gothland; 28 miles N. of Nordkioping.

Regno, *Ne exeat*, in *Law*. See Ne *exeat*, &c.

REGNUM. See Regni.

Regnum *Eccleſiaſticum*, a denomination given to one of the two kingdoms, which the clergy ſuppoſed to have exiſted in ſome countries: this, they pretended, was abſolute and independent of any but the pope, comprehending eccleſiaſtical men and cauſes, and exempt from the ſecular magiſtrate: the other was a *regnum ſeculare* of the king or civil magiſtrate, which was ſubordinate and ſubject to the eccleſiaſtical kingdom: but theſe uſurpations were exterminated here by Henry VIII. 2 Hale's Hiſt. P. C. 324.

REGNY, in *Geography*, a town of France, in the department of the Rhône and Loire; ſeven miles E. of Roanne.

REGOLA, Ital., a rule in muſic, a canon.

Regola *Armonica*, a monochord.

REGOLETS, in *Geography*, a paſſage from the gulf of Mexico into lake Pontchartrain, about ten miles long, and three or four hundred yards wide.

REGRADATION, Regradatio. See Degradation.

REGRATOR, Regratarius, a law-word, formerly uſed for one that bought wholeſale, or by the great, and ſold again by retail.

The

The term is now chiefly uſed, as it is deſcribed by ſtat. 5 & 6 Edw. VI. cap. 14. to denote one that buys corn, or other dead victuals, in any market, and ſells them again, in the ſame market, or within four miles of the place.

Regrating is an offence againſt the public, and is liable, by the ſtatute juſt cited, to the ſame penalty with engroſſing and foreſtalling.

Regrator is alſo uſed for a perſon who furbiſhes up old moveables, to make them paſs for new. See Frippery.

Among maſons, &c. to regrate is to take off the outer ſurface of an old hewn ſtone, with the hammer and ripe, in order to whiten and make it look freſh again.

REGRESSION, or Retrogradation of curves, &c. See Retrogradation.

REGUINY, in *Geography*, a town of France, in the department of the Morbihan; five miles N.W. of Joſſelin.

REGULA. See Rule.

Regula, in *Architecture*. See Reglet.

REGULAR, Regularis, denotes the relation of any thing that is agreeable or conformable to the rules of art.

In this ſenſe, the word ſtands oppoſed to *irregular*, or anomalous.

Thus we ſay, a regular proceeding, a regular building, regular poem, regular verb, &c.

Regular *Figure*, in *Geometry*, is a figure which is both equilateral and equiangular; *i. e.* whoſe ſides, and conſequently its angles, are all equal.

The equilateral triangle and ſquare are regular figures. All other regular figures, conſiſting of more than four ſides, are called regular polygons.

Every regular figure may be inſcribed in a *circle*; which ſee.

For the dimenſions, properties, &c. of regular figures, ſee Polygon.

Regular *Body*, called alſo *Platonic body*, is a ſolid terminated on all ſides by regular and equal planes, and whoſe ſolid angles are all equal.

The regular bodies are five in number; *viz.* the *cube*, which conſiſts of ſix equal ſquares; the *tetrahedron*, or regular triangular pyramid, having four equal triangular faces; the *octahedron*, having eight; the *dodecahedron*, having twelve pentagonal faces; and the *icoſahedron*, having twenty triangular faces. See each under its proper article. Beſides theſe five, there can be no other regular bodies in nature.

To meaſure the ſurface and ſolidity, &c. of the five regular bodies.—The ſolidity, &c. of the cube is ſhewn under the article Cube. The tetrahedron being a pyramid, and the octahedron a double pyramid; and the icoſahedron conſiſting of twenty triangular pyramids; and the dodecahedron of twelve quinquangular ones, whoſe baſes are in the ſurface of the icoſahedron and dodecahedron, and their vertices meeting in a centre; the ſolidities of theſe bodies are all found from what we have ſhewn under Pyramid.

1. Their ſurface is had by finding the area of one of the planes, from the lines that bound it; and multiplying the area thus found by the number from which the body is denominated: *e. gr.* for the tetrahedron, by 4; for the hexahedron, or cube, by 6; for the octahedron, by 8; for the dodecahedron, by 12; and for the icoſahedron, by 20. The product is the ſuperficial area.

Or, the ſuperficial contents of any of the five Platonic bodies may be had by the following proportion; as 1 is to the ſquare of the ſide of the given Platonic body,

ſo is { 1.7320508, 3.4641016, 6.0000000, 8.6602540, 20.6457788 } to the ſuperficial content of the { tetrahedron, octahedron, hexahedron, icoſahedron, dodecahedron }.

Hence we have the following rule: multiply the proper tabular area, taken from the preceding table, by the ſquare of the ſide of the given ſolid, for the ſuperficies.

2. The diameter of a ſphere being given, to find the ſide of any of the Platonic bodies, that may be either inſcribed in the ſphere, or circumſcribed about the ſphere, or that is equal to the ſphere.

As 1 is to the number in the following table, reſpecting the thing ſought, ſo is the diameter of the given ſphere to the ſide of the Platonic body ſought.

The diameter of a ſphere being unity, the ſide of a	That may be *inſcribed* in the ſphere, is	That may be *circumſcribed* about the ſphere, is	That is *equal* to the ſphere, is
Tetrahedron	0.816497	2.44948	1.64417
Octahedron	0.707107	1.22474	1.03576
Hexahedron	0.577350	1.00000	0.88610
Icoſahedron	0.525731	0.66158	0.62153
Dodecahedron	0.356822	0.44903	0.40883

3. The ſide of any of the five Platonic bodies being given, to find the diameter of the ſphere, that may be inſcribed in that body, or circumſcribed about it, or that is equal to it. As the reſpective number, in the above table, under the title, *inſcribed*, *circumſcribed*, or *equal*, is to 1, ſo is the ſide of the given Platonic body to the diameter of its inſcribed, circumſcribed, or equal ſphere, in ſolidity.

4. The ſide of any of the five Platonic bodies being given, to find the ſide of either of the Platonic bodies, which are equal in ſolidity to that of the given body. As the numbet under the title *equal*, againſt the given Platonic body, is to the number under the ſame title, againſt the body whoſe ſide is ſought, ſo is the ſide of the given Platonic body to the ſide of the Platonic body ſought.

5. To find the ſolid contents of any of the five Platonic bodies. As 1 is to the cube of the ſide of any of theſe bodies, ſo is 0.1178513 to the ſolid content of a tetrahedron, 0.4174045 to that of the octahedron, 1.0000000 to that of the hexahedron, 2.1816950 to that of the icoſahedron, and 7.6631189 to the ſolid content of the dodecahedron.

Hence we have the following rule: multiply the tabular ſolidity by the cube of the ſide or linear edge, for the ſolid content. The demonſtration of this rule, and that for the ſuperficies above given, is as follows:

The tabular numbers denote the ſurface and ſolidity of each body, when its ſide or edge is one; and, becauſe, in ſimilar bodies, the ſurfaces are as the ſquares of the linear edges, and the ſolidities as the cubes of the ſame, the truth of the rules is manifeſt.

If one of theſe bodies be required to be cut out of the ſphere of any diameter, let $d\,r$ (*Plate* XII. *Geometry*, *fig.* 9.) be the diameter of any ſphere, and $d\,a$ one-third of it, $= a\,b = b\,r$. Erect the perpendiculars $a\,e$, $c\,f$, and $b\,g$; and draw $d\,e$, $d\,f$, $e\,r$, $f\,r$, and $g\,r$; then will (1) $r\,e$ be the ſide of the tetrahedron; (2) $d\,f$, the ſide of the hexahedron; (3) $d\,e$, the ſide of the octahedron; (4) and cutting $d\,e$ in extreme and mean proportion in h, $d\,h$ will be the ſide of the dodecahedron; (5) ſetting the diameter $d\,r$ up perpendicular at r, from the centre c, to its top, draw the line $c\,g$, cutting

cutting the circle in *g*, let fall the perpendicular *g b*; ſo is *b r* the ſide of the icoſahedron.

Regular *Curve*. See Curve.

Regular *Architecture*, *Fortification*, &c. See Architecture, and Fortification.

Regular *Attacks*, in a ſiege, are thoſe that are made in form, or by regular approaches. See Parallels.

Regular *Baſtion*. See Bastion.

Regular *Place*. See Place.

Regular, in the *Monaſtic Senſe*, denotes a perſon who has made the vows in ſome religious houſe. See Religious and Vow.

Under regulars are comprehended the whole body of monks, friars, and mendicants, &c.

The denomination of regulars, in this caſe, ariſes hence, that they are bound to obſerve the regula or rule of the order they are entered into. Hence,

Regular *Prieſt* is uſed for a prieſt who is in ſome religious order, in oppoſition to a *ſecular* prieſt, who lives in the world, or at large.

A cardinal is reputed both regular and ſecular, and is intitled to the privileges of both ſtates.

Regulars may be promoted to biſhoprics and archbiſhoprics, as well as ſeculars; but their promotion ſecularizes them; the epiſcopal dignity diſpenſing them from the obſervation of the rule of which they had before made profeſſion.

Regular *Abbots*. See Abbot.

Regular *Benefices*, are ſuch as can only be held by monks or religious; or at leaſt, *per cupientem profiteri*, by a perſon deſirous to embrace the monaſtic life. See Benefice.

It is a maxim in the Romiſh canon law, *regularia regularibus*, *i. e.* regular benefices are to be conferred on regular prieſts. The abbeys that are chiefs of their reſpective orders are all regular, and can only be ſerved by monks and cardinals. All benefices are preſumed to be ſecular, unleſs they be proved regular.

Anciently the regular benefices were almoſt all conferred by way of adminiſtration or curacy; the religious incumbents being always *ad manum* to their ſuperiors, who diſplaced them at pleaſure. Hence the common maxim among the canoniſts, *omne beneficium regulare manuale*.

The benefices appropriated to regulars are abbeys, conventual priories, ſimple priories, and clauſtral offices. They may be conferred on ſeculars *in commendam*.

Regular *Canons*. See Canon.

Regular *Places*, are thoſe within the boundary or incloſure of the convent; as the cloiſter, dormitory, chapter, and refectory. In oppoſition to thoſe deſtined for gueſts, and for the neceſſaries of the houſe, which are reputed without the incloſure.

Regular *Corporation*. See Corporation.

REGULATION, a rule or order preſcribed by a ſuperior, for the uniform and orderly management of ſome branch of policy, juſtice, or the like.

REGULATOR *of a Watch*, is a ſmall ſpring belonging to the balance, ſerving to adjuſt the going, and to make it go either faſter or ſlower.

Regulator *of Velocity*, in *Mechanics*, is a contrivance for regulating or governing the motion of a mill, or other large machine, by means of which it will always be cauſed to preſerve an equable and regular velocity in the motion of its parts, notwithſtanding any accidental increaſe of the moving force, or decreaſe of the reſiſtance that may occaſionally ariſe. A regulator muſt be connected with ſome lever, or other parts of the machine, which commands the ſupply of whatever conſtitutes its moving force, as the ſhuttle of a water-wheel, the ſail-cloth of a wind-mill, or valve of a ſteam-engine; and it ſhould have the property of acting ſuddenly upon this lever, or other part, the inſtant any increaſe or decreaſe of velocity in the motion takes place, either to elevate or depreſs it, and thus regulate the ſupply in a degree proportioned to the quantity of alteration in the velocity; and it is by the ſenſibility and accuracy of the regulator in this reſpect that its perfection is eſtimated.

The regulator moſt commonly uſed is called a *governor*. This conſiſts of two or more pendulums ſuſpended from joints, which are ſupported upon a vertical axis: this being cauſed to revolve by the machine, and the pendulums accompanying it, the balls will, by the centrifugal force, recede from the axis or centre a quantity proportioned to the velocity of the motion and length of the pendulum: then, on any acceſſion of the motion, they recede ſtill further from the axis, or *vice verſâ*, if the velocity diminiſhes. This motion is contrived to actuate the lever which regulates the velocity of the machine in a ſteam-engine: it is connected with the valve which admits the ſteam from the boiler to the cylinder, in a water-wheel with the ſhuttle, through which the water flows, or in a wind-mill with the mill-ſtones, or ſail-cloths. See a farther deſcription under Mill-work, Steam-*Engine*, and Windmill.

The principle of the governor is the ſame with the circular or conical pendulum, of which Huygens has laid claim to the invention, as well as of the long pendulum for regulating clocks, who ſays he diſcovered it nearly at the ſame time as the other. The conical pendulum circulates ſeconds when of the ſame length with the common pendulum, which will vibrate only half ſeconds. To explain it, we muſt ſuppoſe a ball or weight to be ſuſpended by a ſtring or rod, ſo that the ball can deſcribe in a horizontal circle by a motion of the rod round a vertical axis, with which the centre of ſuſpenſion coincides. In this motion the rod of the pendulum will deſcribe the ſurface of a cone, of which the point of ſuſpenſion is the vertex, and the horizontal circle which the ball deſcribes is the baſe: it is hence called the circular or conical pendulum. The ball has liberty to recede from, or approach to, the axis, by moving upon its centre of ſuſpenſion, and thus the circle the ball deſcribes will be enlarged or diminiſhed; and it is this circumſtance which gives it the property of circulating or performing a revolution always in the ſame ſpace of time which a ſimple pendulum of four times the length would vibrate; for this takes place equally whether the ball is extended to deſcribe a large circle, or retracted to revolve in a ſmall one; though, it ſhould be obſerved, that this is only true in the ſuppoſition that the pendulum-ball, in moving from the vertical axis upon its centre, will deſcribe a parabola inſtead of a circle, in the ſame manner as the ball of a common pendulum is required to move in the arc of a cycloid inſtead of a circle, to cauſe all the vibrations, both long and ſhort, to be performed in equal ſpaces of time. Mr. Martin has, in his Inſtitutions, given a very complete explanation of the principle of this pendulum, by ſuppoſing an inverted parabola, with its axis placed in a vertical poſition; then ſuppoſing a bowl or veſſel excavated by the revolution of this figure upon its axis a paraboloid will be formed. A heavy globe or ball being put in this bowl, may, by agitating the veſſel, be cauſed to perform a revolution in a horizontal circle within the veſſel, and it will be found to circulate in the ſame period of time, whether it deſcribes a ſmall circle near the bottom of the veſſel, or a large circle in its upper part, where the diameter is larger.

The governor or flying-ball is the regulator moſt generally uſed in machinery, although there are other means which, in particular inſtances, are preferable, from the circumſtance of their poſſeſſing a greater power to operate upon the regulating part of the machine. One of theſe, called the water-regulator, conſiſts of a pump, which, being worked by the machine, will raiſe water into a ciſtern, from which a conſtant ſtream flows off by a pipe and cock; a float is placed upon the ſurface of the water in the ciſtern, and this communicates with the ſteam-valve of the engine, or ſhuttle of the water-wheel. The operation of this regulator is eaſily explained, for the pump will raiſe a quantity of water exactly proportioned to the velocity of the machine, or the number of ſtrokes it makes; whereas the ſtream which flows off by the cock is a conſtant quantity, and equal to that which the pump will ſupply when the machine moves with its intended velocity. When this is the caſe, the ſurface of water in the ciſtern will ſtand at the ſame height; but if the velocity is increaſed, the pump will raiſe more water into the ciſtern than the pipe and cock will carry off, and the ſurface riſing, elevates the float, which, by its action to diminiſh the ſupply of power to the machine, will correct the acceleration which had taken place in its velocity. The oppoſite effect takes place if the velocity decreaſes, *viz.* that the ſupply to the ciſtern being diminiſhed whilſt the efflux is conſtant, the ſurface will ſink, and the float deſcending, opens the valve or ſhuttle, and increaſes the ſupply of power to the machine until it regains the original velocity. The great advantage of this regulator is, that it can ſo readily be made to keep the machine ſteady at any velocity which may be required, and this by merely opening or cloſing the cock: thus, if it is opened to carry off a greater quantity, the ſurface will ſubſide, and the float, by deſcending, opens a greater ſupply of power to the machine, and occaſions it to move quicker; but this, though it raiſes more water by means of the pump, will not raiſe the ſurface of the water in the ciſtern to ſo great a height as it ſtood at before, becauſe the efflux is now equal to the increaſed ſupply.

In all caſes this regulator will cauſe the machine to work at ſuch a rate, as to make the pump raiſe the ſame quantity of water as the cock emits, and its rate may be aſcertained before it is put to work; for if the quantity of water which the cock will diſcharge in a minute, or other given ſpace of time, is known, and the dimenſions of the pump; then it may eaſily be calculated what number of ſtrokes *per* minute the pump muſt make to raiſe an equal quantity of water. The ſenſibility of this regulator will be increaſed by making the ciſtern of a ſmall ſize, becauſe then any deviation from the intended rate of working will cauſe the greater elevation or depreſſion of the ſurface, and a greater action on the float: and, for the ſame purpoſe, it is beſt to make the ciſtern gradually diminiſh in area, ſo as to be ſmaller both towards the top and at the bottom, than at the place where the ſurface is expected to ſtand when the machine moves with the proper velocity. By this means it will riſe or fall more rapidly, in conſequence of the diminiſhed area of the ciſtern, when the alteration of velocity is conſiderable, and a greater correction is required, than when the alteration is only trifling. It is neceſſary that the pump ſhould raiſe a conſtant ſtream of water into the ciſtern, both in the aſcent and deſcent of its bucket: to do this, two pumps, acting alternately, may be uſed, or by a very ſimple contrivance a ſingle pump may be made to effect the ſame; thus, upon the rod of the pump a cylinder of wood is fixed, which is of ſuch a diameter, that its area is equal to half the area of the pump-barrel, and its length being equal to the length thereof, its content will be equal to one-half of the barrel: this is fixed on ſuch a part of the rod, that it will, by the riſing and falling of the rod, be drawn up out of water as much as the rod and bucket moves: now, when the pump-bucket is drawn up, the riſing of the cylinder above the ſurface of the water increaſes the capacity of the ciſtern one-half as much as the quantity of water which is thus drawn up into it, and the efflux of water by the cock being juſt equal to the other half, the ſurface will be ſtationary; and when the bucket deſcends, and no water is raiſed, the cylinder going down into the water diminiſhes the capacity of the ciſtern a quantity equal to the quantity of water which will flow off in the ſame time, and thus ſupplies the waſte of water which flows off in the ſame time. A regulator of this kind may, in many caſes, be formed from ſome part of the machine, without any additional apparatus: thus, the cold water-pump of a ſteam-engine will raiſe the neceſſary water into a ciſtern for the float to act in, and this float muſt be connected with the arm of the ſteam-valve. Alſo, in an engine for blowing a furnace, where it has a water-regulator (ſee BLOWING), the riſe of the water in the external ciſtern may regulate the motion of the engine, the whole machine being of the ſame kind with the regulator we have deſcribed.

A regulator would be applied with great advantage to a machine which is uſed in the *Cotton* MANUFACTURE (ſee that article), for drawing a piece of cotton cloth regularly and ſlowly over a red-hot cylinder of iron by two rollers, from one of which it is wound to the other: now, if the men who turn theſe ſtop but for a moment the cloth is burnt through, but by a regulator it might be lifted off the hot iron the inſtant the motion was ſo far diminiſhed as to endanger the firing of it.

The water-regulator is rendered more powerful by ſuſpending the ciſtern from the end of a lever, like a ſcale-beam, the oppoſite end of which has a counterpoiſe ſufficient to balance the weight of the ciſtern when the water in it ſtands at the intended height; but if the water increaſes in the ciſtern from the cauſes above deſcribed, the box will deſcend, and the motion of the lever will act upon the machine to make the regulation the ſame as the motion of the float: on the other hand, when the water in the ciſtern diminiſhes, the counterpoiſe will draw it up and give motion to the lever. The water from the pump is introduced to the ciſtern by a ſpout, and all the other parts have the ſame conſtruction as we have deſcribed.

It is a defect of both the regulators we have above deſcribed, that they do not operate upon the machine until the alteration of velocity has actually taken place, although they immediately correct it. It would be deſirable to have others which would make the correction before the evil takes place: for inſtance, in a wind-mill, which is more ſubject to irregularity than any other machine, a large vane may be ſuſpended by a heavy pendulum, and oppoſed to the wind; now the force of the latter, when blowing regularly, will cauſe the pendulum to incline a certain quantity from the perpendicular; but if the wind increaſes or diminiſhes, it will incline more or leſs, and this motion may be communicated to the ſhuttle which regulates the feed of corn, ſo as to give more or leſs to the ſtones in proportion to the power of the wind for grinding it, thus adapting the reſiſtance to the power; and if this ſhould increaſe beyond all bounds, the ſame motion may be made to act upon the grip of the mill to check its acceleration effectually. In the ſame manner a water-wheel may have a float placed in the dam or head to act upon the ſhuttle whenever the ſurface thereof riſes or falls above or

below

below the intended level, ſo as to apportion the ſupply to the fall, and keep the velocity uniform.

There is another kind of regulator ſometimes uſed in machines to cauſe a ſufficient reſiſtance to the motion to prevent acceleration, ſuch as a crane or lowering machine, which is to let down a heavy weight, a coal winding machine, &c.; a very good one for theſe purpoſes is a vertical axis with pendulums, like the governor, but having a broad vane to meet the air inſtead of heavy balls, which indeed may be added alſo: this, when put in motion, will oppoſe a very great reſiſtance to the acceleration, becauſe the centrifugal force cauſing the vanes to recede from the centre, they muſt deſcribe a larger circle in the air in proportion to the velocity, or, by collapſing, they make but little reſiſtance when the velocity is ſmall.

REGULO, a title given to the ſons of the emperor of China.

REGULUS, Marcus Attilius, in *Biography*, a celebrated Roman general, was raiſed to the conſulſhip the firſt time in the year 267 B. C., and, in conjunction with his colleague Libo, obtained the honour of a triumph on account of their ſucceſs over the Salentines, from whom they took their capital Brunduſium. During the firſt Punic war the Romans elected Regulus conſul, together with Lucius Manlius Vulſo, B.C. 256, and gave them orders to carry their arms into Africa. They ſailed with a very powerful fleet, and in their voyage encountered a ſuperior Carthaginian force, under Hanno and Hamilcar, which they totally defeated. After refitting in Sicily, and taking freſh troops aboard, the conſuls ſailed for the African coaſt, where they took poſſeſſion of the town of Clupea. They next advanced towards Carthage, which city was thrown into the utmoſt conſternation by this unexpected invaſion; and, after plundering the country almoſt to its gates, they returned to Clupea loaded with booty of all kinds. Very ſoon after this, orders arrived from Rome for the return of Manlius, leaving Regulus with part of the fleet and army to conduct the war in Africa. Regulus aſked for his recall upon the following plea: he was poſſeſſed of a farm of ſeven acres, from which his family derived their ſubſiſtence, and being informed that his ſervants were carrying off his ſtock, he begged that he might return to ſave his family from ſtarving. The plea was over-ruled, by an order that they ſhould be maintained by the public during his abſence upon the ſervice of his country. He again advanced towards Carthage, croſſed the river Bagrada (in paſſing which, according to the Roman hiſtorians, he was encountered by a monſtrous ſerpent,) and laid ſiege to a town not far from the metropolis. Hamilcar attempted to relieve the place, but Regulus met him and gave him a very ſignal defeat. After this he took ſeveral towns, without any reſiſtance. A revolt of the Numidians reduced the Carthaginians to ſtill greater diſtreſs, ſo that it appears the enemy ſought for peace. The terms, however, offered by Regulus were ſo unreaſonable, that the ſenate of Carthage could not for a moment liſten to them, and reſolved upon a vigorous proſecution of hoſtilities. During the interval of negociation a body of Greek mercenaries arrived at Carthage, commanded by Xantippus, a Spartan, by whom the Romans were completely defeated, with the loſs of 30,000 men, beſides 15,000 taken priſoners, among whom was Regulus himſelf, whom the Carthaginians brought in triumph into that city, which, but a few hours before, he had not only inſulted, but, in his own mind, devoted to deſtruction. Hitherto, ſays the hiſtorian, Regulus had appeared only as a Roman commander, and not one of the moſt conſpicuous; the concluding ſcenes of his life are thoſe which entitle him to rank among the firſt of Roman patriots. The Carthaginians behaved to their other priſoners humanely, but Regulus they treated with all the barbarity which they could deviſe; but, when the fortune of war appeared to turn againſt them, they began to uſe him with more lenity, in order that they might engage him to endeavour to obtain an accommodation. At their deſire he went with their ambaſſadors to Rome, having firſt taken an oath that he would return to his priſon, if the negociation ſhould not ſucceed. When he arrived at the gates of the city he refuſed to enter, being, as he ſaid, a ſlave to the Carthaginians; and when his wife and children came out to meet him, he viewed them as ſtrangers, and declined their careſſes. The ſenators aſſembled to give audience to the Carthaginian ambaſſadors, preſſed him to take his ſeat among them, but he refuſed, till commanded by his maſters to accept it. When he was called on for his opinion, he ſpoke ſtrongly both againſt granting the Carthaginians peace, and exchanging himſelf and the other Roman captives for the priſoners of importance whom they had taken from that nation. Though convinced by his arguments, the ſenators were unwilling to ſend back ſo noble a citizen, and a ſubterfuge was ſuggeſted to him by which he might be releaſed from his oath, but he inſtantly rejected the baſe ſuggeſtion, and declared his reſolution to return to Carthage in the face of the cruel puniſhment that he knew awaited him. Acting upon the idea that he was ſtill a ſlave, he took no leave of his family, but, with an unmoved countenance, made his way in ſilence through the crowds of his admiring countrymen. The Carthaginians were told that their offers of peace were not only rejected at Rome, but chiefly ſo through the means of Regulus, whom now they reſolved to puniſh in the ſevereſt manner poſſible. For ſome days he was expoſed to the rays of a meridian ſun, and afterwards confined in a barrel, whoſe ſides were every where filled with large iron ſpikes, till he died in the greateſt agonies. His ſufferings were heard of at Rome, and the ſenate permitted his widow to inflict whatever puniſhment ſhe pleaſed on ſome of the moſt illuſtrious captives of Carthage, and ſhe took a ſevere revenge, till at laſt the ſenate interpoſed, and put a ſtop to the barbarity of her puniſhments. Regulus periſhed in the year B.C. 251. Univ. Hiſt.

Regulus, *Petty King*, in our *Ancient Cuſtoms*, is a term frequently uſed, in the Saxon councils, for comes or count.

Hence *ſub-regulus* was alſo uſed for a vice-comes or viſcount: though in many places the two ſeem uſed indifferently for the ſame dignitary. Thus in the archives of the cathedral of Worceſter, Uthredus ſometimes ſtyles himſelf regulus, and ſometimes ſub-regulus, of the city of Worceſter.

But in other places we find a diſtinction: "Offa, rex Merciorum; Uthredus, regulus; Aldredus, ſub-regulus, &c."

Regulus, *Konig*, Germ., in *Chemiſtry*, denotes, in its moſt extenſive ſenſe, a metal in the proper metallic ſtate. The term is now little uſed, though the old chemiſts chiefly employed it as a diſtinctive appellation in thoſe caſes where a metal and one of its ores happened to be called by the ſame name. Thus, the grey ſulphuret of antimony was not known by the name of antimony long before it was ſuſpected to contain a peculiar metal; when this diſcovery took place, the metal was called regulus of antimony, in order to diſtinguiſh it from the ore from which it was procured. For the ſame reaſon, the metals arſenic and cobalt were denominated the reguli of arſenic and cobalt.

Regulus *of Antimony*. See Antimony.

Regulus, *Martial, of Antimony*. See Antimony.

Regulus *of Arſenic*. See Arsenic.

Regulus *of Cobalt*. See Cobalt.

Regulus, in *Aſtronomy*, is a ſtar of the firſt magnitude, in the conſtellation Leo; called alſo, from its ſituation, *Cor Leonis*, or the *Lion's Heart*; by the Arabs, *Alhabor*; and by the Chaldeans, *Kalbeleced*, or *Kalbeleceid*; from an opinion of its influencing the affairs of the heavens; as is obſerved by Theon. See Leo.

Regulus, in *Ornithology*, a ſpecies of *Falco*; which ſee. —Alſo, a ſpecies of *Motacilla*; which ſee.—See alſo Wren.

REGUSSE, in *Geography*, a town of France, in the department of the Var; 9 miles N.E. of Barjols.

REGYA, a river of Africa, which runs into the Mediterranean; 16 miles E. of Algiers.

REHABERE *facias ſeiſinam*, quando vicecomes liberavit ſeiſinam de majore parte, *quam deberet*, in *Law*, a writ judicial; of which there is another of the ſame name and nature. (Reg. Jud. 13, 51, 54.) It lay when the ſheriff in the *Habere facias ſeiſinam* had delivered more than he ought.

REHABILITATION, Rehabilitatio, in the *Civil* and *Canon Law*, an action by which a prince or pope, by diſpenſation or letters patent, reſtores a delinquent to the condition he was in before his delinquency. See Degradation.

The king alone can rehabilitate an officer, noted, condemned, and degraded; or a gentleman who has derogated from his rank.

The pope alone pretends to rehabilitate, *i. e.* to render capable of benefices and orders, ſuch as had fallen into hereſy or other irregularities.

In Romiſh countries, an eccleſiaſtic who aſſiſts at the execution of a ſentence of death, is to be rehabilitated by an abſolution, called *a fævis*.

By the *rehabilitation* of a convict in the Code Napoleon, or French criminal juriſprudence, is underſtood his reſtoration to all the rights and privileges which he had forfeited by being ſubjected to a painful or infamous puniſhment. He cannot demand it till five years have elapſed ſince the execution of his ſentence, during the whole of which time he muſt have reſided in the ſame *arrondiſſement*; or unleſs he has been domiciled during two complete years in the territory of the municipality to which the demand is addreſſed. It muſt alſo be ſupported by teſtimonials of his good conduct from the municipal authorities. The criminal court receives the demand, and pronounces on it at the end of three months: if their judgment be unfavourable, the application may be renewed at the end of five years, with the ſame advantage; but if the party rehabilitated into ſociety ſhould offend again, he becomes incapacitated for ever.

REHBURG, in *Geography*, a town of Weſtphalia, in the principality of Calenberg; 18 miles W.N.W. of Hanover.

REHEARING, in the *Court of Chancery*, is a proceſs to which either party, that thinks himſelf aggrieved, may have recourſe, before the execution of a final decree. Every petition for a rehearing muſt be ſigned by two counſel of character, certifying that they apprehend the cauſe is proper to be reheard. And upon the rehearing, all the evidence taken in the cauſe, whether read before or not, is now admitted to be read; becauſe it is the decree of the chancellor himſelf, who only now ſits to hear reaſons why it ſhould not be enrolled and perfected; at which time, all omiſſions of either evidence or argument may be ſupplied. But after the decree is once ſigned by the chancellor, and enrolled, it cannot be reheard or rectified, except by bill of review, or by appeal to the houſe of lords.

REHEARSAL, in *Muſic* and the *Drama*, an eſſay or experiment of ſome compoſition, which is made in private, previous to the repreſentation or performance of it in public; to habituate the actors or performers, and make them more ready and perfect in their parts.

REHOBOTH, in *Geography*, a poſt-town of America, in Briſtol county, Maſſachuſetts, on a branch of Providence river, a few miles from Providence, in Rhode iſland, 40 miles ſoutherly from Boſton. It was called "Seconnet" by the Indians; incorporated in 1645, and contains 4866 inhabitants.

REHUT, a town of Hindooſtan, in the circar of Gohud; 20 miles S.S.W. of Gwalior.

REI *Domeſticæ Domeſticus*. See Domesticus.

REICH, in *Geography*, a town of Auſtria; 7 miles N.W. of Schwaneſtadt.

REICHARDT, John Frederic, in *Biography*, chapelmaſter to Frederic II. king of Pruſſia, at Berlin, was born at Königſberg, in Pruſſia, in 1751, and ſtudied under the organiſt of the principal church. Richter taught him the harpſichord, and formed his taſte. He likewiſe practiſed the violin, and was powerful upon that inſtrument, particularly in double ſtops. With theſe talents he travelled in 1771, diſtinguiſhing himſelf in Upper and Lower Saxony, Dreſden, Leipſic, Brunſwick, Hamburgh, and Berlin; where he was appointed by the king, in 1775, chapelmaſter, in the ſtation which Graun had formerly illuſtrated.

The firſt compoſition which he produced in his new office, was a prologue to Graun's opera of "Angelica e Medoro," which he ſet on occaſion of a viſit to the king of Pruſſia by the grand duke of Ruſſia, in 1776; in which prologue he compoſed the famous air "Nell' orror d'Atra Foreſta," for Mad. Mara.

In 1783 he went to Paris, and gave proofs of his abilities at the concert ſpirituel; and in 1784, he was preſent at the commemoration of Handel in London. He married the daughter of Francis Benda, born the ſame year as himſelf, an excellent ſinger.

REICHELIA, in *Botany*, Schreb. Gen. 200. (Sagonea; Aubl. Guian. t. 111. Juſſ. 134. Lamarck Illuſtr. t. 212.) Reduced by its author, on the ſuggeſtion of Swartz, to *Hydrolea*; Schreb. 826. There have been two botaniſts of the name of Reichel; but Schreber, moſt probably, had principally in view George Chriſtian Reichel, profeſſor of medicine at Leipſic, who publiſhed a diſſertation on the Spiral Veſſels of Plants, and died in 1771, at the age of 44.

REICHELSBERG, in *Geography*, a lordſhip of Germany, in the circle of Franconia, deriving its name from a mountain citadel, near the town of Aube, in the duchy of Wurzburg.

REICHELSBURG, a town of the duchy of Wurzburg; 20 miles S.E. of Wurzburg.

REICHELSDORF, a town of Bavaria, in the territory of Nuremberg; 7 miles S. of Nuremberg.

REICHELSHEIM, a town of the duchy of Wurzburg; 4 miles W. of Arnſtein.—Alſo, a town of the principality of Naſſau Weilburg, inſulated in the biſhopric of Fulda; 30 miles S. of Marburg.

REICHELSWAND, a town of Bavaria, in the territory of Nuremberg; 3 miles E. of Lauf.

REICHENAU, an iſland in the lake of Conſtance, about two miles long, and abounding with vines and other fruit

fruit trees, with a celebrated abbey, and the villages of Upper and Lower Zell.—Alſo, a town of Bohemia, in the circle of Chrudim; 9 miles W.N.W. of Politzka.—Alſo, a town of Auſtria; 5 miles S.W. of Freyſtadt.—Alſo, a town of Saxony, in the Vogtland, near Pawſa.—Alſo, a town of the Helvetian republic, at the union of the two branches of the Rhine; 6 miles S.W. of Coire.—Alſo, a town of Bohemia, in the circle of Bechin; 6 miles E. of Roſenberg.—Alſo, a town of Bohemia, called "New Reichenau," in the circle of Bechin; 8 miles E.S.E. of Pilgram.—Alſo, a town of Pruſſia, in the province of Oberland; 8 miles S.E. of Oſterrod.—Alſo, a town of Pruſſia, on the Oſſa; 22 miles E.N.E. of Culm.

REICHENBACH, a town of Saxony, in the Vogtland, containing about 700 houſes, two churches, and a Latin ſchool. The inhabitants are chiefly clothiers, and dealers in cloth. Their method of dyeing is held in high eſtimation, the moſt beautiful ſcarlet in the whole electorate being made at this place; 10 miles S.W. of Zwickau. N. lat. 50° 31′. E. long. 12° 16′.—Alſo, a town of Sileſia, in the principality of Schweidnitz, containing two churches and an hoſpital. The town has ſome conſiderable manufactures of linen, canvas, and fuſtian; 9 miles N. of Schweidnitz. N. lat. 50° 35′. E. long. 16° 35′.—Alſo, a town of France, in the department of the Sarre; 8 miles S. of Lautereck.—Alſo, a town of Luſatia; 4 miles S.W. of Camenz.—Alſo, a town of Pruſſia, in the province of Oberland; 7 miles S.S.W. of Holland.—Alſo, a town of Germany, in the county of Henneberg; 3 miles N. of Smalkalden.—Alſo, a town of Germany, in the principality of Culmbach; 12 miles E.N.E. of Neuſtadt.—Alſo, a town of Germany, in the margraviate of Anſpach; 2 miles N.W. of Schwabach.

REICHENBERG, a mountain of Swabia; 6 miles N.W. of Huiffingen.—Alſo, a town of Bohemia, in the circle of Boleſlaw. Twenty thouſand pieces of cloth are ſuppoſed to have been made in this town in one year; 25 miles N.N.E. of Jung-Buntzlau.—Alſo, a town of Pruſſia, in the province of Ermeland; 3 miles S.W. of Heilſberg.—Alſo, a town and caſtle of Weſtphalia, in the county of Catzenelnbogen; 5 miles E. of St. Goar.

REICHENBURG, a town of the duchy of Stiria; 12 miles S.S.E. of Cilley.

REICHENECK, a town of the duchy of Stiria; 5 miles E.S.E. of Cilley.

REICHENFELS, a town with a caſtle in Saxony, in the principality of Reuſſen; 8 miles N.W. of Greitz.—Alſo, a town of the duchy of Carinthia; 24 miles N.E. of Clagenfurt.

REICHENHALL, a town of Bavaria, on the Sala, with a rich ſalt ſpring, the water of which is partly boiled here, and partly, by means of a large wheel 36 feet in diameter, thrown up to the higher parts of a lofty houſe, and thence conveyed by means of leaden pipes to the diſtance of 12 miles, over mountains, towards Traunſtein, and there boiled, on account of the convenience of wood, and alſo of exportation. An aqueduct of ſquared flints, two miles long and five feet broad, with an arched roof, was formed ſome centuries ago, for conveying water to turn the wheels and other engines, and to carry off any ſuperfluous ſalt water. This aqueduct, after running to a depth of 12 fathoms under the town, and from thence under the gardens and fields, at laſt diſcharges its water in a ſtrong torrent. The current of the water is ſo ſtrong, that a boat with torches may ſail from one end to the other in a quarter of an hour. In the aqueduct are five apertures in the form of towers, and through ſome of theſe a perſon may ſpeak from the ramparts of the town with thoſe who ſail upon the canal; 9 miles S.W. of Salzburg. N. lat. 47° 40′. E. long. 12° 50′.

REICHENSTAIN, a town of Auſtria; 19 miles N.E. of Steyregg.

REICHENSTEIN, a town of Sileſia, belonging to the principality of Brieg, but inſulated in that of Munſterberg; 16 miles W. of Neiſſe. N. lat. 50° 15′. E. long. 16° 40′.—Alſo, a town of France, in the department of the Roer; 21 miles S. of Juliers.

REICHENSTEIN, *Unter*, a town of Bohemia, in the circle of Prachatitz; 3 miles W.S.W. of Berg Reichenſtein.

REICHENTAL, a town of Auſtria; 3 miles E. of Haderfdorf.

REICHENWALT, or RIECHERSWALDE, a town of Pruſſia, in Oberland; 4 miles N.W. of Liebſtat.

REICHERSDORF, a town of Tranſylvania; 4 miles E. of Medies.

REICHMANSHAUSEN, a town of the duchy of Wurzburg; 10 miles E.N.E. of Schweinfurt.

REICHNAW, a town of Bohemia, in the circle of Konigingratz; 17 miles E.S.E. of Konigingratz.—Alſo, a town of Luſatia; 6 miles W. of Gorlitz.

REICHNICH, a town of the duchy of Stiria; 6 miles N.E. of Windiſch Gratz.

REICHOLDSGRUN, a town of Germany, in the principality of Culmbach; 2 miles S. of Kirch Lamitz.

REICHSHOFEN, a town of France, in the department of the Lower Rhine; 9 miles N. of Haguenau.

REICHSTHABER, in *Commerce*. See RIX-DOLLAR.

REICHTHAL, in *Geography*, a town of Sileſia, in the principality of Breſlau; 32 miles S. of Breſlau. N. lat. 51° 9′. E. long. 17° 52′.

REID, THOMAS, in *Biography*, an eminent divine and moraliſt, was born at Strachan, in Kincardineſhire, of which pariſh his father was miniſter, in the year 1710. The elements of learning he received at the pariſh ſchool of Kincardine, after which he was ſent to a claſſical ſchool at Aberdeen; and ſo rapid was his progreſs in his ſtudies, that about the age of thirteen he was found fully qualified for the univerſity, and entered as a ſtudent in Marifchal college. Here he diſtinguiſhed himſelf by his proficiency in the various branches of learning taught during the uſual courſe of four years, particularly in mathematics. At this period he probably took his degree of M.A., and afterwards commenced the ſtudy of theology, and in due time was licenſed as a preacher. He was ſoon appointed librarian to the univerſity; and became intimately acquainted with Mr. John Stewart, the profeſſor of mathematics. This connection ſtrengthened and confirmed his predilection for mathematical ſtudies. Occaſionally he read lectures for his friend, in which he diſcovered a happy faculty of making every thing intelligible to the ſtudents, which he clearly apprehended himſelf. In 1736 Mr. Reid reſigned his ſituation of librarian, and accompanied Mr. Stewart on an excurſion into England, and became acquainted with many illuſtrious characters in London, at Oxford, and at Cambridge. In the following year, Mr. Reid was preſented by the King's college of Aberdeen to the living of New Machar; but his entrance into the functions of his office was very unpropitious. His unwearied attention, however, to the duties of his office, the mildneſs and forbearance of his temper, and the active ſpirit of his humanity, ſoon overcame all their prejudices; and not many years afterwards, when he was called to a different ſituation, the ſame perſons, who had taken a ſhare in the outrages againſt him, followed him, on his departure, with their prayers and tears.

tears. "We fought," ſaid ſome of them, "againſt Mr. Reid, when he came; and would have fought for him, when he went away."

The greater part of his reſidence at New Machar was devoted to the moſt intenſe ſtudy; and by way of amuſement, he had recourſe to gardening and botany, of which he was extremely fond, even in old age. In the year 1748 he publiſhed a paper in the Tranſactions of the Royal Society of London, entitled "An Eſſay on Quantity, occaſioned by reading a Treatiſe, in which ſimple and compound Ratios are applied to Virtue and Merit." The treatiſe here referred to was Dr. Hutcheſon's "Inquiry into the Origin of our Ideas of Beauty and Virtue."

The profeſſors of King's college, Aberdeen, in the year 1752, appointed Dr. Reid to be profeſſor of philoſophy: the choice originated wholly from the high opinion they were led to entertain of his talents and erudition. It is not known what particular plan he purſued in the courſe of his lectures; but his department comprehended mathematics, and phyſics, logic, and ethics. Soon after his removal to this ſituation, he projected, in conjunction with his friend, Dr. John Gregory, a literary ſociety, which ſubſiſted many years, and which, it is believed, had conſiderable effect in exciting and directing that ſpirit of philoſophical reſearch, which has ſince ſo particularly diſtinguiſhed the north of Scotland. The writings of Reid, Gregory, Campbell, Beattie, and Gerard, evince the numerous advantages which the members derived from this inſtitution, as they were in the habit of bringing ſuch works as they intended for publication to the teſt of friendly criticiſm. Among theſe the moſt original was that of our author, publiſhed in 1764, entitled "An Inquiry into the Human Mind, on the Principles of Common Senſe;" intended to refute the philoſophy of Locke and Hartley, by denying the connection which they ſuppoſed to ſubſiſt between the ſeveral phenomena, powers, and operations of the mind; and accounting for the foundation of all human knowledge on a ſyſtem of inſtinctive principles. About the time when this "Inquiry" made its appearance, the author received from the college of Aberdeen the degree of doctor of divinity; and by the univerſity of Glaſgow he was invited to the profeſſorſhip of moral philoſophy. On the duties attached to this office he entered in 1764; and he was enabled, by means of a handſome income, to concentrate all his attention to his favourite purſuits, which had hitherto been diſtracted by the miſcellaneous nature of his academical engagements. The reſearches of Dr. Reid concerning the human mind, were extended and methodized in a courſe, which employed five hours every week, during ſix months in every year. The ſubſtance of theſe lectures was afterwards given to the world, in a more improved form, in the laſt of his publications. In the year 1773 appeared, in the form of an appendix to the third volume of lord Kames' "Sketches of the Hiſtory of Man," a brief account of Ariſtotle's logic, with remarks by Dr. Reid. In the year 1781 Dr. Reid withdrew from his public labours, but he was not inactive: his ſubſequent works afford proof of the aſſiduity with which he availed himſelf of his literary leiſure. In 1785 he publiſhed his "Eſſays on the Intellectual Powers of Man;" and in 1788, thoſe "On the Active Powers." Theſe volumes complete the ſyſtem of philoſophy, begun in his "Inquiry" many years before.

Notwithſtanding his advanced age, Dr. Reid continued to proſecute his ſtudies with unabated ardour and activity. The modern improvements in chemiſtry attracted his particular notice, and he applied himſelf with his accuſtomed diligence to the ſtudy of its theories and nomenclature. He amuſed himſelf alſo, at times, in preparing for a philoſophical ſociety, of which he was a member, ſhort eſſays on particular topics, which happened to intereſt his curioſity, and on which he thought he might derive or afford uſeful hints in the courſe of friendly diſcuſſion. His laſt eſſay appears to have been written in the 86th year of his age, and was read by the author to his aſſociates but a ſhort time previouſly to his death. In the month of September 1796, he was ſeized with a violent diſorder, with which he for ſome time maintained a ſevere ſtruggle; but which, together with ſome paralytic attacks, put an end to his uſeful life on the 7th of October, in the 87th year of his age. In point of bodily conſtitution, few men have been more indebted to nature than Dr. Reid. His form was vigorous and athletic, and his countenance was ſtrongly expreſſive of deep and collected thought; but when brightened up by the face of a friend, what chiefly caught the attention was a look of good will and of kindneſs. The moſt prominent features of his character were intrepid and inflexible rectitude, a pure and devoted attachment to truth, and an entire command over his paſſions. In private life, no man ever maintained, more eminently or more uniformly, the dignity of philoſophy; combining with the moſt amiable modeſty and gentleneſs, the nobleſt ſpirit of independence. As a public teacher, he was diſtinguiſhed by unwearied aſſiduity in inculcating principles, which he conceived to be of eſſential importance to human happineſs. In his elocution and mode of inſtruction, there was nothing peculiarly attractive. Such, however, were the ſimplicity and perſpicuity of his ſtyle; ſuch the gravity and authority of his character, that he was always liſtened to with profound reſpect, and, in his latter years, with a veneration, which age added to great wiſdom always inſpires. Stewart's Life of Reid.

REIDEN, in *Geography*, a town of Switzerland, in the canton of Lucerne; 18 miles N.N.W. of Lucerne.

REJECTIO, a word uſed by medical authors for the caſting any thing up preternaturally by the mouth, whether it be by vomiting or by ſpitting.

REIFF, in *Geography*. See RIVA.

REIFFERSCHEID, a town of France, in the department of the Sarre, and chief place of a canton, in the diſtrict of Prum. The place contains 311, and the canton 3542 inhabitants, in 45 communes.—Alſo, a town of France, in the department of the Rhine and Moſelle, capital of a county in the archbiſhopric of Cologne; 42 miles W. of Coblentz. N. lat. 50° 33'. E. long. 6° 27'.

REIFFLING, a town of the duchy of Stiria, on the river Enns; 28 miles N.W. of Pruck.

REIFFNITZ, a town of Middle Carniola; 4 miles N. W. of Gottſchee.

REIFTENBERG, a town of Auſtria; 59 miles S.E. of Goritz.

REIGELSBERG, a lordſhip of the duchy of Wurzburg.

REIGNAC, a town of France, in the department of the Gironde; 9 miles N.E. of Blaye.

REIGNIER, a town of France, in the department of the Léman, and chief place of a canton, in the diſtrict of Geneva. The place contains 1280, and the canton 9046 inhabitants, on a territory of 102½ kiliometres, in 14 communes.

REIGNING WINDS, in *Meteorology*, are thoſe winds which uſually prevail in any particular coaſt or region, the knowledge of which is eſſentially neceſſary to every pilot, who is charged with the navigation in thoſe ſeas.

REIKENES, in *Geography*, a cape on the S. coaſt of Iceland. N. lat. 63° 43'.

REIKEVIG,

REIKEVIG, a ſea-port town of Iceland, conſiſting of about 60 or 70 houſes, ſtanding in two rows of nearly equal length, at right angles to each other, the high ſtreet being encumbered with rock. Among the rocks, which on every ſide ſurround the town, are ſcattered wretched hovels, a little raiſed above the level of the ground. The adjacent country much reſembles the ſummit of ſome of the higheſt mountains in Scotland, being compoſed of fragments of rocks, and preſenting only a few patches of alpine vegetation. Almoſt all the houſes of Reikevig are of Norwegian conſtruction, and inhabited by Danes. The women of this town are principally employed in the operation of drying fiſh. On the little iſland of Akarve, near this town, are bred eider ducks in great numbers. About ſix miles to the ſouth of Reikevig is an immenſe bed of lava, extending a length of 25 miles, and having its black and deſolate ſurface broken into maſſes and fragments, which render it difficult and dangerous to traverſe it, eſpecially where quantities of the "trichoſtomum" conceal the hollow parts from view. The breadth of this remarkable current varies from two to ten miles; and its hideouſly ſhattered aſpect is ſuppoſed to have reſulted from the expanſive force of elaſtic fluids which eſcaped during the cooling of the lava. Moſt of the produce of the Icelanders is brought to Reikevig; and the inhabitants of the interior of the country take back, in exchange for their tallow and ſkins, the dried heads of the cod-fiſh, and ſuch fiſh as are injured by the rain and not fit for exportation. Theſe form the principal article of their food, and are eaten raw, with the addition of butter, &c. Biſhop Videlinus in this place has a library of 5 or 600 volumes. The author of the work now cited ſtates the height of Hecla at about 5000 feet, and the population of Iceland at about 48,000 perſons, who, from the rigour and inſtability of their climate, can never rely on their native produce even for the neceſſary articles of ſubſiſtence. The principal articles of export are dried fiſh, (eſpecially cod of a ſuperior quality,) mutton, lamb, beef, butter, tallow, train-oil, coarſe woollen cloth, the ſkins of ſheep, lambs and foxes, eider-down and feathers; and their chief importations are timber, fiſhing tackle, various implements of tin, tobacco, bread, ſpirituous liquors, ſalt, linen, &c. A large proportion of their food conſiſts of fiſh, butter, and various preparations of milk. Hooker's Journal of a Tour in Iceland in 1809.

REILLANE, a town of France, in the department of the Lower Alps; 7 miles S. of Forcalquier.

REIMBURSEMENT, in *Commerce*, the act of repaying or returning what monies a perſon had received, by way of advance, &c. or what another had diſburſed or paid for him. A perſon who gives a bill of exchange in payment, is to reimburſe it, if it come to be proteſted, for want of being accepted or paid.

REIMBURSING is alſo uſed for paying the price a commodity coſts its owner.

REIMS, or Rheims, in *Geography*, one of the moſt ancient and celebrated cities of France, and principal place of a diſtrict, in the department of the Marne, ſeated on the Veſle. Before the revolution this city was the ſee of an archbiſhop, who was the firſt duke and peer of France, and always crowned the king. In this place was the abbey of the Benedictines of St. Remy, the nobleſt of that order in the kingdom of France; and on the altar of its church, under which St. Remigius was buried, was kept the holy vial, which, as tradition reports, was, in the year 496, at the baptiſm of Clovis by biſhop Remigius, brought from heaven by a dove in deference to the prayer of that ſaint; the crowd obſtructing his paſſage to the font with the uſual oil. The univerſity of Reims was founded in 1547, and in the following year authoriſed by the parliament of Paris. This city contains 30,295 inhabitants, in the three parts into which it is divided, and it has three correſponding cantons, the firſt containing 12,140, the ſecond 10,107, and the third 10,874, in three, four, and five communes reſpectively, on a territory of 117½ kiliometres. Rheims carries on a conſiderable trade in wine, woollen and ſilk ſtuffs, and gingerbread. It has ſeveral remains of Roman antiquities, particularly the three gates of the city, which ſtill bear the names of as many Pagan deities, *viz.* the Sun, Mars, and Ceres. It was taken by the Engliſh in the reign of Henry V. N. lat. 49° 15'. E. long. 4° 6'.

REIN, a town of the duchy of Stiria; 9 miles N.W. of Gratz.—Alſo, a town of the ſame duchy, on the river Save; 20 miles E. of Cilley.

Rein-*Deer*, in *Zoology*. See Cervus *Tarandus*.

REINDORFF, in *Geography*, a town of Bavaria; 4 miles S.S.W. of Bamberg.

REINECCIUS, Reinier, in *Biography*, a learned German, who flouriſhed in the 16th century, was a diſciple of Melancthon, and taught the belles lettres in the univerſities of Frankfort and Helmſtadt till his death, in 1595. He is known to the learned world by ſeveral works on hiſtory and genealogy, in which he was profoundly verſed. His chief publications are, "Syntagma de Familiis Monarchiarum trium priorum," 1574; "Familiæ Regum Judæorum;" "Chronicon Hieroſolymitanum;" "Hiſtoria Orientalis;" "Hiſtoria Julia," three vols. folio; "Methodus Legendi Hiſtoriam."

REINECK, in *Geography*, a town of France, in the department of the Rhine and Moſelle, late capital of a burgravate, deriving its name from it, and ſituated between the duchy of Juliers and electorate of Cologne, on the borders of the Rhine; 14 miles N.N.W. of Coblentz.

REINEN. See Rheine.

REINERTZ, a town of Sileſia, in the comté of Glatz, on the borders of Bohemia; famous for its manufactures of beautiful cloth and pluſh, and excellent paper, equal to the beſt in Holland; 11 miles W. of Glatz. N. lat. 50° 14'. E. long. 16° 10'.

REINFELDT, a town of Pruſſia, in the province of Pomerelia; 12 miles S.W. of Dantzic.

REINFORCE, in *Gunnery*, is that part of a gun next to the breech, which is made ſtronger, to reſiſt the force of the powder. There are generally two reinforces in each piece, called the firſt and ſecond reinforce: the ſecond is ſomewhat ſmaller than the firſt, upon the ſuppoſition that when the powder is inflamed and occupies a greater ſpace, its force is diminiſhed, which is very abſurd. See Cannon.

Reinforce *Rings* of a cannon, are flat mouldings like iron hoops, placed at the breech-end of the firſt and ſecond reinforce, projecting beyond the reſt of the metal about one-fourth of an inch. See Cannon.

REINFORCEMENT, in *War*, a ſupply, or new proviſion of men, arms, ammunition, &c.

REINGUS, in *Geography*, a town of Auſtria; 12 miles N.N.W. of Waidhoven.

REINHARTSBRUNN, a town of Germany, in the principality of Gotha; 10 miles S.S.W. of Gotha.

REINHARTZ, a town of Saxony; two miles W. of Schmiedelberg.

REINHEIM, a town of the principality of Heſſe Darmſtadt; 5 miles S.E. of Darmſtadt.

REINHOLD, Erasmus, in *Biography*, an eminent German mathematician, was born at Salfeldt, in Thuringia, a province in Upper Saxony, in the year 1511. He was educated

educated at the univerſity of Wittemberg, where his genius chiefly inclined him to the ſtudy of the mathematics, which he cultivated with great ſucceſs. He afterwards became a profeſſor of thoſe ſciences in the ſame univerſity, and acquired very high reputation, not only by his lectures, but by the learned and uſeful writings which he communicated to the public. Of theſe, which are very numerous, we may mention "Theoriæ Novæ Planetarum G. Purbachii," augmented and illuſtrated with diagrams and ſcholia. "Ptolemy's Almageſt, with a Latin Verſion, and Scholia." In 1551 he publiſhed "Prutenicæ Tabulæ Cœleſtium Motuum," which were ſeveral times reprinted. In carrying on this work, which coſt ſeven years' labour, he was encouraged by the munificence of Albert, duke of Pruſſia. They were conſtructed by him from a compariſon of the obſervations of Copernicus with thoſe of Ptolemy and Hipparchus, and he has fully explained the uſe of them in a great number of precepts and canons, forming a complete introduction to practical aſtronomy. Reinhold alſo made many aſtronomical obſervations, but he never had any better inſtrument than a wooden quadrant. The reſult of theſe obſervations were ſhewn to Tycho Brahè after the death of Reinhold, who expreſſed his ſurprize that ſo great and meritorious a cultivator of aſtronomical ſcience was not furniſhed with better inſtruments. Reinhold died in 1553, when only in the 42d year of his age, pronouncing the following verſe a ſhort time before he expired.

"Vixi, et quem dederas curſum mihi, Chriſte, peregi."

He had a ſon of the ſame name, eminent as a mathematician and phyſician, who publiſhed a ſmall work in the German language "On Subterranean Geometry;" alſo a tract concerning the new ſtar which appeared in Caſſiopeia in 1572.

REINISCHDORF, in *Geography*, a town of Sileſia, in the principality of Neiſſe; 5 miles N. of Neiſſe.

REINS, in *Anatomy*, the kidneys. See KIDNEY and RENES.

The word, according to Varro, is formed from the Greek, ῥεῖν, *quaſi rivi obſceni humoris ab iis oriantur.*—The Greeks call the rein νεφρος, from the verb νεφειν, *to rain, ſnow*, &c.

In the manege they ſay, a horſe ſhould have *double* reins; that is, he ſhould have them a little more elevated on each ſide of the back-bone, than upon it; ſo that, paſſing your hand along it, you find it large, well-furniſhed, and double, by the hollow that goes all along the back-bone. The back ſhould be firm and not hollow, or bending from the withers to the croup, but ſtraight.

REINS, of a bridle, alſo denote two ſtraps of leather meeting in the bridle-hand of the horſeman, in order to make the bit bear, and keep the horſe under ſubjection. See BRIDLE.

It is alſo a name given by the duke of Newcaſtle to two ſtraps or ropes of a caveſſon, which he ordered to be made faſt to the girths, or the pommel of the ſaddle, with intent that the rider ſhould pull them with his hand, in order to bend and ſupple the neck of the horſe.

REIN, *Falſe*, is a lath of leather, paſſed ſometimes through the banquet, to bend the horſe's neck, which is diſapproved of by the duke of Newcaſtle, becauſe it ſlacks the curb, and makes the bit no more than a trench that has no curb.

REINS, in *Rural Economy*, the long thongs or ſtrips of leather, or other materials, by which horſes or other animals are directed in carriages or teams. Theſe reins are much uſed in ſome counties, as Norfolk and Suffolk, in directing the plough-teams, in order to ſave the expence of another perſon, the ploughman directing them in this way himſelf, the driver being by this means diſpenſed with.

REINS, *Check*, a term ſignifying the ſame thing as a ſort of rein, and which is made uſe of in particular diſtricts, in checking and directing the animals.

REINS, *Whip*, a term uſed to ſignify a ſort of hempen rein, employed for directing the team in ploughing in ſome diſtricts, ſo called in conſequence of being uſed inſtead of whips.

REINS *of a Vault*. See VAULT.

REINSBERG, or RHINSBERG, in *Geography*, a town of Brandenburg, in the Middle Mark; 10 miles N.N.E. of New Ruppin. N. lat. 53° 4′. E. long. 12° 58′.

REINSCHNICK, DER, a mountain of Stiria; 12 miles S.E. of Landſperg.

REINSDORF, a town of Saxony, in the circle of Erzgebirg; two miles E.S.E. of Zwickau.

REINSPURG, a town of Bavaria, in the territory of Rothenburg; ſix miles S.S.W. of Rothenburg.

REINSTATING, the reſtoring of a perſon or thing to its former ſtate or condition, from whence it had been diſturbed or diſplaced. See REHABILITATION.

REINSTEIN, in *Geography*. See REGENSTEIN.

REINSURANCE, or RE-ASSURANCE, in *Commerce*, a contract by which a firſt inſurer relieves himſelf from the riſks which he has undertaken, and devolves them upon other under-writers, called re-inſurers, or re-aſſurers. When a policy of inſurance has been once ſigned, the under-writers are bound by the terms of it; nor can they be releaſed from their contract without the conſent of the inſured. But if an under-writer repent of what he has done; if he be afraid to encounter the riſk which he has engaged to run; or if he find that he has incautiouſly engaged himſelf to a greater amount than he may be able to diſcharge, he may ſhift it, or part of it, from himſelf to other inſurers, by cauſing a re-inſurance to be made on the ſame riſk, upon the beſt terms in his power, and the new inſurers will be reſponſible to him in caſe of loſs, to the amount of the re-inſurance. But in ſuch caſe, the new inſurers are reſponſible to the original under-writer only, and not to the original inſured, who can have no remedy againſt him, in caſe of loſs, even though the original inſurer become inſolvent; becauſe there is no privity of contract between the original inſured and the re-inſurer. If, therefore, the original inſurer fail, ſo that the original inſured receive only a dividend, however ſmall, the re-inſurer can gain nothing by this, but muſt pay the full amount of the loſs to the original inſurer. Such is the law on this ſubject, in moſt of the commercial ſtates of Europe. But in this country it was found, about the time when the ſtatute 19 Geo. II. c. 17. was made, that this mode of inſurance, though perfectly reaſonable, when confined to its proper object, had been perverted from its original uſe, and was employed as a mode of ſpeculating in the riſe and fall of premiums; and the legiſlature foreſeeing that it might be uſed as a colour for wager policies, and a means of evading the proviſions of that act, declares (ſect. 4.) "that it ſhall not be lawful to make re-inſurance, unleſs the inſurer ſhall be inſolvent, become bankrupt, or die; in either of which caſes, ſuch inſurer, his executors, adminiſtrators or aſſigns, may make re-inſurance to the amount of the ſum before by him inſured; provided it be expreſſed in the policy to be a re-inſurance." This clauſe, having no words to confine its operation to ſhips belonging to Britiſh ſubjects, like the firſt clauſe of the act reſtraining inſurances, *intereſt or no intereſt*, extends to re-inſurances made in England in foreign ſhips, even when they are inſured abroad. This has been ſo determined; though it is obſervable that the following caſe, in which

which that queſtion was made, was not the ſpecies of re-inſurance above deſcribed, and to which only the ſtatute refers, but a *ſecond inſurance*, effected on account of the *original inſured*.

That was the caſe of an inſurance made in London, on a French veſſel, which had before been inſured at Marſeilles for the ſame ſum, by an inſurer there, who, at the time of ſubſcribing the ſecond policy, was living and ſolvent, and who, in fact, afterwards paid the ſum inſured by him. Upon this caſe the court determined that the latter policy was void by the words of the act; for though the firſt clauſe of the act which prohibits inſurances, 'intereſt or no intereſt,' is confined to inſurances on Britiſh ſhips, yet the fourth ſection being general, and without any ſuch reſtrictive clauſe, every re-inſurance in this country, either by Britiſh ſubjects, or foreigners, on Britiſh or foreign ſhips, is declared void by the ſtatute, unleſs the firſt inſurer be inſolvent, become bankrupt, or die.

There are two other kinds of re-inſurance; the one where the inſured inſures the ſolvency of the inſurers; the other, where he makes a new inſurance, in conſequence of the inſolvency of an inſurer during the continuance of the riſk.

The inſurance of the ſolvency of an inſurer is permitted and practiſed in ſome foreign countries; but it ſeems never to have been in uſe among us; not, perhaps, as has been ſuppoſed, becauſe the ſolvency of an under-writer is not an inſurable intereſt, or that ſuch an inſurance would be deemed a wager; but, more probably, becauſe the inſolvency of an inſurer ſeldom happens in England; beſides, a *double inſurance* would better anſwer the end propoſed.

If France, if an inſurer fail during the continuance of the riſk, the inſured may inſiſt on the diſſolution of the contract, unleſs the creditors of the inſolvent inſurer, in order to entitle themſelves to receive the premium, (which is rarely paid in that country till after the riſk is ended,) will give ſecurity for the payment of the ſum inſured, in caſe of loſs. At Marſeilles, (for in France different practices prevail in different provinces,) the inſured, in ſuch caſe, ſues the inſolvent inſurer, till he obtains a ſentence, authorizing him to re-inſure at the expence of the inſolvent, which he may deduct from the ſtipulated premium, if it be not paid, and if this be inſufficient, then out of the effects of the inſolvent.

Double inſurance is where the inſured makes two inſurances on the ſame riſk, and the ſame intereſt; and it differs from a re-inſurance in this, that it is made by the *inſured*, in order that he may be entitled to receive a double ſatisfaction, in caſe of loſs; whereas, a re-inſurance is made by a former inſurer, his executors or aſſigns, to protect himſelf and his eſtate from a riſk to which they were liable by the firſt inſurance. A re-inſurance, except in the caſes permitted by the ſtat. 19 Geo. II. c. 37. § 4, is abſolutely void; but a double inſurance, though it be made with a view to a double ſatisfaction in caſe of loſs, and is therefore in the nature of a wager, is not void by the law of England. The two policies are conſidered as making but *one inſurance*. They are good to the extent of the value of the effects put in riſk: but the inſured ſhall not be permitted to recover a double ſatisfaction. He may ſue the under-writers on both the policies, but he can only recover the real amount of his loſs, to which all the under-writers ſhall contribute in proportion to their ſeveral ſubſcriptions. And therefore, if he ſhould content himſelf with ſuing only on one of the policies, the under-writers on that policy may recover a rateable contribution from thoſe on the other.

In conſequence of the determination of lord Mansfield, in 1763, it has been agreed to be the courſe of practice, that, upon a double inſurance, though the inſured is not entitled to two ſatisfactions, yet, that in an action upon the firſt policy, he may recover the whole ſum inſured, and may leave the defendants therein to recover a rateable ſatisfaction from the other inſurers. Formerly, in the caſe of an *over-inſurance*, that is, where, in a ſingle policy, the ſums ſubſcribed amount to much more than the value of the effects inſured, the firſt under-writers on the policy were holden to be anſwerable to the extent of the loſs, and the ſubſequent ones diſcharged. Although only a ſingle ſatisfaction can be recovered on a double inſurance by the ſame perſon, yet different perſons may inſure the ſame thing, and each recover the full value of the thing inſured. To enable the defendant, in an action on a policy, to diſcover whether there be a double inſurance, he may, by the authority of the ſtatute 19 Geo. II. c. 37. § 6, call upon the plaintiff to declare in writing, what ſums he has inſured in the whole, and how much he has borrowed on bottomry or reſpondentia. Marſhal's Treatiſe on the Law of Inſurance, vol. i. ch. 4. § 4.

REINTAL, in *Geography*, a town of Auſtria; four miles E.S.E. of Feldſberg.

REINTEGRATION. See REDINTEGRATION.

REJOICING FIRE, in *Military Affairs*, is uſed on obtaining a victory, or in celebrating ſome public feſtival: of this there are two ſorts, *viz.* one by a volley, and the other by a running fire, from the right to the left of the battalion or line.

REJOINDER, in *Law*, the defendant's anſwer to the plaintiff's replication.

The order of the court of chancery is thus; firſt, the defendant puts in an anſwer or plea to the plaintiff's bill, which is ſometimes alſo called an *exception*; the plaintiff's anſwer to this is called a *replication*; and the defendant's anſwer to that, a *rejoinder*.

The plaintiff may anſwer the rejoinder by a *ſur-rejoinder*, upon which the defendant may *rebut*; and the plaintiff may anſwer him by a *ſur-rebutter*; which pleas, replications, rejoinders, ſur-rejoinders, rebutters, and ſur-rebutters, anſwer to the *exceptio*, *duplicatio*, *triplicatio*, and *quadruplicatio* of the Roman laws. See PLEADING.

REJOINTING, or REJOYNTING, in *Architecture*, the filling up of joints of the ſtones in old buildings, &c. when worn hollow by the courſe of time, or by weather.

Rejointing is to be performed with the beſt mortar, as that of lime and cement; ſometimes alſo with plaiſter; as in the joints of vaults, &c.

REIPOLTZHEIM, in *Geography*, a town of the duchy of Wurzburg; three miles N.E. of Schwarzbach.

REIPOLTZKIRCHEN, a caſtle of France, in the department of Mont Tonnerre, which gave name to a lordſhip, ſituated in the Hunſruck; five miles E. of Lautereck.

REIS, RE, or *Res*, in *Commerce*. See REES.

REISBACH, in *Geography*, a town of Lower Bavaria, in the Vils; 35 miles W. of Paſſau.

REISCH, a town of Moravia, in the circle of Iglau; 18 miles S. of Iglau.

REISCHSTADT, a town of Bohemia, in the circle of Boleſlau; two miles N.W. of Nimes.

REIS-EFFENDI, in the *Turkiſh Empire*, one of the ten members of the *divan*, (which ſee,) or council of the grand viſir, of which the viſir and mufti are the preſidents. The reis-effendi is a kind of ſecretary of ſtate, high chancellor of the empire, and miniſter for foreign affairs. He ſigns all the orders of the Porte, which do not directly concern the finances and the military operations; he treats with all the European miniſters who are at Conſtantinople: in a word, every thing that concerns the foreign powers, and

every thing that relates to the interior adminiſtration, paſs through the channel of the reis-effendi; but he does nothing without communicating it to the grand viſir, and taking his orders. In this council there are alſo two *ex-reis-effendi*.

REISENBERG, in *Geography*, a town of Auſtria, on the Reiſenpach river; 12 miles S.E. of Vienna.

REISENBURG, a town of Pruſſia, in the province of Oberland, built in the year 1169, and anciently the reſidence of the biſhops of Pomerania. The chief ſubſiſtence of the inhabitants is derived from brewing and agriculture; near it is an ancient caſtle; 78 miles S.W. of Konigſberg.

REISENGEBERG, a town of Bohemia, in the circle of Konigingratz. N. lat. 50° 40′. E. long. 15° 30′.

REISENPACH, a river of Auſtria, which runs into the Danube; 12 miles below Vienna.

REISHOFFEN, a town of France, in the department of the Lower Rhine; 21 miles N. of Straſburg.

REISJARVI, a town of Sweden, in the government of Ulea; 47 miles E. of Gamla Karleby.

REISKE, John James, in *Biography*, a learned philologiſt, born in 1716, at Zorlis, in Miſnia, was the ſon of a tanner in that place. He was, at the age of twelve, ſent to the orphan-ſchool at Halle, where he made a rapid progreſs in the learning of the place. In 1733 he entered at the univerſity of Leipſic, and being deſtined for the theological profeſſion, he ſpent five years chiefly in the ſtudy of rabbinical writings, and in the ſtudy of the Arabic language. To the latter he became ſo ardently attached, and his paſſion for Arabic books was ſo ſtrong, that he almoſt deprived himſelf of neceſſaries to purchaſe them. He went to Holland with the view of improving himſelf in his favourite language, and while there, he ranſacked all the Oriental treaſures of the library at Leyden, while, for his ſubſiſtence, he was obliged to become a corrector of the preſs. He paſſed his time in a ſtate of indigence that brought upon him hypochondriac affections, the effects of which never left him. During his reſidence at Leyden, he was preſented with a gratuitous degree in phyſic, but he never intended to avail himſelf of it in the way of practice: "Poverty," ſays his biographer, "was his perpetual companion, and his ſcanty reſources were derived from correcting the preſs, tranſlating, and performing other taſks for bookſellers." Many learned pieces in Oriental and Greek literature occaſionally proceeded from his pen, which made him well known in the learned world: and ſeveral of the works edited by him are held in very high eſtimation. He was at laſt nominated rector of the college of St. Nicholas, in Leipſic, a ſituation which enabled him to purſue his literary labours more according to his inclination. At the age of forty-eight he married Erneſtine Muller, a young woman of twenty-five, who, under his inſtructions, acquired ſo much knowledge of the Greek and Latin, and ſome modern languages, that ſhe became extremely uſeful to her huſband in his editorial employments. He died at the age of fifty-eight, in the year 1774. Of the moſt valuable works of Reiſke, are "Diſſertatio de Principibus Muhamedanis qui aut ab Eruditione aut ab Amore Literarum inclaruerunt;" "Animadverſiones in Sophoclem;" "Animadverſiones in Auctores Græcos;" "Oratorum Græcorum," 8 vols.; "Plutarchi Opera omnia;" "Maximi Tyrii Diſſert.;" "Apparatus Critici ad Demoſthenem," 3 vols. And after his death were publiſhed his "Conjecturæ in Jobum et Proverbia Salomonis, cum Oratione de Studio Arabiæ Linguæ." The "Acta Eruditorum" were much indebted to the pen of Reiſke.

REISNITZ, in *Geography*, a town of the duchy of Carniola; four miles N.W. of Gottſchee.

REISSENDORF, a town of Sileſia, in the principality of Neiſſe; four miles N. of Patſhkau.

REISTEN, a town of the duchy of Wurzburg; ſix miles N.N.E. of Arnſtein.

REISTERSTOWN, a poſt-town of America, in Baltimore county, Maryland; ten miles S.E. of Weſtminſter.

REITERATED Grafting. See Grafting.

REITERATING, in *Printing*. See Printing.

REITERATION, the act of repeating a thing, or doing it a ſecond time.

The church does not allow of the reiteration of baptiſm. St. Gregory obſerves, that it is no reiteration when there are wanting proofs of the thing's having been regularly done before.

REITLENGIN, in *Geography*. See Reutlengin.

REITTERECK, a town of Stiria; ſeven miles E. of Voitſburg.

REITTERS, an ancient title given the German cavalry. The word is originally High Dutch, and ſignifies a horſeman, cavalier, or even knight.

REITZ, in *Geography*, a town of Portugal, in the province of Beira; three miles N. of Viſeu.

REKEK, a ſmall iſland in the Eaſt Indian ſea. S. lat. 1° 33′. E. long. 128° 40′.

RELAIS, in *Fortification*, a French term, the ſame with *berme*.

RELAND, Adrian, in *Biography*, an eminent orientaliſt and polite ſcholar, was born in the year 1676, at a village in North Holland. He was educated at Amſterdam, and made ſuch progreſs in learning, that, having gone through the uſual claſſical courſe when he was only eleven years old, he employed the next three years in making himſelf acquainted with the Hebrew, Syriac, Chaldee, and Arabic languages. At the age of fourteen he was ſent to the univerſity at Utrecht, and in three years was admitted to the degree of doctor in philoſophy, and on this occaſion he ſuſtained a theſis "De Libertate Philoſophandi." After a reſidence of ſix years at Utrecht he removed to Leyden, and was in a ſhort time choſen by the earl of Portland as preceptor to his ſon. At the age of twenty-four, the univerſity of Harderwyk nominated him to the chair of philoſophy, but he did not remain long in that ſituation, for the univerſity of Utrecht, on the recommendation of king William, invited him to the profeſſorſhip of the Oriental languages and Jewiſh antiquities, which he accepted, and occupied with high reputation during the remainder of his life. He died at the age of 43, in the year 1719. Few writers have met with more general applauſe than Reland. His principal works, which are all extremely valuable, are; 1. "Paleſtina Monumentis veteribus illuſtrata," 2 vols. 4to. 2. "Diſſertationes de nummis veterum Hebræorum." 3. "Antiquitates ſacræ veterum Hebæorum." 4. "Introductio ad Grammaticam Hebræam." 5. "De Spoliis Templi Hieroſolymitani in Arcu Titiano Romæ conſpicuis." 6. "De Religione Muhamedica." Beſides theſe he publiſhed many other things. In private life he was diſtinguiſhed by his modeſty, humanity, and learning, and carried on a correſpondence with the moſt eminent ſcholars of his time. Moreri.

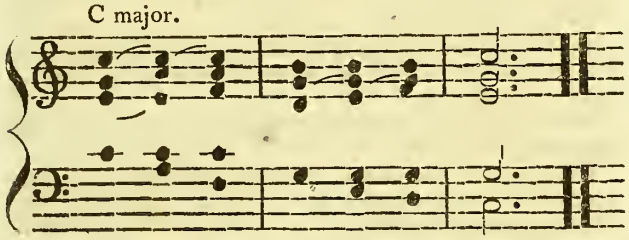
RELAPSE, in *Medicine*, the recurrence of a diſeaſe during the period of convaleſcence.

Relapſes of all diſeaſes, whether acute or chronic, are deemed more dangerous than the original attack; becauſe the conſtitution, being already debilitated and reduced by the previous illneſs, is leſs capable of reſiſting the farther ravages of diſeaſe. This may be ſaid to be true of all acute diſeaſes,

diſeaſes, ſuch as fevers, dyſenteries, inflammations of the lungs, liver, &c. Nevertheleſs, relapſes of theſe diſorders are not always fatal; becauſe, as the weaker conſtitution is leſs capable of being excited to violent action, ſo theſe ſecond attacks are ſometimes milder, and more eaſily influenced by remedies. Relapſes of chronic diſeaſes, ſuch as dropſies or jaundice, are more unfavourable; becauſe their recurrence implies that the internal diſeaſe, from which they originate, is not removed, but has only been temporarily alleviated.

RELATIO, Lat., *Relation*, Engl., in *Muſic*. Relative ſounds are in general ſuch as belong to two or more chords, as in the key of C. The chords of A, F, G, and E, are relative chords; as E, the 5th of A, is 3d of C: in the chord of F, C is the 5th; in the chords of G and E, each of thoſe ſounds is a part of the chord of C.

C major.



The relatives to A minor are obvious here.



In the modulation by riſing and falling a 3d in the baſe, two relative notes are in common with each chord. The moſt agreeable relation of a minor key to a major, is in the modulation from a minor key to the 3d above: as from A to C, or D to F; the ſcales of both keys being the ſame in deſcending. But falling a 3d in the baſe from a minor 3d to a major, as from A to F, or from D to B♭, is ſtill more pleaſing.

Falſe relation is C♯ againſt C♮, or G♯ in the chord of C♮. But even theſe falſe relations are allowed now, as *paſſing-notes* of taſte, though not in the body of the hrmony.

RELATION, Relatio, in *Philoſophy*, the mutual reſpect of two things; or what each is with regard to the other.

The word is formed *a referendo:* relation conſiſting in this, that one thing is referred to another: whence it is alſo called *reſpect*, *habitude*, and *compariſon*.

The idea of relation we acquire, when the mind ſo conſiders any thing, that it doth, as it were, bring it to, and ſet it by, another, and carry its view from the one to the other. Hence the denominations given to things intimating this reſpect, are called *relatives;* and the things ſo brought together, are ſaid to be *related*.

Thus, when I call Caius *huſband*, or this wall *whiter*, I intimate ſome other perſon or thing in both caſes, with which I compare *him* or *it*. Hence the wall is called by the ſchoolmen the *ſubject;* the thing it exceeds in whiteneſs, the *term;* and the whiteneſs, the *foundation* of the relation.

Relation may be conſidered two ways; either on the part of the mind referring one thing to another; in which ſenſe relation is only a mode or affection of the mind, by which we make ſuch compariſon; or on the part of the things referred, which being no other than ideas, relation, in this ſenſe, is only a new idea reſulting or ariſing in the mind upon conſidering of two other ideas. So that relation, take it as you will, is only in the mind, and has nothing to do with the things themſelves.

Any of our ideas, Mr. Locke obſerves, may be the foundation of relation. Though where languages have failed to give correlative names, the relation is not eaſily taken notice of; as in concubine, which is a relative name, as well as wife.

There is, in effect, no idea but is capable of an infinite number of relations: thus, one ſingle man may at once ſuſtain the relations of father, brother, ſon, huſband, friend, ſubject, general, European, Engliſhman, iſlander, maſter, ſervant, bigger, leſs, &c. to an almoſt infinite number; he being capable of as many relations as there can be occaſions of comparing him to other things in any manner of agreement or diſagreement, or any reſpect whatſoever.

The ideas of relations are much clearer and more diſtinct than thoſe of the things related; becauſe the knowledge of one ſimple idea is oftentimes ſufficient to give the notion of a relation; but, to the knowing of any ſubſtantial being, an accurate connection of ſeveral ideas is neceſſary.

The perception we have of the relations between the various ideas in which the mind acquieſces, makes what we call *judgment*. Thus, when I judge that twice 2 make 4, or do not make 5, I only perceive the equality between twice 2 and 4, and the inequality between twice 2 and 5.

The perception we have of the relations between the relations of various things, conſtitutes what we call *reaſoning*. Thus, when from this that 4 is a ſmaller number than 6, and that twice 2 is equal to 4, I gather, that twice 2 is a leſs number than 6; I only perceive together the relation of the numbers twice 2 and 4, and the relation of 4 and 6.

The ideas of cauſe and effect, we get from our obſervation of the viciſſitude of things, while we perceive ſome qualities or ſubſtances begin to exiſt, and that they receive their exiſtence from the due application and operation of other beings. That which produceth, is the cauſe; that which is produced, is the effect.

Thus, fluidity in wax is the effect of a certain degree of heat, which we obſerve to be conſtantly produced by the application of ſuch heat.

The denominations of things taken from time are, for the moſt part, only relations. Thus, when it is ſaid, that queen Elizabeth lived ſixty-nine, and reigned forty-five years, no more is meant, than that the duration of her exiſtence is equal to ſixty-nine, and of her government to forty-five, annual revolutions of the ſun; and ſo are all words anſwering to how long.

Young and old, and other words of time, that are thought to ſtand for poſitive ideas, are indeed relative, and intimate a relation to a certain length of duration, of which we have the ideas in our minds. Thus, we call a man young or old, that had lived little or much of that time which men uſually attain to: and thus a man is called young at twenty, but a horſe old at the ſame period.

There are other ideas that are truly relative, which we ſignify by names that are thought poſitive and abſolute; ſuch as great and little, ſtrong and weak. The things thus denominated

minated are referred to ſome ſtandards, with which we compare them: thus, we call an apple *great*, which is bigger than the ordinary ſort of thoſe we have been uſed to; and a man *weak*, that has not ſo much ſtrength or power to move as men uſually have, or as others of his own ſize have.

Authors give various diviſions of relations. The ſchool philoſophers commonly divide them into thoſe of *origination*, under which are comprehended the relations of cauſe and effect; thoſe of *negation*, which are between oppoſite things; and thoſe of *affirmation*, which are relations of agreement between whole and part, the ſign and thing ſignified, the adjunct and ſubject. This diviſion is founded upon this, that the mind can only compare things three ways; *viz.* by inferring, denying, and affirming.

Others divide relations into thoſe of *origination*; thoſe of *agreement*, *e. gr.* ſimilitude, parity, &c.; thoſe of *diverſity*; and thoſe of *orders*, as priority, poſteriority, &c.

Others divide them into *predicamental* and *tranſcendental*. Under the firſt come thoſe relations between things that belong to the ſame predicament, *e. gr.* between father and ſon. To the latter belong thoſe which are more general than the predicaments, or are of different predicaments; as the relations of ſubſtance and accident; of cauſe and effect; and of Creator and creature.

Mr. Locke gives us a diſtribution of relations on a different principle. All ſimple ideas, he obſerves, in which are parts or degrees, afford an occaſion of comparing the ſubjects in which they are to one another, in reſpect of thoſe ſimple ideas; as whiter, ſweeter, more, leſs, &c. Theſe, depending on the equality and exceſs of the ſame ſimple idea, in ſeveral ſubjects, may be called *proportional* relations.

Another occaſion of comparing things being taken from the circumſtances of their origin, as father, ſon, brother, &c. theſe may be called *natural* relations.

Sometimes the foundation of conſidering things is ſome act, by which any one comes by a moral right, power, or obligation, to do ſomething: ſuch are general, captain, burgher: theſe are *inſtituted* and *voluntary* relations, and may be diſtinguiſhed from the natural, in that they are alterable and ſeparable from the perſons to whom they ſometimes belonged, though neither of the ſubſtances ſo related be deſtroyed. But natural relations are not alterable, but are as laſting as their ſubjects.

Another relation is the conformity or diſagreement of men's voluntary actions to a rule, to which they are referred, and by which they are judged of: theſe may be called *moral* relations.

It is this conformity or diſagreement of our actions to ſome law (by which good or evil is drawn on us from the will and power of the law-maker, and is what we call *reward* or *puniſhment*) that renders our actions morally good or evil.

Of theſe moral rules or laws there ſeem to be three ſorts, with their different enforcements. Firſt, the divine law; ſecondly, civil law; thirdly, the law of opinion or reputation. By their relation to the firſt, our actions are either ſins or duties; to the ſecond, criminal or innocent; to the third, virtues or vices. Locke's Eſſay, vol. i. chap. 25, 26, 33.

Relation, in *Logic*, is an accident of ſubſtance, accounted one of the ten categories or predicaments.

Each ſubſtance admits of an infinity of relations. Thus the ſame Peter conſidered with regard to Henry, is in the relation of a maſter; with regard to John, in that of a tenant; with regard to Mary, in that of a huſband, &c. Again, with regard to one perſon, he is rich; with regard to another, poor; with regard to another, he is far, near, tall, ſhort, a neighbour, ſtranger, learned, unlearned, good, bad, equal, &c. It is diſputed among the ſchool philoſophers, whether or no the relation be a thing formally and really diſtinct from the foundation of the ſubſtance.

Relation, *Relatio*, in *Rhetoric*, is ſometimes uſed to ſignify the ſame with *recrimination*; which ſee.

Relation is alſo uſed, in the *School Theology*, to denote certain of the divine perfections, called *perſonal* ones; becauſe by theſe one Divine Perſon is referred to another, and diſtinguiſhed from it.

Hence the ſchoolmen teach, that in God there is one nature, two proceſſions, three perſons, and four relations.

Theſe relations are paternity, filiation, active ſpiration, and paſſive ſpiration.

Relation, in *Geometry*, *Arithmetic*, &c. is the habitude, or reſpect of two quantities to one another, with regard to their magnitude. This we more uſually called *ratio* or *reaſon*. See Ratio.

The equality or ſameneſs of two ſuch relations we call *proportion*; which ſee.

Relation, in *Grammar*, is the correſpondence which words have to one another in *conſtruction*; which ſee. See alſo Regimen and Syntax.

Faulty and irregular relations are the things chiefly to be guarded againſt in writing correctly; they make the ſenſe obſcure, and frequently equivocal. Thus: the orator was attended to with a coldneſs, which was the more remarkable, as the audience were under ſome emotion before he began. Here coldneſs being put indeterminately, the relative *which* can have no juſt and regular relation to it.

Relation is alſo frequently uſed for analogy, or what ſeveral things have in common. See Analogy.

In painting, architecture, &c. a certain relation of the ſeveral parts and members of the building, or picture, conſtitutes what we call *ſymmetry*; which ſee.

Relation, in *Law*, is where two things, as times, &c. are conſidered as if they were one; the thing ſubſequent being conſidered as taking effect, by relation, at the time preceding.

As if A deliver a writing to B, to be delivered to C, as the deed of A; the writing ſhall be deemed to be delivered to C, at the time when it was given to B, by relation.

When the execution of a thing is done, it hath relation to the thing executory, and makes all but one act to record, although performed at ſeveral times. (1 Rep. 199.) Judgment ſhall have relation to the firſt day of the term, as if given on that very day, unleſs there is a memorandum to the contrary; as where there is a continuance till another day in the ſame term. (3 Salk. 212.) A verdict was given in a cauſe for a plaintiff, and there was a motion in arreſt of judgment within four days; the court took time to adviſe, and in four days afterwards the plaintiff died: it was adjudged, that the favour of the court ſhall not prejudice the party, for the judgment ought to have been given after the firſt four days; and though it is given after the death of the party, it ſhall have relation to the time when it ought to have been given. (1 Leon. 187.) Rule was had for judgment, and two days after the plaintiff died; yet the judgment was entered, becauſe it ſhall have relation to the day when the rule was given, which was when the plaintiff was alive. (Poph. 132.) Judgment againſt an heir of the obligation of his anceſtor ſhall have relation to the time of the writ *firſt* purchaſed; and from that time it will

will avoid all alienation made by the heir. (Cro. Car. 102.) If one be bail for a defendant, and before judgment he leaſes his lands; they ſhall be liable to the bail, and judgment by relation.

By ſtat. 29 Car. II. c. 3. § 16. writs of execution ſhall bind the property of goods taken in execution, only from the time of their delivery to the officer. Sale of goods of a bankrupt, by commiſſioners, ſhall have relation to the firſt act of bankruptcy; and be good, notwithſtanding the bankrupt ſells them afterwards. (Stat. Jac. I. c. 15.) If a man buys cattle in a market, which are ſtolen, and felleth them out of the market, though the cattle are afterwards brought into the market, and the ſecond bargain confirmed, and money paid, &c., this bargain will not be good; for it ſhall have relation to the beginning, which was unlawful. (Dyer 99.) Fines, being but common aſſurances, ſhall be guided by the indentures precedent; and the execution of them have relation to the original act. (Cro. Jac. 110.) Letters of adminiſtration relate to the death of the inteſtate, and not to the time when they were granted.

So bills in parliament to which the king aſſents on the laſt day of parliament, ſhall relate and be of force from the firſt day thereof. Coke calls this *fictio juris*.

Relation, in *Muſic*. See Relatio.

RELATIVE Propositions, are ſuch as include ſome relation and compariſon.

Thus, where the treaſure is, there will the heart be; As much as thou haſt, ſo much thou art worth, &c. are relative propoſitions.

Relative *gravity*, *levity*, *motion*, *neceſſity*, *place*, *ſpace*, *time*, *velocity*. See the ſeveral ſubſtantives.

Relative *Terms*, in *Logic*, are words which imply a relation, or a thing conſidered as compared to another.

Relative terms include a kind of oppoſition between them; yet ſo, as that the one cannot be without the other.

Such are *father* and *ſon*, *huſband* and *wife*, *king* and *ſubjects*, &c.

Relative, in *Grammar*, is a word or term, which in the conſtruction anſwers to ſome word foregoing, called the *antecedent*; which ſee.

All relatives are ſaid to reciprocate, or mutually infer each other; and, therefore, they are often expreſſed by the genitive caſe.

Relative *Pronoun*. See Pronoun.

RELATOR, in *Law*, a rehearſer, or teller, applied to an informer. See Information.

RELAXATION, in *Law*, is uſed for a *releaſing*. See Release.

In this ſenſe, we ſay the relaxation of an attachment in the court of admiralty.

The tenor of indulgence is a relaxation, or a diminution, of the pains of purgatory.

Relaxation, in *Surgery*, is a preternatural extenſion, or ſtraining of a nerve, tendon, muſcle, or the like; either through violence or weakneſs.

Hernias are deſcents or relaxations of the inteſtines, &c.

From the ſame cauſe ariſe deſcents or prolapſions of the anus, &c.

RELAY, a freſh equipage, horſe, &c. ſent before, or appointed to be ready, for a traveller to change, to make the greater expedition; as in riding poſt.

The term is borrowed from the French, *relais*, which ſignifies the ſame thing. In France, the general of the poſts entitles himſelf ſuperintendant of the relays.

Relay *Horſes*, in the *Artillery*, are horſes that march with the artillery or baggage, and are ready to relieve others, or to aſſiſt in going up a hill, or through bad roads, &c.

Relays, in *Hunting*, are freſh ſets of dogs, or horſes, or both, diſpoſed here and there for readineſs, in caſe the game come that way, to be caſt off, or to mount the hunters in lieu of the former, which are ſuppoſed to want reſpite.

Relay, in *Tapeſtry*, is an opening left in a piece of tapeſtry, where the colours or figures are to be changed; becauſe on thoſe occaſions, the workmen are changed; or elſe the places are left to be filled up, till the reſt of the work is done. See Tapestry.

RELEASE, Relaxatio, in *Law*, denotes an inſtrument, by which eſtates, rights, titles, entries, actions, and other things, are ſometimes extinguiſhed and annulled, ſometimes tranſferred, ſometimes abridged, and even ſometimes enlarged: and it is a ſpecies of conveyance which preſuppoſes ſome other conveyance precedent, and ſerves to enlarge, confirm, alter, reſtrain, reſtore, or transfer the intereſt granted by ſuch original conveyance.

A releaſe is either in fact or in law. A releaſe *in fact*, is that which the very words do expreſsly declare.

A releaſe *in law*, is that which acquits by way of conſequence, or intendment of law. A releaſe is the giving or diſcharging of a right of action, which a man hath claimed, or may claim, againſt another, or that which is his: or it is the conveyance of a man's intereſt or right which he hath to a thing, to another who hath poſſeſſion of it, or ſome eſtate in it. (4 New Abr.) According to Coke releaſes are diſtinguiſhed into expreſs releaſes in deed, and thoſe ariſing by operation of law; and are made of lands and tenements, goods and chattels; or of actions real, perſonal and mixed. (1 Inſt. 264.) Releaſes of land may enure, or take effect, either, 1. By way of *enlarging an eſtate*, or *enlarger l'eſtate*: as if there be tenant for life or years, remainder to another in fee, and he in remainder releaſes all his right to the particular tenant and his heirs, this gives him the eſtate in fee. (Litt. § 465.) But in this caſe the releſſee muſt be in poſſeſſion of ſome eſtate, for the releaſe to work upon: for if there be a leſſee for years, and, before he enters and is in poſſeſſion, the leſſor releaſes to him all his rights in the reverſion, ſuch releaſe is void for want of poſſeſſion in the releſſee. (Litt. § 459.) But when it is ſaid, that a releaſe, which enures by enlargement, cannot work without a poſſeſſion, it muſt be underſtood to mean, not that an actual eſtate in poſſeſſion is neceſſary, but that a "veſted intereſt" ſuffices for ſuch a releaſe to operate upon. By comparing this with the operation of a Lease *and Releaſe* (which ſee) it will be ſeen, that not only eſtates in poſſeſſion, but eſtates in remainder and reverſion, and all other incorporeal hereditaments, may be effectually granted and conveyed by leaſe and releaſe; but it is an inaccuracy to ſay, that the releſſees are, in theſe caſes, in actual poſſeſſion of the hereditaments: the right expreſſion is, that they are actually veſted in him, by virtue of the leaſe in poſſeſſion and the ſtatute. 1 Inſt. 270. (*a*) n. 3.

To make releaſes operate by enlargement, it is generally neceſſary, that the releſſee, at the time the releaſe is made, ſhould be in actual poſſeſſion of, or have a veſted intereſt in, the lands intended to be releaſed; that there ſhould be a privity between him and the releſſor; and that the poſſeſſion of the releſſee ſhould be notorious.

2. By way of *paſſing an eſtate*, or *mitter l'eſtate*: as when one or two co-parceners releaſeth all her right to the other, this paſſeth the fee-ſimple of the whole.

(1 Inſt.

(1 Inſt. 273.) And in both theſe caſes there muſt be a privity of eſtate between the releſſor and the releſſee; that is, one of their eſtates muſt be ſo related to the other, as to make but one and the ſame eſtate in law. 3. By way of *paſſing a right*, or *mitter le droit:* as if a man be diſſeiſed, and releaſeth to his diſſeiſor all his right; hereby the diſſeiſor acquires a new right, which changes the quality of his eſtates, and renders that lawful which before was tortious or wrongful. (Litt. §. 466.) 4. By way of *extinguiſhment:* as if my tenant for life makes a leaſe to A for life, remainder to B and his heirs, and I releaſe to A; this extinguiſhes my right to the reverſion, and ſhall enure to the advantage of B's remainder as well as of A's particular eſtate. (Litt. §. 470.) 5. By way of *entry and feoffment:* as if there be two joint diſſeiſors, and the diſſeiſee releaſes to one of them, he ſhall be ſole ſeiſed; and ſhall keep out his former companion; which is the ſame in effect as if the diſſeiſee had entered, and by that means put an end to the diſſeiſin, and afterwards had enfeoffed one of the diſſeiſors in fee. (1 Inſt. 278.) And hereupon we may obſerve, that when a man has in himſelf the poſſeſſion of lands, he muſt at the common law convey the freehold by feoffment and livery; which makes a notoriety in the country: but if a man has only a right or a future intereſt, he may convey that right or intereſt by a mere releaſe to him that is in poſſeſſion of the land: for the occupancy of the releſſee is a matter of ſufficient notoriety already. Blackſt. Com. book ii. See LEASE *and Releaſe.*

Littleton ſays, that the proper words of a releaſe are "remiſiſſe, relaxaſſe, and quietum clamaſſe," which have all the ſame ſignification. Lord Coke adds, "renunciare, acquietare," and ſays, that there are other words which will amount to a releaſe; as, if the leſſor grants to the leſſee for life, that he ſhall be diſcharged of the rent; this is a good releaſe. (Litt. § 445. 1 Inſt. 264. Plowd. 140.) So a pardon, by act of parliament, of all debts and judgments, amounts to a releaſe of the debt: the word pardon including a releaſe. (1 Sid. 261.) An expreſs releaſe muſt regularly be in writing and by deed, according to the common rule, "eodem modo oritur, eodem modo diſſolvitur," ſo that a duty ariſing by record muſt be diſcharged by matter of as high a nature: ſo of a bond or other deed. (Co. Litt. 264. *b.* 1 Rol. Rep. 43. 2 Leon. 76. 213. 2 Rol. Abr. 408. 2 Sand. 49. Morr. 573. pl. 787.) But a promiſe by words may, before breach, be diſcharged or releaſed, by word of mouth only. (1 Sid. 177. 2 Sid. 78. Cro. Jac. 483. 620. See Cro. Car. 383. 1 Mod. 262. 2 Mod. 259. 1 Sid. 293.) A releaſe of a right in chattels cannot be without deed. (1 Leon. 283.) A covenant perpetual, as that the covenantor will not ſue beyond a certain limitation of time, is an abſolute releaſe. But if the covenant be, that he will not ſue *till* ſuch a time, this does not amount to a releaſe, nor is pleadable in bar as ſuch, but the party hath remedy only on his covenant. If two are jointly and ſeverally bound in an obligation, and the obligee, by deed, covenants and agrees not to ſue one of them; this is no releaſe, and he may notwithſtanding ſue the other. (Cro. Car. 551. 2 Salk. 575.) But if two are jointly and ſeverally bound, a releaſe to one diſcharges the other. L. Raym. 420.

It ſeems agreed, that a will, though ſealed and delivered, cannot amount to a releaſe; and, therefore, where in debt on an obligation, by the repreſentative of a teſtator, a defendant pleaded, that the teſtator by his laſt will in writing releaſed to the defendant; this was adjudged ill, and that no advantage could be taken by plea. (1 Sid. 421.) But it hath been held in equity, that though a will cannot enure as a releaſe, yet provided it were expreſſed to be the intention of the teſtator that the debt ſhould be diſcharged, the will would operate accordingly; and that, in ſuch caſe, it would be plainly an abſolute diſcharge of the debt, though the teſtator had ſurvived the legatee. (1 P. Wms. 85. 2 Vern. 521.) If a debt is mentioned to be deviſed to the debtor, without words of releaſe, or diſcharge of the debt, and the debtor die before the teſtator, this will not operate as a releaſe, but will be conſidered as a lapſed legacy, and the debt will ſubſiſt. (2 Vern. 522.) A debt is only a right to recover the amount of the debt by way of action; and as an executor cannot maintain an action againſt himſelf, or againſt a co-executor, the teſtator, by appointing the debtor an executor of his will, diſcharges the action, and conſequently diſcharges the debt. Still, however, when the creditor makes the debtor his executor, it is to be conſidered merely as a ſpecific bequeſt or legacy, deviſed to the debtor to pay the debt; and, therefore, like other legacies, it is not to be paid or retained till the debts are ſatisfied; and if there be not aſſets for the payment of the debts, the executor is anſwerable for it to the creditors. In this caſe, it is the ſame whether the executor accepts or refuſes the executorſhip. On the other hand, if the debtor makes the creditor his executor, and the creditor accepts the executorſhip, if there be aſſets, he may retain his debt out of the aſſets againſt the creditors in equal degree with himſelf; but if there be not aſſets, he may ſue the heir, when the heir is bound. 1 Inſt. 264. *b* in *n.* See EXECUTOR.

Littleton ſays, that a releaſe of all demands is the beſt releaſe to him, to whom it is made; and Coke ſays, that the word "demand" is the largeſt word in law, except "claim;" and that a releaſe of all demands diſcharges all ſorts of actions, rights, and titles, conditions before or after, breach, executions, appeals, rents of all kinds, covenants, annuities, contracts, recognizances, ſtatutes, commons, &c. (Litt. § 508. Co. Litt. 291.) A releaſe of all actions diſcharges a bond to pay money on a future day. But a releaſe of actions does not diſcharge a rent before the day of payment. (Co. Litt. 292.) By a releaſe of all manner of actions, all actions, as well criminal as real, perſonal and mixed, are releaſed. Co. Litt. 287. See Jacob's Law Dict. by Tomlins.

RELEGATION, RELEGATIO, a kind of exile or baniſhment, by which the obnoxious perſon is commanded to retire to a certain place preſcribed, and to continue there till he be recalled.

Lord Coke calls relegation a baniſhment for a time only; Courtin more adequately defines relegation a baniſhment to a certain place for a certain term.

In Rome, relegation was a leſs ſevere puniſhment than deportation, in that the relegated perſon did not thereby loſe the rights of a Roman citizen, nor thoſe of his family, as the authority of a father over his children, &c.

RELHANIA, in *Botany*, received that name from the pen of the late M. l'Heritier, in honour of the Rev. Richard Relhan, F.R.S. and A.L.S., author of the Flora Cantabrigienſis. — L'Herit. Sert. Angl. 22. Schreb. 563. Willd. Sp. Pl. v. 3. 2135. Mart. Mill. Dict. v. 4. Ait. Hort. Kew. v. 5. 91. Thunb. Prodr. 145. Poiret in Lamarck Dict. v. 4. 93. (Eclopes; Gærtn. t. 169. Lamarck Illuſtr. t. 689.)—Claſs and order, *Syngeneſia Polygamia-ſuperflua.* Nat. Ord. *Compoſitæ diſcoideæ*, Linn. *Corymbiferæ*, Juſſ.

Gen. Ch. *Common calyx* oblong, imbricated, with oblong chaffy ſcales. *Cor.* compound, radiated; united florets in the diſk numerous, tubular, funnel-ſhaped, five-cleft; female ones in the radius ligulate, ovate-oblong.

Stam.,

Stam., in the perfect florets, filaments five, very ſhort; anthers combined into a tube. *Piſt.* in the perfect florets, germen oblong; ſtyle ſimple; ſtigmas two, reflexed: in the female ones, germen oblong, rather incurved; ſtyle ſimple; ſtigmas two, recurved. *Peric.* none, except the permanent unchanged calyx. *Seeds*, to all the florets alike, ſolitary, angular, with a membranous, many-cleft, ſhort crown. *Recept.* chaffy.

Eſſ. Ch. Receptacle chaffy. Seed-crown membranous, ſhort, cylindrical. Calyx imbricated, chaffy. Florets of the radius numerous.

M. l'Heritier diſtinguiſhes this genus from *Athanaſia* by the preſence of a radius; from *Oſmites* by the florets of that radius producing perfect ſeeds; and from *Leyſera* by the want of a feathery ſeed-down. Gærtner remarks that his *Eclopes*, adopted from ſir Joſeph Banks's and Dr. Solander's papers, is nothing more than an *Athanaſia*, furniſhed with a radius. A due attention to the ſyngeneſious claſs ſoon teaches us to miſtruſt this character, which is unſtable, even in ſeveral ſpecies of that claſs; witneſs the genera *Coreopſis* and *Bidens*. Still leſs is the fertility or barrenneſs of the radiant florets capable of diſtinguiſhing natural genera, though Linnæus has, unadviſedly, founded a diſtinction of orders, in the claſs in queſtion, upon thoſe differences. We cannot but aſſent, therefore, to the opinion of Poiret, that the genus of *Relhania* is not naturally diſtinct from the Linnæan *Oſmites*, at leaſt, which laſt name being already eſtabliſhed, ought to have been retained. However ſtriking the radiating, chaffy, ſhining inner ſcales of the calyx may be in a few ſpecies of *Oſmites;* approaches towards that character are found in the *Relhaniæ*, as *geniſtifolia*, and ſtill more in *paleacea*. We are far from intending to do away the claims of our friend, Mr. Relhan, to botanical commemoration, even were that honour beſtowed in general far leſs indiſcriminately than it is. For the preſent, the *Relhania* of L'Heritier is received; and if that be at any time aboliſhed, there ought to be one eſtabliſhed on more ſolid principles.

Willdenow has nineteen ſpecies of this ſuppoſed genus; all natives of the Cape of Good Hope, moſtly of a ſhrubby buſhy habit, green-houſe plants in England, where only one of them indeed appears to be cultivated. Their flowers are moſtly corymboſe, ſmall, of a dull yellow, not remarkable for beauty. We ſelect a few examples.

R. *ſquarroſa*. Hook-leaved Relhania. Willd. n. 1. Ait. n. 1. (Athanaſia ſquarroſa; Linn. Sp. Pl. 1180. Amœn. Acad. v. 6. 98. Santolina ſquarroſa; Linn. Am. Acad. v. 4. 329.)—Leaves elliptical, pointed; recurved at the point.—Sent to Kew by Mr. Maſſon, in 1794. It flowers in the green-houſe in May and June. The whole *ſhrub* is ſmooth, much branched. *Leaves* numerous, ſomewhat imbricated, about a quarter of an inch long, elliptical, obſcurely ſingle-ribbed beneath, entire, acute; ſtrongly recurved, ſmooth, finely dotted on both ſides. *Flowers* ſolitary, on ſlender axillary ſtalks, thrice the length of the leaves. *Calyx* about half an inch long, very ſmooth, rather ſhining. This ſhould ſeem a different plant from *R. ſquarroſa* of Thunberg, who defines his "with terminal umbels," and has thus led Willdenow, contrary to the deſcription of Linnæus, to refer the ſpecies in queſtion to the firſt ſection of the genus, "*with aggregate flowers.*" It appears, by ſpecimens in the Linnæan herbarium, that the *flowers* are ſometimes ſo crowded about the ends of the branches, as to aſſume a corymboſe appearance, though each ſtalk is really axillary. Such a ſpecimen probably was deſcribed by Thunberg.

R. *geniſtifolia*. Broom-leaved Relhania. Willd. n. 2. (Athanaſia geniſtifolia; Linn. Syſt. Nat. ed. 12. v. 2. 540. Mant. 464.)—Leaves obovato-lanceolate, pointed, ſingle-ribbed beneath, entire, ſmooth, ſomewhat imbricated. Flowers terminal, umbellate.—A buſhy *ſhrub*, very much branched. *Leaves* a quarter of an inch, or hardly ſo much, in length, numerous, crowded, dotted, entire, ſmooth; the lower ones obovate, and ſmalleſt; the upper more lanceolate and elongated; all bluntiſh, with a minute, often hooked, point, and ſingle-ribbed at the back only. *Flowers* ſmaller than the preceding, from five to eight together, in little terminal umbels. *Calyx* ſhining.

R. *viſcoſa*. Glutinous Relhania. L'Herit. Sert. 23. Willd. n. 5. (Eclopes viſcida; Gærtn. v. 2. 440. t. 169.)—Leaves linear-lanceolate, pointed, viſcid, obſcurely ſingle-ribbed beneath, rather fleſhy; the upper ones ſomewhat crenate.—The *flowers* are much like the laſt-mentioned; but the *leaves* are twice as large, more elongated in ſhape, more ſlightly ribbed, the edges of the upper ones rough or crenate, and all of them extremely glutinous. When bruiſed, the dried *leaves* are found to retain a powerful aromatic ſcent, approaching to that of orange-peel.

R. *pedunculata*. Long-ſtalked Dwarf Relhania. L'Herit. Sert. Angl. 23. Willd. n. 7. (R. pumila; Thunb. Prodr. 146. Athanaſia pumila; Linn. Suppl. 362. Zoegea capenſis; ibid. 382.)—Leaves linear, villous, and glandular. Stem diffuſe. Flower-ſtalks axillary, much longer than the leaves.—A ſmall herbaceous annual ſpecies, whoſe *root* is furniſhed with numerous capillary fibres. *Stem* a ſpan high, branched from the baſe, round, purpliſh, ſpreading; glandular and ſlightly cottony in the upper part, as well as the *leaves;* which are about an inch long, very narrow, ſomewhat triangular. *Flowers* ſmall, yellow, on long, ſtoutiſh, downy, axillary ſtalks, about the ſummits of the branches. This occurs twice in the *Supplementum*, having, in one inſtance, been deſcribed by Linnæus himſelf, from a wild ſpecimen, and in the other, adopted by his ſon, unſeen, from Thunberg's communications.

R. *paleacea*. Chaffy-flowered Relhania. L'Herit. Sert. Angl. 24. Willd. n. 11. Thunb. Prodr. 146. (Leyſera paleacea; Linn. Syſt. Veg. ed. 13. 641. L. ericoides; Berg. Cap. 294. Eclopes; Lamarck f. 2? Aſterophorus fruticoſus luteus, foliis roriſmarini crebris, ovariis hirſutis; Vaill. Act. German edition, 585.)—Leaves linear, triangular, channelled, hoary; recurved at the point. Flowers terminal, ſolitary, ſeſſile. Calyx turbinate.—Communicated by Van Royen to Linnæus, and by Sherard, as it appears, to Vaillant. The *ſtem* is ſhrubby, a ſpan high, branched. *Leaves* numerous, about an inch long, narrow, clothed, as well as the young *branches*, with fine hoary down. *Calyx* ovate, ſmooth, a quarter of an inch in diameter; its inner ſcales much elongated, lanceolate, acute, and membranous, reſembling the ſcales of the *receptacle*, which ſtand prominent and erect, above the florets of the diſk. This plant has ſo much of the external aſpect of *Leyſera gnaphalodes*, that we can hardly wonder at Linnæus, for having referred it, by the habit alone, to the ſame genus. Upon a careful examination, however, the characters, and even the appearance, of the parts of fructification, are abundantly different in the two plants.

Moſt of the other ſpecies of *Relhania*, in Willdenow, are adopted from the ſhort ſpecific definitions of Thunberg and L'Heritier; nor have we been able to determine them all with certainty. It is remarkable that no figure of any has appeared, except in Gærtner and Lamarck, nor is the latter very happy or diſcriminative, in what he has exhibited of this genus, called by him, after Gærtner, *Eclopes*.

RELICS, Reliquiæ, in the *Romiſh Church*, certain

remains of the body or clothes of ſome ſaint or martyr, devoutly preſerved in honour to his memory, carried at proceſſions, kiſſed, revered, &c.

The abuſes of that church in point of relics have been very flagrant. F. Mabillon, a Benedictine, complains of the great number of ſuſpected relics expoſed on altars: he owns, that were there to be a ſtrict inquiſition into the relics, vaſt numbers of ſpurious ones would be found offered every where to the piety and devotion of the faithful; and adds, that bones are frequently conſecrated, ſo far from belonging to ſaints, that, in all probability, they do not belong to Chriſtians.

The catacombs are an inexhauſtible fund of relics; yet it is ſtill diſputed who were the perſons interred in them.

In the eleventh century, a method was introduced of trying ſuppoſed relics by fire. Thoſe which did not conſume in the fire were reputed genuine; the reſt not.

It is an ancient cuſtom, which ſtill obtains, to preſerve the relics in the altars on which maſs is celebrated. To this purpoſe, a ſquare hole is made in the middle of the altar, big enough to receive the hand; and in that is the relic depoſited, being firſt wrapped in red ſilk, and incloſed in a leaden box.

The Romaniſts allege a conſiderable degree of antiquity in behalf of their relics. The Manichees, it ſeems, out of hatred to the fleſh, which they held an evil principle, are recorded as refuſing to honour the relics of ſaints; which is eſteemed a kind of proof, that the Catholics did it in the firſt ages.

Indeed, folly and ſuperſtition blended themſelves with religion at too early a period. Even the touching of linen cloths on relics, from an opinion of ſome extraordinary virtue derived from them, appears to be as ancient as the firſt ages; there being a hole made in the coffins of the forty martyrs at Conſtantinople, expreſsly for this purpoſe.

This practice of honouring the relics of ſaints, on which the church of Rome, in ſucceeding ages, founded her ſuperſtitious and lucrative uſe of them, as objects of devotion, as a kind of charms or amulets, and as inſtruments of pretended miracles, ſeems to have originated in a very ancient cuſtom, that prevailed among Chriſtians, of aſſembling at the cœmeteries or burying-places of the martyrs, for the purpoſe of commemorating them, and of performing divine worſhip. When the profeſſion of Chriſtianity obtained the protection of the civil government, under Conſtantine the Great, ſtately churches were erected over their ſepulchres, and their names and memories were treated with every poſſible token of affection and reſpect. (See SAINTS.) In proceſs of time, this reverence of the martyrs exceeded all reaſonable bounds; and thoſe prayers and religious ſervices were thought to have a peculiar ſanctity and virtue, which were performed over their tombs. Hence probably proceeded the practice, already mentioned, which obtained in the fourth century, of depoſiting relics of the ſaints and martyrs under the altars in all their churches. This practice, however, was then thought of ſuch importance, that St. Ambroſe would not conſecrate a church, becauſe it had no relics; and the council of Conſtantinople in Trullo ordained, that thoſe altars ſhould be demoliſhed, under which there were found no relics. The rage of procuring relics for this and other purpoſes of a ſimilar nature became ſo exceſſive, that, in 386, the emperor Theodoſius the Great was obliged to paſs a law, forbidding the people to dig up the bodies of the martyrs, and to traffick in their relics.

Such was the commencement of that reſpect for ſacred relics, which, in after ages, was perverted into a formal worſhip of them, and became the occaſion of innumerable proceſſions, pilgrimages, and miracles, from which the church of Rome hath derived incredible advantage. Towards the cloſe of the ninth century, it was not enough to reverence departed ſaints, and to confide in their interceſſions and ſuccours: it was not enough to clothe them with an imaginary power of healing diſeaſes, working miracles, and delivering from all ſorts of calamities and dangers; their bones, their clothes, the apparel and furniture they had poſſeſſed during their lives, the very ground which they had touched, or in which their putrified carcaſes were laid, were treated with a ſtupid veneration, and ſuppoſed to retain the marvellous virtue of healing all diſorders both of body and mind, and of defending ſuch as poſſeſſed them againſt all the aſſaults and devices of Satan. The conſequence of this wretched notion was, that every one was eager to provide himſelf with theſe ſalutary remedies; for which purpoſe, great numbers undertook fatiguing and perilous voyages, and ſubjected themſelves to all ſorts of hardſhips; while others made uſe of this deluſion, to accumulate their riches, and to impoſe upon the miſerable multitude by the moſt impious and ſhocking inventions. As the demand for relics was prodigious and univerſal, the clergy employed all their dexterity to ſatisfy theſe demands, and were far from being nice in the methods they uſed for that end. The bodies of the ſaints were ſought by faſting and prayer, inſtituted by the prieſt, in order to obtain a divine anſwer and an infallible direction; and this pretended direction never failed to accompliſh their deſires: the holy carcaſe was always found, and that always in conſequence, as they impiouſly gave out, of the ſuggeſtion and inſpiration of God himſelf. Each diſcovery of this kind was attended with exceſſive demonſtrations of joy, and animated the zeal of theſe devout ſeekers to enrich the church ſtill more and more with this new kind of treaſure. Many travelled with this view into the Eaſtern provinces, and frequented the places which Chriſt and his diſciples had honoured with their preſence, that, with the bones and other ſacred remains of the firſt heralds of the goſpel, they might comfort dejected minds, calm trembling conſciences, ſave ſinking ſtates, and defend their inhabitants from all ſorts of calamities. Nor did theſe pious travellers return home empty; the craft, dexterity, and knavery of the Greeks found a rich prey in the ſtupid credulity of the Latin relic-hunters, and made a profitable commerce of this new devotion. The latter paid conſiderable ſums for legs and arms, ſkulls and jaw-bones, (ſeveral of which were Pagan, and ſome not human,) and other things that were ſuppoſed to have belonged to the primitive worthies of the Chriſtian church: and thus the Latin churches came to the poſſeſſion of thoſe celebrated relics of St. Mark, St James, St. Bartholomew, Cyprian, Pantaleon, and others, which they ſhew at this day with ſo much oſtentation. But there were many, who, unable to procure for themſelves theſe ſpiritual treaſures by voyages and prayers, had recourſe to violence and theft: for all ſorts of means, and all ſorts of attempts, in a cauſe of this nature were conſidered, when ſucceſsful, as pious and acceptable to the Supreme Being.

Beſides the arguments from antiquity to which the Papiſts refer, in vindication of their worſhip of relics, of which the reader may form ſome judgment from this article, Bellarmine appeals to ſcripture in ſupport of it, and cites the following paſſages, *viz.* Exod. xiii. 19. Deut. xxxiv. 6. 2 Kings, xiii. 21. 2 Kings, xxiii. 16, 17, 18. Iſaiah, xi. 10. Matth. xi. 20, 21, 22. Acts, v. 12—15. Acts, xix. 11, 12. See POPERY.

Relics are forbidden to be uſed or brought into England by ſeveral ſtatutes; and juſtices of peace are empowered to ſearch houſes for Popiſh books and relics, which, when found, are to be defaced and burnt, &c. 3 Jac. I. cap. 26.

RELICT, Relicta, in *Law*. See Widow.

RELICTA Verificatione, is when a defendant relinquiſhes his proof or plea, and thereupon judgment is entered for the plaintiff.

RELIEF, Relevium, *Levamen*, a fine paid the chief lord, by a perſon at his coming to the inheritance of land held by military ſervice.

This was ſaid *relevare hereditatem caducam;* and the money thus paid was called *relevamen*, *relevium*, or *relief*. Relief is uſually to the value of a year's rent or revenue.

The origin of the cuſtom is thus: a feudatory or beneficiary eſtate in lands being at firſt only granted for life, after the death of the vaſſal, it returned to the chief lord; and was hence called *feudum caducum*, *q. d.* fallen to the lord by the death of the tenant.

In courſe of time, theſe feudatory eſtates being converted into inheritances by the connivance and conſent of the lord; when the poſſeſſor of ſuch eſtate died, it was called *hæreditas caduca*, *q. d.* an inheritance fallen to the lord, from whom it was to be recovered, by the heir's paying a certain ſum of money. But this ſum was arbitrary, and at the will of the lord; ſo that, if he pleaſed to demand an exorbitant relief, it was in effect to diſinherit the heir. The Engliſh ill brooked this conſequence of their new-adopted policy; and, therefore, William the Conqueror by his laws (cap. 22, 23, 24.) aſcertained the relief, by directing (in imitation of the Daniſh heriots), that a certain quantity of arms and habiliments of war ſhould be paid by the earls, barons, and vavaſours reſpectively; and if the latter had no arms, they ſhould pay 100*s*. William Rufus broke through this compoſition, and again demanded arbitrary uncertain reliefs, as due by the feodal laws; thereby in effect obliging every heir to new-purchaſe or redeem his land: but his brother Henry I. by his charter, reſtored his father's law; and ordained that the relief to be paid ſhould be according to the law ſo eſtabliſhed, and not an arbitrary redemption. But afterwards, when, by an ordinance in 27 Hen. III. called the Aſſiſe of Arms, it was provided that every man's armour ſhould deſcend to his heir, for defence of the realm, and it thereby became impracticable to pay theſe acknowledgments in arms, according to the laws of the Conqueror, the compoſition was univerſally accepted of 100*s*. for every knight's fee; as we find it ever after eſtabliſhed. (Glanv. l. ix. c. 4. Litt. § 112.) But it muſt be remembered, that this relief was only then payable, if the heir at the death of his anceſtor had attained his full age of twenty-one years.

Relief, *Reaſonable*, called alſo *lawful* and *ancient* relief, is that enjoined by ſome law, or fixed by ancient cuſtom; and which does not depend on the will of the lord.

Thus in a charter of king John, mentioned by Matthew Paris:—"Si quis comitum vel baronum noſtrorum, ſive aliorum tenentium de nobis in capite per ſervitium militare, mortuus fuerit, & cum deceſſerit, hæres ſuus plenæ ætatis fuerit, & relevium debet, habeat hæreditatem ſuam per antiquum relevium."

What this was, may be ſeen in the laws of William the Conqueror, &c. Bracton ſays this fine was called a relief, "quia hæreditas, quæ jacens fuit per anteceſſoris deceſſum, relevatur in manus hæredum, &c."

A relief is alſo paid in ſocage-tenure, or petit ſerjeanty; where a rent, or other thing, is paid by rendering as much as the rent or payment reſerved. But the manner of taking relief upon ſocage-tenure is very different from that upon tenure in chivalry. The relief on a knight's fee was 5*l*., or one-quarter of the ſuppoſed value of the land; but a ſocage-relief is one year's rent or render, payable by the tenant to the lord, be the ſame either great or ſmall (Litt. § 126.); and, therefore, Bracton (l. 2. c. 37. § 8.) will not allow this to be ſo properly a relief, but "quædam præſtatio loco relevii in recognitionem domini." So, too, the ſtatute 28 Edw. I. c. 1. declares, that a free ſokeman ſhall give no relief, but ſhall double his rent after the death of his anceſtor, according to that which he hath uſed to pay his lord, and ſhall not be grieved above meaſure. Reliefs in knight-ſervice were only payable, if the heir at the death of his anceſtor was of full age; but in ſocage they were due even though the heir was under age, becauſe the lord has no wardſhip over him. (Litt. § 127.) The ſtatute 12 Car. II. reſerves the reliefs incident to ſocage-tenures; and, therefore, whenever lands in fee-ſimple are holden by a rent, relief is ſtill due of common right upon the death of a tenant. 3 Lev. 145.

By the cuſtom of Normandy, relief is due for lands held in villainage as well as in fee. By the cuſtom of Paris, relief is not due upon inheritances in the direct line.

The quantity of the relief is very different; there are *ſingle* reliefs, *double* reliefs, &c. The quality, too, is diverſe: there are *reliefs of property*, paid by the heir; *reliefs of bail*, or *tutorage*, paid by the guardian for his minor, or by the huſband for the fiefs of his wife, &c.; *relief of horſe and arms*, &c.

By the laws of king Canutus, the relief of an earl, paid to the king, was eight war horſes with their bridles and ſaddles, four cuiraſſes, four helmets, four ſwords, four hunting-horſes, and a palfrey. The relief of a baron or thane was four horſes, &c.

Relief, in *Chancery*, denotes an order ſued out for the diſſolving of contracts, and other acts, on account of their being unreaſonable, prejudicial, grievous, or from ſome other nullity, either *de jure*, or *de facto*.

Minors obtain relief againſt acts paſſed in their minority. Majors have relief in caſes of enormous damage, deceit, violence, over-reaching, extravagant bargains, &c.

Among the Romaniſts it is a rule, that the church obtains relief any time, and againſt all acts paſſed in its prejudice; no preſcription prevailing againſt it.

Relief, *Aid de*. See Aid.

Relief *of a Hare*, among *Hunters*, is the place where ſhe goes to feed in the evening.

Relief, in *Sculpture*. See Relievo.

RELIEVE, in the *Military Senſe*. To relieve, is to take the poſt of another body. Hence, to relieve the guard, to relieve the trenches, &c. is to bring freſh men upon the guard, or to the trenches, and to ſend thoſe to reſt who have been upon duty before. They alſo ſay, relieve a ſentinel, which is generally done every two hours, by a corporal who attends the relief; relieve the ſteerſman, &c.

To relieve a place that is beſieged, is to furniſh it with a ſupply of men, proviſions, ammunition, &c.

RELIEVER, in *Artillery*, is an iron ring fixed to a handle by means of a ſocket, ſo as to be at right angles to it. It ſerves to diſengage the firſt ſearcher of a gun, when any of its points are retained in a hole, and cannot be got out otherwiſe.

RELIEVING Tackles, in a *Ship*, are two ſtrong tackles, uſed to prevent a ſhip from overturning on the careen, and to aſſiſt in bringing her upright after that operation is completed. The relieving tackles are furniſhed

with two ſtrong *guys*, or pendants, by which their efforts are communicated, under the ſhip's bottom, to the oppoſite ſide, where the ends of the guys are attached to the lower gun-ports. The other ends of the tackles are hooked to the wharf or pontoon, by which the veſſel is careened. Thus, if a ſhip is firſt to be laid down on the larboard ſide, which is neareſt the wharf, the relieving tackles are paſſed under her bottom from the ſaid wharf, and attached to the ſtarboard ſide, by which they will reſtrain her from falling lower than is neceſſary. Falconer.

RELIEVING *Tackle*, is alſo a name given to the train tackles of a gun-carriage.

RELIEVO, or RELIEF, *Imboſſment*, is applied to a figure which projects, or ſtands out prominent, from the ground or plane on which it is formed, whether that figure be cut with the chiſſel, moulded, or caſt. There are three kinds of relievo; *viz. alto*, *baſſo*, and *demi-relievo*.

RELIEVO, *Alto*, *haut relief*, or *high relievo*, is when the figure is formed after nature, and projects as much as the life.

RELIEVO, *Baſſo*, *bas relief*, or *low relievo*, is when the work is but raiſed a little from its ground, as we ſee in medals, and in the frontiſpieces or buildings, particularly the hiſtories, feſtoons, foliages, and other ornaments in friezes. See BASSO *Relievo*.

RELIEVO, *Demi*, is when one-half of the figure riſes from the plane, *i. e.* when the body of a figure ſeems cut in two, and one-half is clapped on a ground. When in a baſſo relievo there are ſome parts that ſtand clear out, detached from the reſt, the work is called a *demi-boſſe*.

RELIEVO, in *Architecture*, denotes the ſally or projecture of any ornament.

This, Daviler obſerves, is always to be proportioned to the magnitude of the building it adorns, and the diſtance at which it is to be viewed.

If the work be inſulate, and terminated on all ſides, it is called a *figure in relievo*, or a *round emboſſment*. Such are ſtatues, acroters, &c.

RELIEVO, in *Painting*, denotes the degree of force or boldneſs by which a figure ſeems, at a due diſtance, to ſtand out from the ground of the painting, as if really imboſſed.

The relievo depends much on the depth of the ſhadow, and the ſtrength of the light; or on the light of the different colours bordering on one another; and particularly on the difference of the colour of the figure from that of the ground.

When the light is well choſen, to make the neareſt parts of figures advance; and well diffuſed on the maſſes, ſtill diminiſhing inſenſibly, and terminating in a large ſpecious ſhadow, brought off inſenſibly; the relievo is ſaid to be *bold*, and the claire obſcure, *well underſtood*.

RELIGION, RELIGIO, that worſhip or homage that is due to God, conſidered as Creator, Preſerver, and, with Chriſtians, as Redeemer of the world.

The foundation of all religion is, that there is a God; and that he requires ſome acknowledgment and ſervice from his creatures.

Accordingly, religion, in the true meaning of the term, neceſſarily ſuppoſes and includes an intercourſe between God and man; *i. e.* on the part of God diſcoveries and manifeſtations of himſelf and his perfections, and of his will with regard to the duties which he requires; and on the part of man, a capacity and readineſs to receive and improve thoſe diſcoveries, and to conform to all the ſignifications of the divine will. For it is an undeniable principle, that whatſoever plainly appeareth to be the mind and will of God, whatever be the way in which we obtain the knowledge of it, we are indiſpenſibly obliged to obſerve. And as there are two ways by which God may be ſuppoſed to manifeſt himſelf and his will to mankind, *viz.* by his works and by his word, religion has been uſually diſtributed into *natural* and *revealed*. Theſe are not two kinds of religion, eſſentially different, much leſs contrary or contradictory to each other, becauſe they both have God for their object, and proceed from him; nor are they altogether the ſame, and differing merely in the mode of their communication. Although all true revealed religion muſt be conſiſtent with, and in no reſpect contrary to, the clear light of nature and reaſon, yet it may diſcover and reveal ſeveral things pertaining to truth and duty, which that light, if left to itſelf, could not have diſcovered at all, or not with ſufficient clearneſs and certainty. Theſe ſhould not be oppoſed to one another; nor is the one of them deſigned to exclude the other.

RELIGION, *Natural*, has been taken in different acceptations. Some underſtand by it every thing in religion, with regard to truth and duty, which, when once diſcovered, may be clearly ſhewn to have a real foundation in the nature and relations of things, and which unprejudiced reaſon will approve, when fairly propoſed, and ſet in a proper light. Accordingly ſome Chriſtian philoſophers and divines have comprehended under their ſcheme or ſyſtem of natural religion, a conſiderable part of what is contained in the ſcripture revelation, *e. gr.* the important truths and principles relating to the exiſtence, the unity, and attributes of God, his governing providence and moral adminiſtration, the worſhip that is due to him, the law that is given to mankind; or the whole of moral duty in its juſt extent, as relating to God, our neighbours, and ourſelves, the rewards and puniſhments of another ſtate, and other articles nearly connected with theſe, and dependent upon them. Having taken great pains to ſhew, that all this is perfectly agreeable to ſound reaſon, and founded in the nature of things, they have honoured the whole with the name of *natural religion*. None can heſitate to allow, that it is a real and great ſervice to religion to ſhew, that the main principles and duties of it are what reaſon muſt approve; and thoſe are unqueſtionably entitled to praiſe, who have undertaken to demonſtrate this with great clearneſs and force of argument. But it does not follow that, becauſe theſe things, when once clearly diſcovered, may be proved agreeable to reaſon, and to have a real foundation in the nature of things, reaſon alone, in the preſent ſtate of mankind, if left to itſelf, without higher aſſiſtance, would merely, by its own force, have diſcovered all of them, with their genuine conſequences, and have applied them to their proper uſes, for directing men in the true knowledge and practice of religion. Many things, ſays Mr. Locke, in his "Reaſonableneſs of Chriſtianity," are taken for unqueſtionable truths, and eaſily demonſtrable, without conſidering how long we might have been in doubt or ignorance reſpecting them, if revelation had been ſilent. Native and original truth is not ſo eaſily wrought out of the mine, as we who have it ready dug and faſhioned to our hands, are apt to imagine. To the ſame purpoſe Dr. Clarke obſerves, (Diſc. on Nat. and Rev. Religion,) that it is one thing to ſee, that theſe rules of life, which are before-hand plainly and particularly laid before us, are perfectly agreeable to reaſon, and another thing to find out theſe rules merely by the light of reaſon, without their having been firſt otherwiſe made known. Accordingly ſome able and ſtrenuous aſſertors of natural religion, or the law of nature, though they contend that it is founded in the nature of things,

things, and agreeable to right reaſon, derive the promulgation of it from divine revelation. Hence it may be concluded, that natural religion, or the LAW *of Nature* (which ſee), is not ſo called, becauſe it was originally diſcovered by natural reaſon, but becauſe, when once made known, it is what the reaſon of mankind, duly exerciſed, approves, as founded in truth and nature.

Natural religion, in the ſenſe now explained, is very conſiſtent with the ſuppoſition of an extraordinary divine revelation, for the purpoſe of diſcovering and promulgating it at firſt, and alſo of re-eſtabliſhing and confirming it, when, through the corruption of mankind, the important principles and duties of it were ſunk into ſuch darkneſs, and ſo confounded with pernicious errors, that an extraordinary aſſiſtance was neceſſary to recover men to the right knowledge and practice of it.

Natural religion is underſtood by others in a ſenſe which is abſolutely excluſive of all extraordinary revelation, and in direct oppoſition to it. By natural religion, they mean that religion which men diſcover by the ſole exerciſe of their natural faculties and powers, without any other or higher aſſiſtance. Theſe perſons diſcard all pretences to extraordinary revelation, as the effects of enthuſiaſm or impoſture. It is in this ſenſe, that thoſe who call themſelves DEISTS (ſee that article) underſtand natural religion, which they highly extol as the only true religion, the only diſcovery of truth and duty upon which we may ſafely depend; and which comprehends the whole of what is neceſſary to be known and done, in order to our obtaining the favour of God, and attaining to true happineſs. But thoſe who take natural religion in this ſenſe entertain different opinions of the ſubject, and expreſs their ſentiments variouſly. The ableſt advocates for natural religion, as oppoſed to revelation, maintain, that it is clear and obvious to the whole human race, and that all men have a natural knowledge of it. They argue, that ſince religion is equally the concern of all mankind, the wiſdom and goodneſs of God require, that it ſhould be actually known to all. To this purpoſe is the reaſoning of lord Herbert, who alleges, that God hath imprinted on the minds of all men innate ideas of the main principles of religion and morality. Tindal alſo, and the author of "Chriſtianity as old as the Creation," argue in a ſimilar manner: the former aſſerts, that this clear univerſal light that ſhines into the minds of all men cannot be made clear to any man by an external extraordinary revelation: with the latter it is a kind of fundamental principle, that the law, or religion, of nature was a perfect ſcheme of religion and morality, fairly drawn on the mind and heart of every man, in ſuch a manner, that it is not poſſible for any man to miſtake it: and he even affirms, that the moſt illiterate of the human race have naturally and neceſſarily a clear and intimate perception of the whole of religion and of their duty. Hence it will be eaſily owned, that there is no need of an extraordinary revelation to teach men what they all naturally and neceſſarily know. This ſcheme, however plauſible it may at firſt appear, and though it ſeems to exhibit a beautiful repreſentation of the dignity of our ſpecies, and of the univerſal goodneſs of God to the human race, appears to be altogether viſionary, when brought to the teſt of fact and experience: whilſt it ſuppoſes, that religion, in its true nature and juſt extent, is naturally known to all men, ſo that they cannot miſtake it, it contradicts the teſtimony of the authentic hiſtory of mankind in all ages, which evinces that they have miſtaken religion in its important principles and obligations.

Senſible of the inconveniences of this ſcheme, others, by natural religion, underſtand not merely that which is naturally and neceſſarily known to all men, but that which reaſon, duly exerciſed and improved, is able, by its own natural force, to diſcover, without the aſſiſtance of any extraordinary revelation. In order to form a juſt conception of this theory, we might inveſtigate the extent of the powers and abilities of human reaſon in judging concerning matters of religion, independently of all revelation: but without entering on a ſpeculation of this kind, the diſquiſition of which would be more curious in the proceſs than ſatisfactory in the reſult, we ſhould recur to the ſureſt and plaineſt mode of judging, which is the examination of the concluſions that may be deduced from fact and experience. Let us then inquire, what hath human reaſon actually done in this way, by its own force, without any extraordinary aſſiſtance? The ſatisfactory anſwer to this inquiry cannot be obtained from any ſyſtems formed by perſons who have lived in ages and countries which have enjoyed the light of divine revelation; ſince in this caſe it may reaſonably be ſuppoſed, that they have borrowed light from revelation, though they are not willing to acknowledge it, or may not themſelves be ſenſible of it. Syſtems, therefore, that have been drawn up by our modern admirers of natural religion in Chriſtian countries, cannot be alleged in proof of the force of unaſſiſted reaſon in matters of religion; and the ſame may be ſaid of thoſe Pagan philoſophers who have lived after Chriſtianity had made ſome progreſs in the world. Nor can we fairly infer the ſufficiency of the light of natural reaſon, without the aid of revelation, from the ſyſtems of the ancient philoſophers, lawgivers, and moraliſts, who lived before the Chriſtian revelation was publiſhed; unleſs it can be ſhewn, that they themſelves derived the religious and moral principles which they taught, ſolely and entirely from the reſearches and diſquiſitions of their own reaſon, and diſclaimed their having had any aſſiſtance, with regard to thoſe truths and principles, from tradition or divine inſtruction. And it is no hard matter to ſhew, by teſtimonies from the moſt celebrated ancients, that this was not the caſe, nor was it what they aſſumed to themſelves. It is well known, that the moſt admired philoſophers of Greece did not pretend to ſet up merely on their own ſtocks, but travelled into Egypt, and different parts of the Eaſt, for the purpoſe of improving their knowledge by converſation with the ſages of thoſe countries; who themſelves profeſſed to have derived their knowledge, not merely from the diſquiſitions of their own reaſon, but from a higher ſource, from very ancient traditions, to which, for the moſt part, they aſſigned a divine original. After all it muſt be allowed, that the moſt celebrated and ſagacious of the ancient philoſophers made pathetical complaints of human darkneſs and ignorance, and of the great difficulties they experienced in ſearching after truth. Many of them were ſenſible of the great need there was of divine inſtruction and aſſiſtance, for enlightening and directing mankind in matters of religion and their duty: ſo that no argument can be juſtly drawn from the wiſe men and philoſophers among the ancients, to ſhew that the knowledge of what is uſually called natural religion, in its juſt extent, is wholly and originally owing to the force of human reaſon, excluſive of all divine revelation. And perhaps, ſays the excellent writer whoſe obſervations we are now citing, it would not be eaſy to mention any nations, among whom any true knowledge of religion has been preſerved, concerning which we can be aſſured, that they never had any benefit from the light of divine revelation; and that the principles of religious truth and duty, which were to be found among them, were originally the mere product of natural reaſon, without any higher aſſiſtance. Several things may be obſerved among them, which

ſeem to be the remains of an ancient univerſal tradition, or primeval religion, derived from the remoteſt antiquity, and which, probably, had their original ſource in divine revelaton, though in proceſs of time it was greatly altered and corrupted. Leland's Advantage and Neceſſity of the Chriſtian Revelation, vol. i. § 1.

Religion, *Revealed*, is commonly underſtood to be that knowledge of religion, which was originally communicated from God to men in a way of extraordinary revelation, for inſtructing them in important religious truth, and directing and engaging them to the practice of their duty. In a general ſenſe, all truth, and the manifeſtation of it, may be ſaid to come from God, even that which we diſcover in the ordinary uſe of thoſe rational faculties which God hath given us. But revealed religion, as diſtinguiſhed from that which is uſually called natural, denotes that knowledge of religion which was originally communicated in an extraordinary and ſupernatural way. Leland, ubi ſupra. See Revelation.

The firſt kind of religion, above-mentioned, or natural religion, flows immediately from the relation between the creature and the Creator; the latter, or revealed religion, does not follow from ſuch a relation, but is ſuperadded from the mere will and pleaſure of the Creator.

The firſt we ordinarily call morality, or ethics; becauſe immediately converſant about the manners and duties of men towards one another; and towards themſelves, conſidered as creatures of that Being. See Ethics, Morality, and *Moral* Philosophy.

The latter we call, by way of eminence, religion, as being the rule of our duty immediately to God himſelf.

The firſt ſuppoſes a God, a providence, and a future ſtate, of rewards and puniſhments; the latter likewiſe ſuppoſes an immediate miſſion from God himſelf, atteſted by miracles, &c. See Christian *Religion*.

Religion is more particularly uſed for that ſpecial ſyſtem of faith and worſhip, which obtains in a particular age, ſect, or country, &c.

In this ſenſe we ſay the Romiſh religion, the Reformed religion, the religion of the Greeks, the Mahometan religion, the Jewiſh religion, &c. See Judaism, Mahometanism, &c.

The Siameſe hold the diverſity of religions, *i. e.* the different manners of honouring God, to be pleaſing to him; inaſmuch as they have all the ſame object, and all tend to the ſame end, though by different means. Claude.

This ſentiment of theſe idolaters is doubtleſs more juſt than that of our zealots, who hold all but thoſe of their own religion odious to God. The ſeveral ſects in religion ſee under their proper articles. See alſo Sect.

Of the religion of the ruling part of the world, you may find a lively deſcription in a chorus in Seneca's Troas, at the end of the ſecond act, beginning thus: "Verum eſt, an timidos fabula decipit? umbras corporibus vivere conditis, &c." This, according to Patin, is the religion of princes, and great men, of magiſtrates, monaſtic ſuperiors, and even ſome phyſicians and philoſophers. M. Du Maine, head of the leaguers in France, uſed to ſay, that princes have no religion till after they are turned of forty. "Cum numine nobis mors inſtat, majore facit." Patin. Lett. Choiſ. 106.

Under this article we are naturally led to diſcuſs the ſubject of national religion, in its connection with religious eſtabliſhments. It muſt appear, on the ſlighteſt reflection, that religion has a very conſiderable influence, not only on the diſpoſition and character of individuals, but on the ſtate of ſociety in general. Accordingly legiſlators and rulers have often found it one of the moſt powerful inſtruments of civil policy; and the hiſtory of almoſt every country affords numerous inſtances of its being an excellent ally to the power of the civil magiſtrate, or the moſt dangerous rival. By religion we now mean that principle which influences men by the dread of evil or the hope of reward, from unknown and inviſible cauſes; whether the good or the evil be expected to take place in this world or in another; and in this general ſenſe of the term, it comprehends enthuſiaſm, ſuperſtition, and every other ſpecies of falſe religion as well as the true. It would lead us too far, if we attempted to trace the influence of this principle in the more barbarous or more civilized nations of antiquity. Enthuſiaſm and ſuperſtition have been more powerful and more efficacious on many occaſions, which hiſtory records, than political wiſdom in the cabinet, or martial ſkill and valour in the field. In ſome caſes religion has concurred with the views of the civil magiſtrate; and in others, it has counteracted them even in favour of the beſt intereſts of mankind. It is an obſervation of Mr. Hume's, that the precious ſparks of liberty were kindled and preſerved by the Puritans in England, and that it is to this ſect, whoſe principles appear ſo frivolous, and whoſe habits ſo ridiculous, as he ſomewhat invidiouſly deſcribes them, that the Engliſh owe the whole freedom of their conſtitution. The aſſertion, however, is too general. The capital advantage derived from Chriſtianity in this weſtern part of the world, is the total abolition of ſlavery, in conſequence of its raiſing men's ideas of the importance of the human ſpecies. It is a memorable fact, that after the introduction of Chriſtianity into the Roman empire, every law which was made relating to ſlaves was in their favour, till at laſt all the ſubjects of the empire were reckoned equally free. Although, in later times, ſlavery has been revived and continued, for commercial purpoſes, in countries calling themſelves Chriſtian, we truſt that laudable efforts, originating in the liberal ſentiments and affections which Chriſtianity inculcates, will be crowned with ſucceſs, and gradually annihilate this nefarious kind of traffick in every nation of the globe. Chriſtianity, indeed, is almoſt incompatible with abſolute deſpotic power, both in ſovereigns and private perſons. The corruptions of Chriſtianity, exemplified in the exorbitant power of the pope, and the ſuperſtition of the Popiſh worſhip, have been indirectly productive of conſiderable benefit. The union of the weſtern churches under one ſupreme pontiff facilitated the intercourſe of nations in barbarous ages; and the pomp of the Popiſh power contributed in no ſmall degree towards preventing the fine arts from being totally loſt in the barbariſm of Europe, and to their ſubſequent revival, previouſly to that of literature and ſcience in this weſtern part of the world. Erroneous notions of religion, and the ſuperſtition blended with its purer principles, have been, however, the occaſion of the moſt lamentable evils in the government of ſtates. Beccaria ſays, in his "Eſſay on Crimes and Puniſhments," that more than 100,000 witches have been condemned to die by Chriſtian tribunals. Falſe principles of religion have encouraged men to commit the moſt horrid crimes; and to inflict tortures both on themſelves and others, which cannot be thought of without horror. The hiſtorical page of perſecution is ſtained with blood. But it is our preſent deſign to ſketch out the benefits reſulting from religion to civil ſociety, rather than the evils which the perverſion of its principles and genuine ſpirit have produced. It is natural to imagine, that the civil magiſtrate would take religion under his protection with a view to theſe benefits; nevertheleſs, it is much to be lamented that by erroneous notions of its nature and deſign, and a miſapplication of its influence, it has been rendered the in-

ſtrument of tyranny and oppreſſion. If magiſtrates and rulers availed themſelves of the aſſiſtance which religion affords for meliorating the character and condition of the members of the community over which they preſide; if they patronized and encouraged the principles and profeſſion of it for the purpoſe of reſtraining the profligate and vicious, and of promoting a virtuous conduct with a view to the welfare and proſperity of the ſtate; and if they made uſe of the mighty powers with which religion furniſhes them merely for the purpoſe of maintaining order and peace in the community to which they belong, and of ſecuring and advancing its true intereſts; there could be no reaſon for alarm or complaint. Religion and civil government might unite their efforts for ſuch laudable purpoſes, and co-operate in promoting them, without any apprehenſion of danger; but lamentable experience has teſtified that in too many inſtances religion has been made ſubſervient to ambition and worldly policy, inſomuch that many perſons of juſt reflection and comprehenſive views have dreaded the interference of civil governors in matters of religion. If, in ſome caſes, they have done good, in others their interference has been pernicious, not only to religion, which has been thus corrupted and degraded, but to the civil community itſelf. Nevertheleſs the opinion, that it is neceſſary for the ſtate to preſcribe the principles, and to regulate the modes of religion, has been almoſt univerſally prevalent.

We are thus led briefly to diſcuſs the ſubject of national eſtabliſhments of religion; and that we may do this without prejudice and partiality, we ſhall ſtate the arguments on both ſides of the queſtion, as much as poſſible in the language of thoſe who oppoſe, and of thoſe who defend them. Amongſt thoſe who have thought freely, and who have written as freely on this ſubject, we find ſome who contend againſt eſtabliſhments in any degree whatever. They will not allow that religion ſhould receive any ſupport from the ſtate, but inſiſt that it ought to be left entirely to its own operation. There is naturally, they ſay, no more connection between civil government and religion, than between the former and any thing elſe that depends upon opinion; leſs than the buſineſs of philoſophy or religion. Becauſe theſe reſpect the preſent life, with which civil governors have to do; whereas religion reſpects the life to come, with which they have nothing to do. However, the concluſiveneſs of this kind of reaſoning ſeems to be materially affected by our preliminary remarks. Religion, it is ſaid, is a concern that lies out of the proper province of the civil magiſtrate. Its object is inviſible; its principles and affections, which are the ſprings of moral and religious conduct, as well as its motives and ſanctions, are not ſubject to the direction and controul of ſecular counſel and power; its ſeat is the underſtanding and heart: not is the external conduct, to which alone the cognizance of the civil magiſtrate extends, of any importance in a moral view, independently of the internal principles in which it originates, and by which it is guided and governed. Beſides, it has been urged that civil rulers have no right to preſcribe to the judgment in the province of religion, or to frame and enforce rules of moral conduct, for the obſervance or violation of which mankind are accountable only to God; nor are they competent or qualified for the exerciſe of ſuch high powers. And if they cannot controul the faculties of the mind, their influence on the profeſſion and practice, and that outward conformity to modes and rites of a religious nature which they may enforce, without the conſent of the judgment and concurrence of the will, are calculated to do much greater harm than good; and to add to the number of hypocrites or martyrs. As the civil magiſtrate cannot beſtow the rewards, nor inflict the puniſhments, that are appropriate to religion; and as he cannot eſtimate the moral worth or demerit of his ſubjects, he cannot, without culpable preſumption, aſſume, nor without intruding on the province of the ſupreme and almighty God, exerciſe the authority of a ſpiritual and final judge. Civil governors in general, ſuch are their rank and ſtation, the courſe of their education, and the habits of their lives, are leſs able than many others of lower condition, but of different views and connections, to decide concerning religious truth, or to determine who are qualified to adviſe and aſſiſt them. Moreover, it has been obſerved, that neither magiſtrates nor their eccleſiaſtical adviſers are warranted to eſtabliſh a ſtandard either of religious faith or moral conduct, to which all the members of a community are required to conform, and from which they are not allowed to deviate without incurring ſome loſs or damage. Such a ſtandard, let it be ever ſo liberally framed, or ever ſo mildly enforced, is not likely to be ſo comprehenſive, as to include all the teachers and all the profeſſors of religion, who are entitled to the protection of the ſtate in which their lot is caſt. Beſides, if ſuch a ſtandard of faith and practice could be deviſed, thoſe who object to religious eſtabliſhments on the ground now ſtated, conceive, that their civil rulers have no right to eſtabliſh and impoſe it; and thus to deprive perſons, who cannot approve it, of worldly honours and benefits, to which they have naturally an equal claim with others of their fellow-ſubjects;—a claim, which they do not forfeit by the exerciſe of their own judgment in the province of religion. It has alſo been argued, that Chriſtianity, ſo far from countenancing, rather diſcourages every kind of religious eſtabliſhment, that interferes with the right of private judgment. The language of the divine Author of our holy religion is, "Render to Cæſar the things that are Cæſar's, and to God the things that are God's;—Search the ſcriptures;—Call no man maſter on earth;—My kingdom is not of this world." And that of his apoſtles, "Let every man be fully perſuaded in his own mind;—Judge ye what I ſay;" &c. &c. The adverſaries of eſtabliſhments allege, that a national church, conſtituted by the civil magiſtrate, and governed by laws enacted by his authority, and the Chriſtian church, founded on the doctrine of Chriſt and his apoſtles, are eſſentially diſtinct; and they ſay, that ſuch a church, *e.gr.* the church of England, leſs exceptionable than many others, which claims and exerciſes, according to its 20th article, "power to decree rights and ceremonies, and authority in matters of faith," has, agreeably to the true nature and conſtitution of the Chriſtian church, no ſuch power and authority; that it is inconſiſtent with the allegiance which Chriſtians, as the ſubjects of Jeſus Chriſt, owe to him, the only lawgiver and king in the church; who, as they ſay, hath expreſsly commanded that no power of this kind ſhall ever be claimed, or ever be yielded by any of his followers. In the proſecution of this mode of reaſoning, they farther add, that if the church of England hath really this authority and right, the church of Rome had it before, and, as the elder and mother-church, ought to have been obeyed; and conſequently the reformation, as it has been called, was a rebellion againſt ſuperiors, a diſobedience to the authority veſted in the church, and ought, as ſuch, to be renounced by returning to the church of Rome. They alſo argue, that this power to order the manner of God's worſhip, and to ſettle articles of faith, is not at all lodged in the biſhops or clergy, who are the ſpiritual paſtors and guides in the eſtabliſhed church, but entirely in the king and parliament of theſe realms. So far were the biſhops and clergy from having any concern in the firſt forming our preſent eſtabliſhed church,

or in ordering its rites and articles of faith, that it was done not only without, but in actual oppoſition to them. Hence they conclude, that the church of England is, in reality, a parliamentary church; that it is not, properly, an ally, as ſome have aſſerted, but a mere creature of the ſtate. It depends entirely upon the acts and authority of parliament for its very eſſence and frame. The qualifications of its miniſters, their power to officiate, the manner in which they are to adminiſter the ſacraments, are all limited and preſcribed by authority of parliament; and this authority, which at firſt made, can alone alter and new-make it; can aboliſh, or add to its articles or rites, according to its pleaſure, even though the whole body of biſhops and clergy ever ſo much diſlike or proteſt earneſtly againſt it.

If it be aſked, how came the civil magiſtrate to poſſeſs the authority which he exerciſes in the church of Chriſt? The objectors to eſtabliſhments reply, that the ſubjection to higher powers, and obedience to magiſtrates, which the ſcriptures enjoin on Chriſtians, relates only to civil, and not at all to religious matters, for this obvious reaſon, that the magiſtrate was at that time every where Pagan. They ſay, that Chriſtianity is ſo far from enjoining, that it actually forbids, obedience to civil governors in things of a religious nature. It commands us "to call no man upon earth father or maſter" (Matt. xxiii. 8, 9.), *i. e.* to acknowledge no authority or juriſdiction of any in matters of religion, but to remember, that "one, one only is our maſter" and lawgiver, even Chriſt, and that all Chriſtians are brethren; and that, though "the princes of the Gentiles exerciſe dominion over them, and they who are great exerciſe authority upon them, yet it ſhall not," ſays our Lord, "be ſo amongſt you." (Matt. xx. 25.) Chriſt's kingdom is not of this world, and of courſe he is the ſole lawgiver, judge, and ſovereign in religious matters. (See Matt. xxiii. 8. xxviii. 18, 19. 1 Cor. viii. 6. Epheſ. i. 22.) In the church of Chriſt, it is ſaid, all authority and juriſdiction are veſted originally in him, and flow from him, nor can any one lawfully exerciſe them without a commiſſion from him; but in the church of England, the king, or queen, is "ſupreme head," poſſeſſing "all power to exerciſe all manner of eccleſiaſtical juriſdiction, and archbiſhops, biſhops, archdeacons, and other eccleſiaſtical perſons, have no manner of juriſdiction eccleſiaſtical, but by and under the king's majeſty, who hath full power and authority to hear and determine all manner of cauſes eccleſiaſtical; and to reform and correct all vice, ſin, errors, hereſies, enormities, abuſes whatſoever, which by any manner of ſpiritual authority or juriſdiction, ought, or may be lawfully reformed." (26 Hen. VIII. cap. 1. 37 Hen. VIII. cap. 17. 1 Eliz. cap. 1.) At the firſt eſtabliſhment of this church under Henry VIII. and Edward VI. all the biſhops took out commiſſions from the crown, for the exerciſing of their ſpiritual juriſdiction in theſe kingdoms, during the king's pleaſure only; "and in their commiſſions acknowledge all ſorts of juriſdiction, as well eccleſiaſtical as civil, to have flowed originally from the regal power, as from a ſupreme head, and a fountain and ſpring of all magiſtracy within his own kingdom." Burnet's Hiſt. Reform. part ii. Col. p. 92.

Yea, even the power of ordination itſelf, which is reckoned a peculiar of the epiſcopal office, the firſt reformers and founders of this church derived from the king, and exerciſed only as by authority from him, and during his pleaſure. "Thus Cranmer, archbiſhop of Canterbury, Bonner, biſhop of London, &c. took out commiſſions from the crown, importing, that becauſe the vicegerent (Cromwell, a lay perſon) could not perſonally attend the charge in all parts of the kingdom, the king authoriſes the biſhop, in his, (the king's or perhaps the vicegerent's) ſtead to ordain, within his dioceſe, ſuch as he judged worthy of holy orders; to collate to benefices; to give inſtitution; and to execute all other parts of the epiſcopal authority; and this during the king's pleaſure only."

In conſequence of this ſupremacy, the king or queen of this church hath power to excommunicate from, or to readmit into it, independent of, yea, in direct oppoſition to, all its biſhops and clergy. The king or queen revoke, if they pleaſe, any ſpiritual cenſures of the biſhops or archbiſhops; yea, can ſuſpend, deprive, or even excommunicate, themſelves; or can, by their proclamation only, without the leaſt confeſſion, humiliation, or ſatisfaction for their offence, pardon and reſtore excommunicated perſons, the vileſt offenders, to the church's boſom again.

Yea, further, they have power to forbid all preaching for a time; as did king Henry VIII. king Edward VI. queen Mary, and queen Elizabeth; to limit, inſtruct, and preſcribe to the clergy what they ſhall, and what they ſhall not preach; as did queen Elizabeth, king James I. king Charles I. king William, &c. Finally, to the king or queen only does it pertain to declare what is hereſy, and authoritatively to pronounce what doctrines and tenets are, and what are not, to be cenſured as ſuch: nor have all the biſhops and clergy, aſſembled in convocation, the leaſt authority to cenſure any tenet as heretical, if the prince on the throne refuſe his conſent.

Accordingly, the objectors to religious eſtabliſhments allege, that in Chriſt's church, himſelf is the only ſovereign and head; he only hath power to decree ceremonies and rites, to fix terms of communion and authority in points of faith: nor hath any earthly prince power to make laws in his kingdom, which ſhall bind the conſcience of his ſubjects; or ſovereignly to dictate to his ſervants and miniſters what they ſhall believe, and what they ſhall preach. Yea, his ſubjects are expreſsly commanded and charged to receive nothing as doctrine or parts of religion, which are only commandments of men.

But in the church of England there is another ſovereign, lawgiver, ſupreme head, beſides Jeſus Chriſt; an authority which commands things which Chriſt never commanded, which teaches doctrines he never taught, which enjoins terms of communion, and rites of religious worſhip, which Chriſt never enjoined. Hence they conclude, that theſe two churches are two diſtinct and quite different ſocieties, framed after different models, conſiſting of different members, and governed by different officers, ſtatutes, and laws. Whilſt the objectors to eſtabliſhed forms of worſhip eſteem and reverence the great number of illuſtrious and excellent perſons, both clergy and laity, of which the church of England can boaſt, they ſuggeſt, that the preſent eſtabliſhed forms were drawn up when this kingdom juſt emerged out of Popiſh darkneſs; that in drawing them up ſpecial regard was had to the weakneſs of the people at that time, who could not be all at once entirely brought off from the old ceremonies and forms; and that there are ſeveral parts of our liturgy and eccleſiaſtical conſtitution, which even many of our biſhops and clergy wiſh to ſee altered. Schemes have been propoſed, and attempts have been made for omitting what is offenſive, for correcting what is eaſily capable of amendment, and for accommodating the doctrine and forms of the eſtabliſhed church, to the preſent advanced ſtate of knowledge, and to the correſponding liberality of the modern profeſſors of religion, both in and out of the church; but they have hitherto been unavailing: and it has been thought, that an excluſive eſtabliſhment, appropriating to itſelf diſtinguiſhed honours and benefits of a ſecular nature, and expoſing thoſe

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whom it does not comprehend to privations, both of emolument and honour, has a tendency to discourage every effort for improving its constitution, and enlarging its boundaries. Some have also been of opinion that it restrains freedom of inquiry, embarrasses integrity, and too much disposes the uninstructed and uninformed to intolerance and persecution. From whom, it has been said, is a reform to be expected, but from those who have reason for wishing every thing to continue in statu quo? The dignitaries of the church, whose emoluments induce them to rest satisfied, and the ruling magistrates of the state, who wish things to remain quiet, and the great body of the laity, connected in one way or other with ecclesiastical establishments, cannot be supposed to be very anxious about a change in the constitution of the church: nor will they be at a loss for plausible reasons for resisting any material alteration. The church and the state are so incorporated, that nothing but a revolution, as it has been said, in the latter, would cause any very important amendment in the former. Nevertheless, reformers have maintained, that if the liturgy, clergy, articles, canons, with all the ceremonies and rites of the established church, were entirely vanished from the land; if its immense revenues were applied to ease our heavy taxes, and for the payment of the public debts; and if preachers were paid only by voluntary contributions; the state would not sustain so essential a loss and damage, that it could not thenceforward possibly subsist. Would, say they, the British monarchy be overthrown; our courts of judicature be shut up; the courts of law be stopped; parliaments no more meet; commerce and trade stagnate, because the national church was no more? On the contrary, however great the convulsion might be, the government, both civil and military, might remain the very same. A timely reformation, however, would, as they imagine, prevent its total destruction, and contribute to its permanence and prosperity.

Some notice should here be taken of the learned Warburton's famous argument in favour of an established church. The church, says this prelate, has, by contract or alliance, resigned her supremacy in matters ecclesiastical, and her independency, to the state. In consequence of this, the state hath drawn up for her articles of faith, and forms of public worship, which it requires the church to subscribe and use. This alliance is a mere phantom, created by the warm imagination of the paradoxical bishop, whose ingenuity and learning have not been sufficient to render it popular, even among the most zealous advocates of religious establishments. Neither our history nor our laws know any thing at all of it. The nature of our constitution utterly disowns it; and avows the church to be not an ally, but a subject to the state. An alliance supposes independency in the powers between which it subsists. But it is needless to enlarge on this topic.

Whilst it is allowed that religion has an influence on the conduct of men in this life, it is pleaded, on the other hand, that this beneficial influence of religion is promoted in all denominations of Christians, and as much in those which are reprobated by the state as in those which are encouraged by it. It has been also said, that the subject of religion is so interesting to the generality of mankind, that if government did not interfere, the contention about it would be so violent, that the public peace could not be preserved. To this argument in favour of establishments, it has been replied, that these contentions are much increased by the favour shewn to one mode of religion, and the opprobrium which is consequently thrown on the rest; and that, where temporal interest is not concerned, mere opinions will not occasion any differences at which government need to be alarmed. Christianity was introduced and established, and subsisted for about three hundred years, without any favour or protection from the governing powers; and the example of America, in some provinces of which there is, strictly speaking, no establishment of religion, and in which numerous forms of religion are openly professed, serves to shew, that the want of an establishment is attended with no danger to the state. It is farther objected, that the state, by undertaking the care of religion, the truth and utility of which will, under providence, ensure its permanence, has taken upon itself a great, dangerous, and unnecessary burden; and from its jealousy of sectaries, often deprives itself of the services of some of its best and most able subjects; and at some times it has been induced to persecute and destroy them, because if they were left free, and even suffered to live, it was apprehended their principles might spread to the risk of the establishment. To the national establishment of our own country, the enlightened advocates of which abhor and discountenance intolerance and persecution, it has been objected, that it deprives the people of the choice of their own teachers and pastors; that it imposes subscription to creeds of doubtful evidence, and the observance of forms of questionable utility, on its own ministers; that it renders the support of them burdensome to those who avail themselves of their labours, and to others who derive no benefit from them; and that it excludes by obnoxious statutes a considerable class of loyal subjects from offices which they are competent to discharge, as well as emoluments and honours of which they have a right to participate. See DISSENTERS, SUBSCRIPTION, TEST, and TYTHES.

We now proceed to state the arguments that have been urged in favour of national establishments of religion; and we shall here avail ourselves of the reasoning of an excellent writer, who has done ample justice to the subject, and who, at the same time, has discussed it with a liberality and moderation, which have a tendency to conciliate those whose sentiments may be different from his own. "A religious establishment," he says, "is no part of Christianity; it is only the means of inculcating it." It cannot be proved, that any form of church government has been laid down in the Christian, as it had been in the Jewish scriptures, with a view of fixing a constitution for succeeding ages; and which constitution, consequently, the disciples of Christ would, every where, and at all times, by the very law of their religion, be obliged to adopt. Certainly no command for this purpose was delivered by Christ himself; and though the apostles ordained bishops and presbyters among their first converts, and appointed also deacons and deaconesses, investing them with functions different from any that now subsist, such offices were at first erected in the Christian church, as the good order, the instruction, and the exigencies of the society at that time required, without any declared design of regulating the appointment, authority, or distinction of Christian ministers under future circumstances. After this concession, our author founds the authority of a church establishment in its utility; and in judging of the comparative excellence of different establishments, he suggests, that the single view, under which we ought to consider any of them, is that of "a scheme of instruction," and the single end we ought to propose by them is, "the preservation and communication of religious knowledge." Every other idea, and every other end that have been mixed with this, as the making of the church an engine, or even an ally of the state; converting it into the means of strengthening, or of diffusing influence; or regarding it as a support of regal, in opposition to popular forms of government, have served only

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to debaſe the inſtitution, and to introduce into it numerous corruptions and abuſes. The notion, ſays our author, of a religious eſtabliſhment comprehends three things, a clergy, or order of men ſecluded from other profeſſions to attend upon the offices of religion; a legal proviſion for the maintenance of the clergy: and the confining of that proviſion to the teachers of a particular ſect of Chriſtians. Without theſe, there exiſts no national religion, or eſtabliſhed church, according to the ſenſe which theſe terms are uſually made to convey. He, therefore, who would defend eccleſiaſtical eſtabliſhments, muſt ſhew the ſeparate utility of theſe three eſſential parts of their conſtitution. Under the firſt head he maintains, that the knowledge and profeſſion of Chriſtianity cannot be maintained in a country without a claſs of men ſet apart by public authority to the ſtudy and teaching of religion, and to the conducting of public worſhip; and that for theſe purpoſes they ſhould be precluded from other employments; and that of courſe they ought to derive a maintenance from their own. If they depended for this maintenance upon the voluntary contributions of their hearers, he is of opinion, that few would ultimately contribute any thing at all. To the conſideration of the difficulty with which congregations would be eſtabliſhed and upheld upon the *voluntary* plan, he adds, that of the condition of thoſe who are to officiate in them. Preaching, he thinks, would in this caſe become a kind of begging; and the preacher, being at the mercy of his audience, would be obliged to adapt his doctrines, and alſo his ſtyle and manner of preaching, to the pleaſure of a capricious multitude; and to live in conſtant bondage to tyrannical and inſolent directors; which he could not do without a ſacrifice of principle, and a depravation of character. Admitting theſe circumſtances to be fairly ſtated, which perhaps an objector would reluctantly allow, Dr. Paley concludes, that a legal proviſion for the clergy, compulſory upon thoſe who contribute to it, is expedient; and then proceeds to inquire, whether this proviſion ſhould be confined to one ſect of Chriſtians, or extended indifferently to all. This queſtion, it ſhould be recollected, *can* never offer itſelf where the people are agreed in their religious opinions, and *ought* never to ariſe, where a ſyſtem of doctrines and worſhip may be ſo framed as to comprehend their diſagreements, and which might ſatisfy all by uniting all in the articles of their common faith, and in a mode of divine worſhip that omits every ſubject of controverſy or offence. Where ſuch a comprehenſion is practicable, the comprehending religion ought to be made that of the ſtate. But where this comprehenſion is impracticable, and ſeparate congregations and different ſects muſt continue in the country, the queſtion fairly recurs, whether, under ſuch circumſtances, the laws ought to eſtabliſh one ſect in preference to the reſt; that is, whether they ought to confer the proviſion aſſigned to the maintenance of religion upon the teachers of one ſyſtem of doctrines alone. This queſtion is intimately connected with, and in a great meaſure dependent upon, another; and that is, in what way, or by whom, ought the miniſters of religion to be *appointed?* In that ſpecies of patronage which ſubſiſts in this country, and which allows private individuals to nominate teachers of religion for diſtricts and congregations, to which they are abſolute ſtrangers, ſome teſt ſhould be propoſed to the perſons nominated, in order to prevent that diſcordancy of religious opinions that might otherwiſe ariſe between the ſeveral teachers and their reſpective congregations. The requiſition of ſubſcription, or any other teſt by which the national religion is guarded, may be conſidered merely as a reſtriction upon the exerciſe of private patronage. Wherefoever, therefore, this conſtitution of patronage is adopted, a national religion, or the legal preference of one particular religion to all others, muſt almoſt neceſſarily accompany it. If we ſuppoſe that the appointment of the miniſter of religion was in every pariſh left to the choice of the pariſhioners, might not this choice be ſafely exerciſed, without its being limited to the teachers of any particular ſect? The effect, ſays our author, of ſuch a liberty muſt be, that a Papiſt, or a Preſbyterian, a Methodiſt, a Moravian, or an Anabaptiſt, would ſucceſſively gain poſſeſſion of the pulpit, according as a majority of the party happened at each election to prevail; and on every choice, it is apprehended, that violent conflicts would be renewed, and bitter animoſities be revived. If the ſtate appoint the miniſters of religion, this conſtitution will differ little from the eſtabliſhment of a national religion: for the ſtate would undoubtedly appoint only thoſe whoſe religious opinions, or rather whoſe religious denomination, agree with its own; unleſs it be thought that religious liberty would derive any advantage from transferring the choice of the national religion from the legiſlature of the country to the magiſtrate who adminiſters the executive government. The only plan which ſeems to render the legal maintenance of a clergy practicable, without the legal preference of one ſect of Chriſtians to another, is that of an experiment which has been attempted (and which is ſaid to have ſucceeded) in ſome of the new ſtates of North America. The nature of the plan is thus deſcribed. A tax is levied upon the inhabitants for the general ſupport of religion: the collector of the tax goes round with a regiſter in his hand, in which are inſerted, at the head of ſo many diſtinct columns, the names of the ſeveral religious ſects that are profeſſed in the country. The perſon who is called upon for the aſſeſſment, as ſoon as he has paid his quota, ſubſcribes his name in which of the columns he pleaſes; and the amount of what is collected in each column is paid over to the miniſter of that denomination. In this ſcheme it is not left to the option of the ſubject, whether he will contribute, or how much he ſhall contribute, to the maintenance of a Chriſtian miniſter: it is only referred to his choice to determine by what ſect his contribution ſhall be received. The above arrangement, ſays Paley, is undoubtedly the beſt that has been propoſed upon this principle; it bears the appearance of liberality and juſtice; and it may contain ſome ſolid advantages. But our author thinks that its inconveniences will be found to overbalance all its recommendations. It is ſcarcely compatible with the firſt requiſite in an eccleſiaſtical eſtabliſhment, which is the diviſion of the country into pariſhes of a commodious extent. If the pariſhes be ſmall, and miniſters of every denomination be ſtationed in each, which the plan ſeems to ſuppoſe, the expence of their maintenance will become too burdenſome a charge for the country to ſupport. If, for reducing the expence, the diſtricts be enlarged, the place of aſſembling will, in ſome caſes, be too far removed from the reſidence of the perſons who ought to reſort to it. Beſides, if the pecuniary ſucceſs of the different teachers of religion be made to depend upon the number and wealth of their reſpective followers, this would naturally generate ſtrifes and indecent jealouſies amongſt them, as well as produce a polemical and proſelyting ſpirit, founded in or mixed with views of private gain; which would both deprave the principles of the clergy, and diſtract the country with endleſs contentions.

If it be expedient, ſays our author, to eſtabliſh a national religion, that is, one ſect in preference to all others, ſome *teſt*, by which the teacher of that ſect may be diſtinguiſhed from the teachers of different ſects, appears to be an indiſpenſable conſequence. The exiſtence of ſuch an eſtabliſh-

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ment fuppofes it: the very notion of a national religion includes that of a teft. But the neceffity of a teft has furnifhed to almoft every church a pretence for extending, multiplying, and continuing fuch tefts beyond what the occafion juftified. For though fome purpofes of order and tranquillity may be anfwered by the eftablifhment of creeds and confeffions, yet they are at all times attended with ferious inconveniences. They check inquiry; they violate liberty; they enfnare the confciences of the clergy, by holding out temptations to prevarication; and in procefs of time, they contradict the opinions of the church, whofe doctrines they profefs to contain; and they often perpetuate the profeription of fects and tenets, from which any danger has long ceafed to be apprehended. Although tefts and fubfcriptions may not be abolifhed, they fhould be made as eafy and fimple as poffible. They fhould be adapted from time to time to the varying fentiments and circumftances of the church in which they are received; nor fhould they at any time advance one ftep farther than fome fubfifting neceffity requires. Promifes of conformity to the rites, liturgy, and offices of the church, if fufficient to prevent confufion in the celebration of divine worfhip, fhould be accepted in the place of ftricter fubfcriptions. If any agreements, not to preach certain doctrines, nor to revive certain controverfies, denominated articles of *peace*, would exclude indecent altercations amongft the national clergy, and alfo fecure to the public teaching of religion as much of uniformity and quiet as is neceffary to edification; then confeffions of faith ought to be converted into articles of peace. In a word, it ought to be held, fays Dr. Paley, a fufficient reafon for relaxing the terms of fubfcription, or for dropping any or all of the articles to be fubfcribed, that no prefent neceffity requires greater ftrictnefs.

It is a queftion that has been long agitated in the reformed churches of Chriftendom, whether a parity amongft the clergy, or a diftinction of orders in the miniftry, be more conducive to the general ends of the inftitution? Our author is inclined to the latter alternative, for reafons which he has ftated.

In difcuffing the fubject of a national eftablifhment of religion, the right of the civil magiftrate to interfere at all in matters of religion offers itfelf to confideration; and although this right may be acknowledged whilft he is employed folely in providing means of public inftruction, it may be queftioned whether he fhould inflict penalties, and impofe reftraints or incapacities on the account of religious diftinctions. Our author, deducing the authority of civil government from the will of God, and inferring that will from public expediency alone, concludes that the jurifdiction of the magiftrate is limited by no confideration but that of general utility; or that whatever be the fubject demanding regulation, it is lawful for him to interfere, whenever his interference, in its general tendency, appears to be conducive to the common intereft. Our author conceives, that there is nothing in the nature of religion, as *fuch*, which exempts it from the authority of the legiflator, when the fafety or welfare of the community requires his interpofition. To the objection, that religion, pertaining to the intereffs of a life to come, lies beyond the province of the civil government, the office of which is confined to the affairs of this life, Dr. Paley replies, that when the laws interfere even in religion, they interfere only with temporals; their effects terminate, their power operates only upon thofe rights and intereffs, which confeffedly belong to their difpofal. He proceeds to obferve, probably without fatisfying the objector, "that the acts of the legiflator, the edicts of the prince, the fentence of the judge, cannot affect my falvation; nor do they, without the moft abfurd arrogance, pretend to any fuch power: but they may deprive me of liberty, property, and even of life itfelf, on account of my religion; and however I may complain of the injuftice of the fentence, by which I am condemned, I cannot allege that the magiftrate has tranfgreffed the boundaries of his jurifdiction; becaufe the property, the liberty, and the life of the fubject, may be taken away by the authority of the laws, for any reafon, which, in the judgment of the legiflature, renders fuch a meafure neceffary to the common welfare. Moreover, as the precepts of religion may regulate all the offices of life, or may be fo conftrued as to extend to all, the exemption of religion from the control of human laws might afford a plea, which would exclude civil government from every authority over the conduct of its fubjects. Religious liberty is like civil liberty, not an immunity from reftraint, but the being reftrained by no law, but what in a greater degree conduces to the public welfare."

By way of qualifying this reafoning, which may be thought exceptionable, Dr. Paley obferves, that "ftill it is right to obey God rather than man."—"When human laws interpofe their direction in matters of religion, by dictating, for example, the object or the mode of divine worfhip; by prohibiting the profeffion of fome articles of faith, and by executing that of others; they are liable to clafh with what private perfons believe to be already fettled by precepts of revelation, or to contradict what God himfelf, they think, hath declared to be true. In this cafe, on whichever fide the miftake lies, or whatever plea the ftate may allege to juftify its edict, the fubject can have none to excufe his compliance. The fame conffideration alfo points out the diftinction, as to the authority of the ftate between temporals and fpirituals. The magiftate is not to be obeyed in temporals more than in fpirituals, where a repugnance is perceived between his commands, and any credited manifeftations of the divine will; but fuch repugnancies are much lefs likely to arife in one cafe than in the other." The general propofition laid down by our author is as follows: "That it is lawful for the magiftrate to interfere in the affairs of religion, whenever his interference appears to him to conduce, by its general tendency, to the public happinefs." To others this propofition will appear to be in many refpects exceptionable. The magiftrate of courfe is to be the judge, what are the occafions in which he may interfere; and thefe occafions will occur whenever he pleafes. Dr. Paley has therefore endeavoured to guard it againft mifapprehenfion and mifapplication. Having ftated, that it is the *general* tendency of the meafure, or, in other words, the effects which would arife from the meafure being *generally* adopted, that fixes upon it the character of rectitude or injuftice, he then proceeds to inquire what is the degree and the fort of interference of feeular laws in matters of religion, which are likely to be beneficial to the public happinefs. In fettling this point he premifes two maxims; the firft is, that any form of Chriftianity is better than no religion at all; and the fecond is, that of different fyftems of faith, that is the beft which is the trueft. From the firft propofition it is inferred, that when the ftate enables its fubjects to learn *fome* form of Chriftianity by diftributing teachers of a religious fyftem throughout the country, and by providing for the maintenance of thefe teachers at the public expence; that is, when the *laws* eftablifh a national religion, they exercife a power and interference, which are likely, in their general tendency, to promote the intereft of mankind.

But after the right of the magiſtrate to eſtabliſh a particular religion has been, upon this principle, admitted; a doubt ariſes, whether the religion he ought to eſtabliſh be that which he himſelf profeſſes, or that which he obſerves to prevail amongſt the majority of the people. Aſſuming it to be an equal chance, which of the two religions, that of the magiſtrate or that of the people, contains more of truth, it becomes a conſideration of ſome importance, to which arrangement we may attach the greater efficacy; that of an order of men appointed to teach the people their own religion, or to convert them to another; and as in our author's opinion the advantage lies on the ſide of the former ſcheme, it becomes the duty of the magiſtrate, in the choice of the religion which he eſtabliſhes, to conſult the faith of the nation rather than his own. For our author's reaſoning on other topics connected with a national eſtabliſhment of religion, we refer to the articles SUBSCRIPTION, TEST, and TOLERATION. He cloſes the diſcuſſion of the general ſubject with the following ſummary of his argument: the reſult of our examination of thoſe general tendencies, by which every interference of civil government in matters of religion ought to be tried, is this: "That a comprehenſive national religion, guarded by a few articles of peace, and conformity, together with a legal proviſion for the clergy of that religion; and with a *complete* toleration of all diſſenters from the eſtabliſhed church, without any other limitation or exception, than what ariſes from the conjunction of dangerous political diſpoſitions with certain religious tenets, appears to be, not only the moſt juſt and liberal, but the wiſeſt and ſafeſt ſyſtem, which a ſtate can adopt: inaſmuch as it unites the ſeveral perfections, which a religious conſtitution ought to aim at—liberty of conſcience, with means of inſtruction; the progreſs of truth, with the peace of ſociety; the right of private judgment, with the care of the public ſafety." Paley's Principles of Moral and Political Philoſophy, vol. ii. ch. 10.

In moſt countries where religion is eſtabliſhed, it is that of the majority of the people; and on this principle the writers in defence of eccleſiaſtical eſtabliſhments vindicate them. But in a part of the united kingdom of Great Britain, *viz.* in Ireland, we have a remarkable exception to this rule. There the eſtabliſhed religion is not that of the majority, but of a ſmall minority of the people. Ever ſince the reformation the members of the church of England have kept poſſeſſion of the tithes of the whole iſland, where they have long deſpaired of bringing the people over to that religion for which they pay ſo dear.

In connection with the national eſtabliſhment of religion we ſhall here remark, that in this country the care which government takes of religion extends itſelf to the buſineſs of *education*, confining the univerſities, which are ſupported by the national funds, to the education of the members of the church of England, and rigorouſly excluding all ſectaries, either by requiring ſubſcription to the thirty-nine articles at the time of matriculation, or of taking certain degrees, or obliging the ſtudents to attend the ſervice of the eſtabliſhed church, and to declare that they are *bona fide* members of it.

Among the offences againſt religion enumerated by judge Blackſtone, and puniſhable by the laws of England, are *apoſtacy* and *hereſy*, which ſee reſpectively; and alſo thoſe which affect the eſtabliſhed church. Theſe latter are either poſitive or negative; poſitive by reviling its ordinances, or negative, by non-conformity to its worſhip. See REVILING, &c. COMMON *Prayer*, NON-CONFORMISTS, DISSENTERS, PAPISTS, and POPERY. See alſo BLASPHEMY, PROFANENESS, CONJURATION and WITCHCRAFT, *Religious* IMPOSTORS, SUNDAY, *Falſe* PROPHECIES, DRUNKENNESS, LEWDNESS, and SIMONY.

RELIGION, again, is applied to a military order, conſiſting of knights who live under ſome certain rule, &c.

In this ſenſe we ſay, the *religion of Malta*, &c. See MALTA.

RELIGION is ſometimes alſo uſed for a convent. Thus, we ſay, there are religions of men, *i. e.* mónks; religions of women, *i. e.* nuns.

RELIGION, *The*, uſed abſolutely, denotes the Reformed in France. Thus, they ſay, d'Ablancourt and Dacier were of the religion. See HUGUENOTS.

RELIGIOUS, in a general ſenſe, ſomething that relates to religion.

We ſay, a religious life, religious ſociety, &c. Churches and church-yards are religious places. A religious war is alſo called a *croiſade*; which ſee.

RELIGIOUS is more particularly uſed for a perſon engaged by ſolemn vows to the monaſtic life; or a perſon ſhut up in a monaſtery, to lead a life of devotion and auſterity, under ſome rule or inſtitution.

The male religious we popularly call *monks* and *friars*; the female, *nuns* and *canoneſſes*. See CANON, MONK, NUN, &c.

M. Nicole obſerves, that ſome domeſtic chagrins, and a certain pride, which leads people to abſcond when they cannot make a figure to their mind, make as many religious as real piety. He adds, that a girl muſt often be made a religious for no other reaſon, but becauſe ſhe cannot be married anſwerable to her condition.

Great influence, however, may be attributed to enthuſiaſm and ſuperſtition, and to thoſe miſtaken notions of duty and of perfection of character, which have often originated in theſe ſources, and which have produced effect on honeſt minds of a peculiar temperament and diſpoſition. Whilſt no kind of argument can juſtify this retirement from the world, and total ſecluſion from the occupations and pleaſures of ſocial life, it would manifeſt a want of candour as well as ignorance of human nature indiſcriminately to condemn all who have devoted themſelves to ſuch a kind of indolent and uſeleſs life.

A religious cannot make any will. By the council of Trent, a religious may reclaim his vows within five years.

Anciently the religious were all laymen, and it was even prohibited them to take up orders. In 1557, the parliament of Paris made a difficulty of receiving a biſhop of Laon to the oath of a duke and peer, by reaſon of his being a religious: yet a religious, being promoted to a biſhopric, is thenceforth ſecularized or diſpenſed from the obſervation of his rule.

In ancient deeds and conveyances of lands, we often find the ſeller reſtrained from giving or alienating it, *viris religioſis, vel Judæis*, to religious, or to Jews; to the end the land might not fall into *mortmain*; which ſee.

In a memorial directed by king John to his viſcounts, they are ordered to proclaim through their reſpective counties, that nobody, as they love their bodies and cattle, injure the religious or clerks, either in word or deed, on penalty of being hanged up on the next oak. "Nulli, ſicut diligunt corpora et catalla ſua, malum faciant vel dicant viris religioſis vel clericis. Si quem inde attingere poſſimus, ad proximam quercum eum ſuſpendi faciemus."

RELIGIOUS *Houſes*, denote houſes ſet apart for religious purpoſes,

purpoſes, ſuch as monaſteries, churches, hoſpitals, and all other places where charity is extended to the relief of the poor and orphans, or for the uſe or exerciſe of religion. See "Notitia Monaſtica," or "A ſhort Hiſtory of the religious Houſes in England and Wales," by Tanner, 8vo.; in which, according to the alphabetical order of counties, is accurately given a full account of the founders, the time of foundation, tutelar ſaints, the order, the value, and the diſſolution; with reference to printed authors and MSS. which preſerve any memoirs relating to each houſe; with a preface of the inſtitution of religious orders. Cowel.

Religious *Impoſtors*. See Impostors.

Religious *Order*. See Order.

Moſt military orders pretend likewiſe to be religious; as thoſe of Malta, who make vows, &c. See Malta.

RELINQUISHMENT, in *Law*, is a forſaking, abandoning, or giving over. It hath been adjudged, that a perſon may relinquiſh an ill demand in a declaration, &c. and have judgment for that which is well-demanded.

RELIQUA, the remainder or debt, which a perſon finds himſelf debtor in, upon the balancing or liquidating an account.

Hence *reliquitary*, the debtor of a reliqua; as alſo a perſon who only pays piece-meal.

The term reliqua is pure Latin.

RELIQUÆ, Relics, in *Antiquity*, the aſhes and bones of the dead, which remained after burning their bodies; and which they very religiouſly gathered, and put into urns, and afterwards depoſited in tombs. See Relics.

RELIQUARY, a ſhrine or caſket, in which the relics of a dead ſaint are kept.

RELIQUE. See Relics.

RELIQUIA, in *Natural Hiſtory*, a term uſed to expreſs the foſſile remains of certain ſubſtances found in different parts of the earth. In the article Petrifactions we have given the Linnæan diviſion of the fifth claſs of minerals, and a pretty full deſcription of the eight genera into which it is divided. In this place we ſhall preſent our readers with a very brief view of Mr. Martin's "Syſtema Reliquiorum." He conſiders the regnum foſſile, or foſſile kingdom, to be divided into five claſſes, *viz.*

I. Reliquia, or foſſile remains from animals or plants.
II. Terræ, earths.
III. Salia, ſalts.
IV. Inflammabilia, inflammable ſubſtances.
V. Metalla, metallic ſubſtances.

The reliquia he divides into two orders, *viz. animal* and *vegetable* remains: of the former he gives eight genera; of the latter only one genus, which are as follow:

Order I. Reliquia Animalia.

Innata.

Genus 1. Mammodolithus, or remains of Mammalia.
2. Ornitholithus, - - Birds.
3. Amphibiolithus, - - Amphibia.
4. Ichthyolithus, - - Fiſhes.
5. Entholithus, - - Inſects.
6. Helmintholithus, of the parts of worms not fabricated.

Fabricata.

7. Conchyliothus, or remains of Teſtacea.
8. Eriſmatolithus, of fulciments, or fabricated ſupports of worms.

Order II. Reliquia Vegetalia.

9. Phytolithus, the remains of Plants.

Mr. Martin has given certain fundamental principles, on which he conceives the ſtudy of reliquia may be ſcientifically conducted: theſe are as follow.

1. All natural bodies without life found on or beneath the ſurface of the earth, and which are not ſuſceptible of putrefaction, belong to the foſſile kingdom, and are either reliquia or minerals. Foſſils are uſually denominated "bodies deſtitute of an organic ſtructure:" now though it be admitted that all foſſils are, according to the common acceptation of the term, unorganized, they are not deſtitute of the ſtructure which diſtinguiſhes an organized body. This being admitted, it follows that a line muſt be drawn between animal and vegetable matter recently buried in the earth, and which has acquired a genuine foſſile character. This line will depend perhaps on putrefaction, to which even organic ſubſtances, after they have become foſſile, are no longer ſubject.

2. An organic ſtructure, whether of a plant or animal, is the eſſence of an extraneous foſſil or reliquium. By this alone it is characteriſed, or diſtinguiſhed from a mineral.

3. It is the organic form alone on which the arrangement of reliquia muſt be founded. Every ſyſtem of natural bodies ſhould aſſume for its baſis but one principle, and this ſhould be drawn from the moſt eſſential characteriſtics of the bodies under arrangement. It is on this account the form is pointed out as furniſhing the only genuine principle, on which the claſſification of reliquia can be eſtabliſhed.

4. The primary diviſions of the arrangement, *viz.* orders, genera, &c. ſhould agree with ſuch natural diviſions of plants and animals as are determinable by the form of the foſſile ſubjects.

5. The ſpecific differences in reliquia depend on the ſpecific differences of form in the original bodies. One ſpecies of plant or animal can give but one real or genuine ſpecies of extraneous foſſil. For if the eſſence of the reliquium be an organic form, its other affections, ariſing from ſubſtance, mode, and ſoil, are accidental, and cannot be uſed as ſpecific diſtinctions, which muſt always depend on ſomething eſſential to the body which we wiſh to diſcriminate. *Form*, therefore, muſt furniſh ſpecific differences of reliquia, and it of courſe follows that there will be as many genuine ſpecies of reliquia, as there are genuine ſpecific forms in the animal and vegetable prototypes or originals: and that the number of foſſile ſpecies are not increaſed by a ſeparation of parts, or other accidental circumſtances to which the original bodies may have been ſubjected during their change into foſſils.

6. Specific diſtinctions of reliquia being founded only on the organic form, it follows, that their geological and mineralogical affections, with their modal diverſities, merely characteriſe ſpecimens.

7. The ſpecific deſcriptions of reliquia are to be given according to the principles of botany and zoology. Thoſe of the ſpecimens, according to the principles of mineralogy and geology. The *eſſential* form of the reliquium muſt be diſtinguiſhed from the *accidental*, that is, the form of the original body, from that which has ariſen in the foſſil from the mode of mineralization, the conſtituent ſubſtance, and the ſoil of the ſpecimen.

8. The nomenclature of reliquia ſhould manifeſt the extent of the preſent ſtate of knowledge with reſpect to the original bodies.

To what has been ſaid, we ſhall add an account of our author's "Delineations of Reliquia."

The leading parts in the delineation of a reliquium are

the ſpecific character or diagnoſis, and the general deſcription.

The *ſpecific character* contains the marks that diſtinguiſh the ſpecies to which they belong, from all others in the ſame genus. Specific characters of reliquia ſhould be ſo conſtructed as to diſtinguiſh permanent from temporary ſpecies; and thoſe whoſe originals have not, as yet, been diſcovered. The ſpecific character of the recent ſpecies of plants or animals frequently depends on parts often or conſtantly wanting in the foſſile ſubject. When that is the caſe, another diagnoſis muſt be given to diſtinguiſh the reliquium; that of the recent ſpecies being marked as a parentheſis. The generic and trivial names are prefixed to the ſpecific character. And, generally, the name of the family, or ſubdiviſion of the genus to which the reliquium belongs: after which is to be detailed in diſtinct claſſes, 1. The ſynonyms or names by which the ſpecies has been diſtinguiſhed by authors, with references to the figures given of it. 2. The varieties of the ſpecies, with their ſynonyms. 3. The vernacular name. 4. The mode or ſtate in which the reliquium is found. 5. Its ſoil or geological ſituation. 6. Its geographic ſituation, and then the general deſcription.

The deſcription delineates in appropriate terms all the parts conſtituting the eſſential form of the reliquium, according to their number, figure, proportion, and ſituation: it muſt primarily refer to the original of the reliquium, as no juſt or perfect delineation of the ſpecies can be given, until the nature of its prototype be aſcertained.

The terms employed in deſcribing reliquia, which derive their form from the external parts of animals and plants, muſt be thoſe uſed by zoologiſts and botaniſts of the Linnæan ſchool. But thoſe which derive their form from the internal parts of organic bodies, are to be deſcribed in ſuch terms as anatomiſts would uſe in diſtinguiſhing the ſame parts in the recent ſubjects.

As appendant parts to the general deſcription of the reliquium muſt be given, 1. An enumeration of the ſpecimens which exhibit the various accidental forms under which the ſpecies has been found. 2. An enumeration of the various ſubſtances which have been obſerved as conſtituting the reliquium and its matrix.

Having given this brief account of Mr. Martin's ſcientific delineations of reliquia, we ſhall preſent our readers with the ſubſtance of two very intereſting communications ſent to the Royal Society ſince the printing of the article PETRIFACTIONS. Of theſe, the firſt is "An Account of ſome Organic Remains found by Mr. Trimmer, near Brentford, in Middleſex."

"The ſpecimens," ſays Mr. Trimmer, "have been collected from two fields, not contiguous to each other; therefore, to avoid confuſion, I ſhall take each field ſeparately, firſt deſcribing the ſtrata as far as they have come within my knowledge, and afterwards I ſhall ſpeak of the organic remains as they were reſpectively found in thoſe ſtrata.

"The firſt field is about half a mile north of the Thames at Kew bridge; its ſurface is about twenty-five feet above the Thames at low water. The ſtrata here are, firſt, ſandy loam from ſix to ſeven feet, the loweſt two feet ſlightly calcareous. Second, ſandy gravel, a few inches only in thickneſs. Third, loam ſlightly calcareous, from one to five feet: between this and the next ſtratum, peat frequently intervenes in ſmall patches, of only a few yards wide, and a few inches thick. Fourth, gravel containing water; this ſtratum varies from two to ten feet in thickneſs, and is always the deepeſt in the places covered by peat; in theſe places the lower part of the ſtratum becomes an heterogeneous maſs of clay, ſand, and gravel, and frequently exhales a diſagreeable muddy ſmell. Fifth, the main ſtratum of blue clay, which lies under this, extends under London and its vicinity; the average depth of this clay has been aſcertained, by wells that have been dug through it, to be about two hundred feet under the ſurface of the more level lands, and proportionally deeper under the hills, as appears from lord Spencer's well at Wimbledon, which is five hundred and ſixty-ſeven feet deep. This ſtratum, beſides figured foſſils, contains pyrites and many detached nodules; at the depth of twenty feet there is a regular ſtratum of theſe nodules, ſome of which are of very conſiderable ſize.

"In the firſt ſtratum, as far as my obſervation has extended, no remains of an organized body has ever been found, and as my ſearch has not been very limited, I may venture to ſay it contains none. In the ſecond ſtratum, ſnail-ſhells, and the ſhells of river-fiſh, have been found, and a few bones of land animals, but of inconſiderable ſize, and in ſuch a mutilated ſtate, that it cannot be aſcertained to what claſs they belong. In the third ſtratum, the horns and bones of the ox, and the horns, bones, and teeth of the deer, have been found, and alſo, as in the ſecond ſtratum, ſnail-ſhells, and the ſhells of river-fiſh. In the fourth ſtratum were found teeth and bones of both the African and Aſiatic elephants, teeth of the hippopotamus, bones, horns, and teeth of the ox.

"A tuſk of an elephant meaſured, as it lay on the ground, nine feet three inches, but, in attempting to remove it, it broke into ſmall pieces. When this ſtratum dips into the clay, and becomes a mixed maſs, as before ſtated, it is ſeldom without the remains of animals. In the fifth ſtratum, namely, the blue clay, the extraneous foſſils are entirely marine, with the exception of ſome ſpecimens of fruit and pieces of petrified wood, the latter of which may be conſidered as marine, becauſe, when of ſufficient ſize, they are always penetrated by teredines. The other foſſils from this ſtratum are nautili, oyſters, pinnæ marinæ, crabs, teeth and bones of fiſh, and a great variety of ſmall marine ſhells; this ſtratum has been penetrated hitherto in this field only to the depth of thirty feet, throughout which the ſpecimens found were diſperſed without any regularity.

"The ſecond field is about one mile to the weſtward of the former, one mile north of the Thames, and a quarter of a mile to the eaſtward of the river Brent; its height above the Thames, at low water, is about forty feet. The ſtrata are, firſt, ſandy loam, eight or nine feet, in the loweſt three feet of which it is ſlightly calcareous. Second, ſand, becoming coarſer towards the loweſt part, and ending in ſandy gravel from three to eight feet. Third, ſandy loam highly calcareous, having its upper ſurface nearly level, but gradually increaſing in thickneſs from a feather-edge to nine feet. Below this are two ſtrata of gravel and clay, as in the other field; but as theſe ſtrata have been only occaſionally penetrated in digging for water, nothing therefore is known with reſpect to them, but that they exiſt there.

"In the firſt ſtratum, as in the other field, no organic remains have been obſerved. In the ſecond, but always within two feet of the third ſtratum, have been found the teeth and bones of the hippopotamus, the teeth and bones of the elephant, the horns, bones and teeth of ſeveral ſpecies of deer, the horns, bones and teeth of the ox, and the ſhells of river-fiſh.

"The remains of hippopotami are ſo extremely abundant, that, in turning over an area of 120 yards in the preſent ſeaſon, parts of ſix tuſks have been found of this animal, beſides a tooth and part of the horn of a deer, part of a tuſk, and part of a grinder of an elephant, and the horns, with a ſmall part of the ſkull, of an ox. One of theſe horns I had

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an opportunity of meaſuring as it lay on the ground, and found it to be 4½ feet in length, and five inches in diameter at the large end; it was found impracticable to remove it, otherwiſe than in fragments, which I have preſerved, and have hopes of being able to put a conſiderable part of it together. The immenſe ſize of this horn is rendered more remarkable by another horn from the ſame ſpot, which meaſures but ſix inches in length. Though this ſtratum is ſo extremely productive of the remains of animals, yet there are but few good cabinet ſpecimens from it, owing, it is preſumed, to their having been cruſhed at the time they were buried, and to the injury they have ſince received from moiſture. It is neceſſary to remark, that the gravel-ſtones in this ſtratum do not appear to have been rounded in the uſual way by attrition, and that the bones muſt have been depoſited after the fleſh was off, becauſe, in no inſtance, have two bones been found together which were joined in the living animal; and further, that the bones are not in the leaſt worn, as muſt have been the caſe had they been expoſed to the waſh of a ſea-beach.

"In the third ſtratum, *viz.* calcareous loam, have been found the horns, bones and teeth of the deer, the bones and teeth of the ox, together with ſnail-ſhells, and the ſhells of river-fiſh.

"Brentford, in the neighbourhood of which are the fields I have mentioned, is ſituated on the north bank of the Thames, and is ſix miles weſt of London.

"The fall of the Thames from Brentford to its mouth at the Nore, is eſtimated at ſeven feet."

The next communication is in relation to a foſſile human ſkeleton, found imbedded in lime-ſtone lately brought from the iſland of Guadaloupe by the honourable ſir Alexander Cochrane, and preſented by the admiralty to the Britiſh Muſeum. Of this highly curious ſpecimen Mr. Konig has given an account that, to naturaliſts, will be regarded as highly important and intereſting.

"On the hiſtory of the ſtrata produced by the more recent cataſtrophes of the globe," ſays Mr. Konig, "moſt light has been thrown by the indefatigable exertions of M. Cuvier. Superlatively ſkilled in comparative anatomy, this gentleman has ſucceeded in determining the foſſile bones of no leſs than 78 ſpecies, of which 49 are entirely unknown among the exiſting races of animals; about 12 are identified with known ſpecies, and the remainder ſtrongly reſemble exiſting ſpecies, although their identity has not been completely aſcertained. From the multiplied obſervations which this naturaliſt has communicated in his numerous memoirs, we may gather that the viviparous quadrupeds appear at a much later period in the foſſile ſtate than the oviparous; the latter being probably coeval with the fiſhes, whilſt the former are found only in the neweſt formations, in which, according to Brongniart and Cuvier's intereſting diſcovery, marine beds are obſerved to alternate with thoſe of freſh water, and which (in the neighbourhood of Paris) overlay the coarſe ſhell lime-ſtone, which conſtitutes the laſt ſtrata formed, as it would appear, by a long and quiet ſtay of the ſea on our continent.

"All the circumſtances under which the known depoſitions of bones occur, both in alluvial beds and in the caverns and fiſſures of flœtz lime-ſtone, tend to prove, that the animals to which they belonged met their fate in the very places where they now lie buried. Hence, it may be conſidered as an axiom, that man, and other animals, whoſe bones are not found intermixed with them, did not co-exiſt in time and place. The ſame mode of reaſoning would further juſtify us in the concluſion, that, if thoſe cataſtrophes which overwhelmed a great proportion of the brute creation were general, as geognoſtic obſervations in various parts of the world render probable, the creation of man muſt have been poſterior to that of thoſe genera and ſpecies of mammalia which periſhed by a general cataclyſm, and whoſe bones are ſo thickly diſſeminated in the more recent formations of rocks.

"The human ſkeletons from Guadaloupe are called Galibi by the natives of that iſland; a name ſaid to have been that of an ancient tribe of Caribs of Guiana, but which, according to a plauſible conjecture, originated in the ſubſtitution of the letter *l* inſtead of *r*, in the word Caribbee. No mention is made of them by any author except general Ernouf, in a letter to M. Faujas St. Fond, inſerted in vol. v. (1805) of the Annales du Muſeum; and by M. Lavaiſſe, in his Voyage à la Trinidad, &c. publiſhed in 1813. The former of theſe gentlemen writes, that, on that part of the windward ſide of the Grande-Terre, called La Moule, ſkeletons are found enveloped in what he terms "Maſſes de madrépores pétrifiés," which being very hard, and ſituated within the line of high water, could not be worked without great difficulty, but that he expected to ſucceed in cauſing ſome of theſe maſſes to be detached, the meaſurements of which he ſtates to be about eight feet by two and a half.

"The block brought home by ſir Alexander Cochrane exactly anſwered this account with regard to the meaſurements; in thickneſs it was about a foot and a half. It weighed nearly two tons; its ſhape was irregular, approaching to a flattened oval, with here and there ſome concavities, the largeſt of which, as it afterwards appeared, occupying the place where the thigh-bone had been ſituated, the lower part of which was therefore wanting. Except the few holes evidently made to aſſiſt in raiſing the block, the maſons here declared, that there was no mark of a tool upon any part of it; and, indeed, the whole had very much the appearance of a huge nodule diſengaged from a ſurrounding maſs.

"The ſituation of the ſkeleton in the block was ſo ſuperficial, that its preſence in the rock on the coaſt had probably been indicated by the projection of ſome of the more elevated parts of the left fore-arm.

"The ſkull is wanting; a circumſtance which is the more to be regretted, as this characteriſtic part might poſſibly have thrown ſome light on the ſubject under conſideration, or would, at leaſt, have ſettled the queſtion, whether the ſkeleton is that of a Carib, who uſed to give the frontal bone of the head a particular ſhape by compreſſion; which had the effect of depreſſing the upper, and protruding the lower edge of the orbits, ſo as to make the direction of their opening nearly upwards, or horizontal, inſtead of vertical.

"The vertebræ of the neck were loſt with the head. The bones of the thorax bear all the marks of conſiderable concuſſion, and are completely diſlocated. The ſeven true ribs of the left ſide, though their heads are not in connection with the vertebræ, are complete; but only three of the falſe ribs are obſervable. On the right ſide only fragments of theſe bones are ſeen; but the upper part of the ſeven true ribs of this ſide are found on the left, and might at firſt ſight be taken for the termination of the left ribs. The right ribs muſt, therefore, have been violently broken, and carried over to the left ſide, where, if this mode of viewing the ſubject be correct, the ſternum muſt likewiſe lie concealed below the termination of the ribs. The ſmall bone dependent above the upper ribs of the left ſide, appears to be the right clavicle. The right os humeri is loſt; of the left nothing remains except the condyles in connection with the fore-arm, which is in the ſtate of pronation; the radius of this ſide exiſts nearly in its full length, while of the ulna the lower part only remains, which is conſiderably puſhed upwards. Of the two bones of the right fore-arm, the inferior termina-

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tions are ſeen. Both the rows of the bones of the wriſts are loſt, but the whole metacarpus of the left hand is diſplayed, together with part of the bones of the fingers: the firſt joint of the fore-finger reſts on the upper ridge of the os pubis, the two others, detached from their metacarpal bones, are propelled downwards, and ſituated at the inner ſide of the femur, and below the foramen magnum iſchii of this ſide. Veſtiges of three of the fingers of the right hand are likewiſe viſible, conſiderably below the lower portion of the fore-arm, and cloſe to the upper extremity of the femur. The vertebræ may be traced along the whole length of the column, but are in no part of it well defined. Of the os ſacrum, the ſuperior portion only is diſtinct: it is diſunited from the laſt vertebra and the ilium, and driven upwards. The left os ilium is nearly complete; but ſhattered, and one of the fragments depreſſed below the level of the reſt: the oſſa pubis, though well defined, are gradually loſt in the maſs of the ſtone. On the right ſide the os innominatum is completely ſhattered, and the fragments are ſunk; but towards the acetabulum, part of its internal cellular ſtructure is diſcernible.

"The thigh-bones and the bones of the leg of the right ſide are in good preſervation, but being conſiderably turned outwards, the fibula lies buried in the ſtone, and is not ſeen. The lower part of the femur of this ſide is indicated only by a bony outline, and appears to have been diſtended by the compact lime-ſtone that fills the cavities both of the bones of the leg and thigh, and to the expanſion of which theſe bones probably owe their preſent ſhattered condition. The lower end of the left thigh-bone appears to have been broken and loſt in the operation of detaching the block; the two bones of the leg, however, on this ſide are nearly complete: the tibia was ſplit almoſt the whole of its length a little below the external edge, and the fiſſure being filled up with lime-ſtone, now preſents itſelf as a dark-coloured ſtraight line. The portion of the ſtone which contained part of the bones of the tarſus and metatarſus was unfortunately broken; but the ſeparate fragments are preſerved.

"The whole of the bones, when firſt laid bare, had a mouldering appearance, and the hard furrounding ſtone could not be detached, without frequently injuring their ſurface; but, after an expoſure for ſome days to the air, they acquired a conſiderable degree of hardneſs. Sir H. Davy, who ſubjected a ſmall portion of them to chemical analyſis, found that they contained part of their animal matter, and all their phoſphate of lime. Here follows an exact deſcription of the rock, in which the foſſile ſkeleton is found. The attention of geologiſts being now directed towards this object, it may be expected that a ſcientific examination of the circumſtances under which this lime-ſtone occurs, will not fail ere long to fix its age, and aſſign to it the place it is to occupy in the ſeries of rocks. All our preſent information reſpecting the Grande Terre of Guadaloupe amounts to this, that it is a flat lime-ſtone country, derived principally from the detritus of zoophytes, with here and there ſingle hills (mornes) compoſed of ſhell lime-ſtone; while Guadaloupe, properly ſo called, ſeparated from the upper part by a narrow channel of the ſea, has no traces of lime-ſtone, and is entirely volcanic."

M. Lavaiſſe, alluded to above as the only author who mentions the galibies, except general Ernouf, ſpeaks of the bed of lime-ſtone which incloſes them, as the moſt remarkable of the calcareous rocks in the Leeward iſlands. Mr. Konig, therefore, expected to find in his work an exact ſtatement of its mode of occurring; but the only poſitive information he could collect from this author is, that the bed is a kilométre (nearly an Engliſh mile) in length, and that it is covered by the ſea at high water. According to him, no trace of ſhells or organized bodies is diſcoverable in this rock; but in lieu of theſe, he was fortunate enough to meet with mortars, peſtles, hatchets, &c. of a baſaltic or porphyritic rock, which, we are informed, were petrified (petrifiés). From this very vague account, we ſhould not be induced to lay much ſtreſs upon the circumſtance that the poſition of the ſkeletons is eaſt-weſt, and that the ſpot muſt, therefore, have been a cemetery, which time and circumſtances have transformed into a hard calcareous rock.

"I have to apologiſe for this long letter on a ſubject," concludes Mr. Konig, "which may turn out to be intereſting only ſo far, as the human bones from Guadaloupe are unqueſtionably the only bones we are acquainted with that have ever been found imbedded in a hard ſtony maſs, that does not appear to belong to common ſtalactitical calcareous depoſitions. This circumſtance admits of being eaſily aſcertained by a cloſe inſpection of the locality; and I am perfectly of opinion, that a compariſon of the nature of the different varieties of ſhell-ſand, with which the neighbourhood of the Caribbee iſlands abounds, would alone be ſufficient to remove many doubts relative to the origin of the bed in queſtion. The ſand from thence, which I had an opportunity of ſeeing, was unlike that of which the ſtone is compoſed."

RELL, Mouse, in *Zoology*, the Engliſh name of the white-bellied mouſe, with a blackiſh back and long body. See Myoxus and Glis.

RELLING, in *Geography*, a town of the duchy of Holſtein; 2 miles S.S.E. of Pinnenberg.

RELLINGEN, a town of France, in the department of the Moſelle, and chief place of a canton, in the diſtrict of Thionville. The place contains 602, and the canton 9046 inhabitants, on a territory of 212½ kiliometres, in 36 communes.

RELLINGHAUSEN, a town of Germany, lately belonging to the abbey of Corvey; 16 miles N.N.E. of Duſſeldorf.

RELLINGHUSEN, a town of the duchy of Holſtein; 9 miles E. of Itzehoa.

REM, *Information in*, in *Law*. See Information.

REMAGEN, in *Geography*, a town of France, in the department of the Rhine and Moſelle, and chief place of a canton, in the diſtrict of Bonn. The place contains 790, and the canton 7801 inhabitants, in 37 communes.

REMAIGHIAN, a town of Perſia, in the province of Lariſtan; 10 miles N.W. of Tarem.

REMAINDER, Remanentia, in *Law*, an eſtate limited to take effect and be enjoyed after another eſtate is determined. As if a man ſeiſed in fee-ſimple granteth lands to A for twenty years, and, after the determination of the ſaid term, then to B and his heirs for ever: here A is tenant for years, remainder to B in fee. In the firſt place, an eſtate for years is created or carved out of the fee, and given to A; and the reſidue or remainder of it is given to B. But both theſe intereſts are in fact only one eſtate; the preſent term of years and the remainder afterwards, when added together, being equal only to one eſtate in fee. (Co. Litt. 143.) Thus, alſo, if land be granted to A for twenty years, and after the determination of the ſaid term to B for life; and after the determination of B's eſtate for life, it being limited to C and his heirs for ever: this makes A tenant for years, with remainder to B for life, remainder over to C in fee. In this caſe alſo, the firſt eſtate, and both the remainders, for life and in fee, are one eſtate only. Hence it is eaſy to infer, that no remainder can be limited after the grant of an eſtate in fee-ſimple (Plowd. 29.

Vaugh. 269.); becauſe this is the higheſt and largeſt eſtate that a ſubject is capable of enjoying; and he that is tenant in fee, hath in him the whole of the eſtate: a remainder, therefore, which is only a portion, or reſiduary part of the eſtate, cannot be reſerved after the whole is diſpoſed of.

The rules that are laid down by law to be obſerved in the creation of remainders, are as follow. 1. There muſt neceſſarily be ſome particular eſtate, precedent to the eſtate in remainder; which particular eſtate is ſaid to ſupport the remainder. (Co. Litt. 49. Plowd. 25.) 2. The remainder muſt commence or paſs out of the grantor, at the time of the creation of the particular eſtate (Litt. § 671. Plowd. 25.): as where there is an eſtate to A for life, with remainder to B in fee; here B's remainder in fee paſſes from the grantor at the ſame time that ſeiſin is delivered to A of his life-eſtate in poſſeſſion. And it is this which induces the neceſſity at common law of livery of ſeiſin being made on the particular eſtate, whenever a freehold remainder is created. (Litt. § 60. Co. Litt. 49.) 3. The remainder muſt veſt in the grantee during the continuance of the particular eſtate, or *eo inſtanti* that it determines. (Plowd. 25. 1 Rep. 66.) As if A be tenant for life, remainder to B in tail: here B's remainder is veſted in him, at the creation of the particular eſtate to A for life: or if A and B be tenants for their joint lives, remainder to the ſurvivor in fee; here, though during their joint lives the remainder is veſted in neither, yet on the death of either of them, the remainder veſts inſtantly in the ſurvivor; whence both theſe are good remainders. But if an eſtate be limited to A for life, remainder to the eldeſt ſon of B in tail, and A dies before B hath any ſon; here the remainder will be void, for it did not veſt in any one during the continuance, nor at the determination, of the particular eſtate: and even ſuppoſing that B ſhould afterwards have a ſon, he ſhall not take by this remainder; for, as it did not veſt at or before the end of the particular eſtate, it never can veſt at all, but is gone for ever. (1 Rep. 138.) Hence remainders are either *veſted* or *contingent*. *Veſted* remainders (or remainders executed, by which a preſent intereſt paſſes to the party, though to be enjoyed *in futuro*) are ſuch where the eſtate is invariably fixed, to remain to a determinate perſon after the particular eſtate is ſpent. As if A be tenant for twenty years, remainder to B in fee; here B's is a *veſted* remainder, which nothing can defeat or ſet aſide. *Contingent* or executory remainders (by which no preſent intereſt paſſes) are where the eſtate in remainder is limited to take effect, either to a dubious and uncertain perſon, or upon a dubious or uncertain event; ſo that the particular eſtate may chance to be determined, and the remainder never take effect. (3 Rep. 20.) In the firſt caſe, if A be tenant for life, with remainder to B's eldeſt ſon (then unborn) in tail, this is a contingent remainder, becauſe it is uncertain whether B will have a ſon or not; and if A dies before B's ſon is born, the remainder is abſolutely gone; even though A leaves his wife big with child, and after his death a poſthumous ſon is born. (Salk. 228. 4 Mod. 282.) But to remedy this hardſhip, it is enacted by ſtatute 10 & 11 W. III. cap. 16. that poſthumous children ſhall be capable of taking in remainder, in the ſame manner as if they had been born in their father's life-time; that is, the remainder is allowed to veſt in them, while yet in their mother's womb. This ſpecies of contingent remainder, to a perſon not in being, muſt, however, be limited to ſome one, that may by common poſſibility, or *potentia propinqua*, be *in eſſe* at or before the particular eſtate determines. (2 Rep. 51.) A remainder to a man's eldeſt ſon, who has none, is good; becauſe by common poſſibility he may have one: but if it be limited in particular to his ſon John or Richard, it is bad, if he have no ſon of that name; for it is too remote a poſſibility, that he ſhould not only have a ſon, but the ſon of a particular name. (5 Rep. 51.) A limitation of a remainder to a baſtard before he is born, is not good (Cro. Eliz. 505.); for though the law allows the poſſibility of having baſtards, it preſumes it to be a very remote and improbable contingency. In the ſecond caſe, where land is given to A for life, and in caſe B ſurvives him, then with remainder to B in fee: here B is a certain perſon, but the remainder to him is a contingent remainder, depending upon the uncertainty of his ſurviving A. During the joint lives of B and A, it is contingent; and if B dies firſt, it can never veſt in his heirs, but is for ever gone; but if A dies firſt, the remainder to B becomes veſted. Contingent remainders of either kind, if they amount to a freehold, cannot be limited on an eſtate for years, or any other particular eſtate, leſs than a freehold. Thus, if land be granted to A for ten years, with remainder in fee to the right heirs of B, this remainder is void (1 Rep. 130.); but if granted to A for life, with a like remainder, it is good. Contingent remainders may be defeated, by deſtroying or determining the particular eſtate upon which they depend, before the contingency happens, by which they become veſted. 1 Rep. 66. 155.

In deviſes by laſt will and teſtament, remainders may be created in ſome meaſure contrary to the rules here laid down: though our lawyers will not allow ſuch diſpoſitions to be ſtrictly remainders; but call them by another name, that of executory deviſes, or deviſes hereafter to be executed. Blackſt. Com. book ii. chap. 11. § 3.

Spelman makes the difference between a remainder and reverſion to conſiſt in this; that by a reverſion, after the appointed term, the eſtate returns to the donor, or his heirs, as the proper fountain; whereas by remainder it goes to ſome third perſon or ſtranger.

Or, a remainder is an expectancy, created by act of the parties; whereas a reverſion is created by act of law.

The limitations of perſonal goods and chattels, in remainder after a bequeſt for life, are permitted in laſt wills and teſtaments: ſo that if a man, either by deed or will, limits his books or furniture to A for life, with remainder over to B, this remainder is good. But where an eſtate-tail in things perſonal is given to the firſt or any ſubſequent poſſeſſor, it veſts in him the total property, and no remainder over ſhall be permitted on ſuch a limitation. 1 P. Wms. 290.

Glanville obſerves, that biſhops and abbots, in regard their baronies are the king's alms, cannot give any part of them by way of remainder.

REMAINDER, *Writ of formedon in the.* See FORMEDON.

REMAINDER, in *Mathematics*, is the difference; or that which is left after the taking a leſſer number, or quantity, from a greater.

REMAL, in *Geography*, a town of Hindooſtan; 18 miles N.W. of Agimere.

REMALAND, a town of France, in the department of the Orne, and chief place of a canton, in the diſtrict of Mortagne. The place contains 1702, and the canton 11,685 inhabitants, on a territory of 202½ kiliometres, in 12 communes.

REMANCIPATE, *To*, in *Commerce*, is to ſell or return a commodity to him who firſt ſold it.

REMANCIPATION, REMANCIPATIO, among the Romans, a form of divorce obſerved in marriages that had been contracted by *coemption*. This was done by delivering the wife into the huſband's hands; ſo the marriage was diſ-

ſolved

ſolved by the huſband's re-delivering the wife into any perſon's hands agreed upon between them.

REMAND, Fr., *To*, in *Military Language*, to ſend back; as when a ſoldier, who has been brought out of priſon, or the guard-houſe, for the purpoſe of being examined or tried, is ſent back, without any thing final occurring relative to his caſe.

REMANSO, in *Geography*, a town of South America, in the province of Cordova; 170 miles N. of Cordova.

RE-MARRYING, the repeating of a marriage; or the going through the ſolemnities of a ſecond marriage.

Clandeſtine and uncanonical marriages are deemed null; and the parties are to be re-married in form; at leaſt, it had always better be ſo to avoid diſputes.

It was anciently expreſsly forbid to re-marry in the firſt year of viduity. M. Bayle obſerves, that a perſon who does not re-marry, is anſwerable to the public for all the time loſt in his viduity, or widowhood.

REMBANG, in *Geography*, a town on the N. coaſt of the iſland of Java, where the Dutch had a reſident merchant. It yields ſalt and timber, and was the place where the ſmall veſſels of the company were built; 45 miles N.E. of Samarang.

REMBERTUS, in *Biography*, the diſciple, friend, and fellow labourer of Anſgarius, ſtyled the apoſtle of the north, was a native of Thurholt, in Flanders, in the monaſtery of which, as well as in that of Corbey in Weſtphalia, he officiated as ſchool-maſter. He was one of the firſt promoters of Chriſtianity in Denmark, and in or about the year 860 he became biſhop of Ribe. After the death of Anſgarius, in 865, he was appointed to the archbiſhopric of Hamburgh, which office he held till his death, in 888. He wrote, in conjunction with a friend, the life of Anſgarius, which is inſerted in the firſt volume of Langebeck's "Scriptores Rerum Danicarum." In this work Rembertus relates various facts, not elſewhere to be found, with regard to the ſtate of Denmark at that period, but intermixed with fables. He collected extracts from Gregorius Magnus, whoſe works no longer exiſt, and he wrote many letters, one of which only is to be found in the ſecond volume of Langebeck's collection. An account of Rembert's life and miracles is given in the ſame work. A Daniſh writer, quoted in the General Biography, to which we are indebted for this article, in ſpeaking of Rembert's labours, ſays; "here we have not ſo much the commencement of Daniſh literature, as the ſeeds of it. They were ſown by the exertions of Ebbo, Willehad, Anſgarius, and Rembert, but remained a long time, as it were, trodden down by the ſevere perſecutions to which the Chriſtians were expoſed from Gormo the old, and other kings; and retarded in their growth by the rudeneſs and barbariſm which formed the principal features in the character of a people, who were fonder of roving about on the ſeas to rob and murder, and of feaſting and drinking, than of reading and writing books. At length, however, the ſeeds which he had ſcattered took root, ſprung up in the 11th century, and in the 12th and 13th produced abundance of fruit." Gen. Biog.

REMBERVILLERS, in *Geography*. See RAMBERVILLERS.

REMBRANDT, VAN RYN, in *Biography*, was born at a village near Leyden, in 1605. The real name of his family was Gerretſz; but he acquired that of Van Ryn, from having reſided in early life at a village upon the banks of the Rhine.

The little which this extraordinary artiſt owed to tuition was derived firſt from Zwanenburg, then from Peter Laſtman, and afterwards from Jacob Pinas, from whoſe manner ſome are induced to think that Rembrandt drew his own inclination for powerful oppoſitions of light and ſhade; but whatever hints he may have obtained from others at the outſet of his practice, they were ſoon loſt in the effulgence of his brilliant career, and abſorbed in the luſtre of his own over-powering abilities.

He was firſt brought into notice by having taken a picture to the Hague, and offered it for ſale to an able connoiſſeur; who, conſcious of his merit, treated him with kindneſs, and gave him a hundred florins for it. By this incident both himſelf and the public were made acquainted with his worth; and hence aroſe the reputation and ſucceſs he afterwards enjoyed. Inceſſant occupation ſoon crowded upon him, and many pupils applied for admiſſion into his ſchool, with each of whom he received 100 florins a-year; and whoſe copies of his pictures he not unfrequently ſold as originals, after beſtowing a ſhort time upon them himſelf. By theſe means, aided by inceſſant induſtry, and the ſale of etchings, which he produced with great facility and ſkill, he accumulated conſiderable wealth: his income, according to Sandrart, being, for a length of time, at leaſt 2500 florins yearly.

His place of reſidence, during this ſucceſsful diſplay of his talents, was Amſterdam, where his peculiarities procured him the character of a humoriſt, whilſt his abilities aſtoniſhed and delighted his contemporaries, and he produced thoſe works which ſtill gratify ſucceeding ages.

The peculiarities of his mind are as much obſervable in the manner of producing his effects, as in the choice of the materials. The execution of his earlier works was in a ſtyle highly laboured, with great neatneſs, and patient completion of the figures; ſuch is that of the picture of the woman taken in adultery at Mr. Angerſtein's. As he advanced in art, he took liberties with the pencil, wrought with all the broad fulneſs of the bruſh, and left the touch undiſturbed: he even employed the ſtick, the pallet-knife, or his fingers, accordingly as they were moſt capable of producing the effect he deſired, when ſeen at a proper diſtance, diſregarding the appearance of the work upon a cloſer inſpection.

In his pictures is exhibited a total inattention to the taſte of the antique; he is even ſaid to have made it a ſubject of ridicule, and to have jocoſely denominated a collection of old armour and rich dreſſes, which he had collected and employed to ſtudy and paint from, "his antiques." Theſe he evidently uſed as his models, though frequently in moſt heterogeneous combination; but by an innate power of ſeizing the moſt ſtriking effects produced by light and ſhade, ſuperadded to the moſt perfect maſtery over the materials of the pallet, he always excited an intereſt, either by originality or beauty.

It is not, however, the approval of his power in the technical part of the art, which can or ought to ſatisfy the obſerver of the works of Rembrandt. Entering with the warmth of a poet into the nature of his ſubjects, he produced pictures which terrify with their ſublimity, delight with their ſuavity, or gratify us with the moſt perfect tranſcripts of Nature, in her moſt varied aſpects. Being himſelf poſſeſſed of the full force of his ſubject, he impreſſes it ſtrongly, and notwithſtanding the frequent vulgarity, and even deformity of the agents he exhibits, he extorts from us praiſe before we have time to conſider the means by which we are ſtimulated to beſtow it. To him every time and ſeaſon was alike eaſy of repreſentation; and all degrees of illumination, in form or quantity, he managed with the greateſt perfection; no matter whether the ſcene aroſe from the breadth of the noon-day blaze, the dimneſs of twilight, the

the darkneſs of night, or the glimmerings of the lonely taper; whether the light were ſpread over an extended ſpace and a multitude of figures, or confined to the interior of a room, and ſerving only to illumine the books or the figure of a ſequeſtered philoſopher.

He was certainly a genius of the firſt claſs, although the objects upon which he exerciſed his powers bore little or no proportional value when compared with thoſe ſelected by the beſt Greek and Italian maſters. His invention was abundantly fertile, but employed generally among low characters and materials, although the ſubject he treated might be, as it frequently was, of a ſacred or ſublime quality. In deſigning the nude, he never appears to have had a thought of an elevated nature concerning form. Such as the model preſented, he imitated with exactneſs, when he wiſhed to be moſt perfect; but he ſometimes ſeems to have ſported with the idea of ſelection, by making figures demanding grace and beauty, ſuch as Venus, Cupid, &c. ſtill more vulgar, and in actions more diſguſting, than thoſe he drew of common life. The redemption of this vulgarity and meanneſs reſts with the extreme force, depth, richneſs, brilliancy, and truth of his colouring, and the perfection with which he treated his chiaro-ſcuro; which conjointly faſcinate the eye, and hold it in admiration, in ſpite of the deformities preſented in deſign.

The power of Rembrandt in the art he practiſed was perfectly original, and its exerciſe quite unlike that of any other painter; being drawn from nature with the moſt faithful and diſcriminating eye, but with the moſt peculiar ſelection. Always powerfully and beautifully executed, but not unfrequently too artificial; and only agreeable becauſe it is perfectly effective. All imitations of his ſtyle which are not well wrought, reduce it to manner, and only exhibit the artifice by which it is conducted.

To gueſs from the number and finiſh of his works, he muſt have painted with amazing facility. His ſyſtem appears to have been that of uſing the ground as a half teint, and repeating the lights and darks till he had obtained the effect he ſought for. His pencil, particularly in his earlier and more finiſhed works, is remarkably delicate, yet full; and has never been exactly imitated; though ſome of his ſcholars, as Bohl and Eckhout, approached very near it: none of them, however, appear to have imbibed any large portion of his clear perception of natural effects, which ſo powerfully appeals to our ſympathy in his ſcenes of twilight, of tempeſt, and the ſpirit-ſtirring gloom of night.

His pictures are juſtly and highly valued, and are rarely to be purchaſed; and then only at very high prices. We are poſſeſſed of many fine ſpecimens of his talents, both in hiſtory and portraiture; and the gallery of the Louvre is rich in his ſmaller productions. At Florence alſo, and at Genoa, his name is eſteemed, and his works preſerved with due reſpect.

He lived to the age of ſixty-eight, and died in 1674.

REMDA, in *Geography*, a town of Saxony, in the principality of Eiſenach; 11 miles S.S.W. of Jena. N. lat. 50° 45′. E. long. 11° 19′.

REMEDIAL *Part of a Law*. See LAW.

REMEDIAL *Statutes*, are thoſe which are made to ſupply ſuch defects, and abridge ſuch ſuperfluities, in the common law, as ariſe either from the general imperfection of all human laws, from change of time and circumſtances, from the miſtakes and unadviſed determinations of unlearned judges, or from any other cauſes whatſoever. And this being done, either by enlarging the common law where it was too narrow and circumſcribed, or by reſtraining it where it was too lax and luxuriant, hath occaſioned another ſubordinate diviſion of remedial acts of parliament into enlarging and reſtraining ſtatutes. *E. gr.* In the caſe of treaſon, clipping the current coin of the kingdom was an offence not ſufficiently guarded againſt by the common law; therefore it was thought expedient by ſtatute 5 Eliz. cap. 11. to make it high treaſon, which it was not at the common law; ſo that this was an enlarging ſtatute. At common law alſo ſpiritual corporations might leaſe out their eſtates for any term of years, till prevented by the ſtatute 13 Eliz. cap. 10. This was, therefore, a reſtraining ſtatute. Blackſt. Com. book i.

REMEDIOS, in *Geography*, a town of South America, in the province of Popayan; 71 miles S. of Santa Fé de Antioquia.

REMEDIOS, or *Noſtra Segnora de los Remedios de Pueblo Nuevo*, a town of Mexico, in the province of Veragua; 90 miles W.N.W. of St. Yago. N. lat. 8° 44′. W. long. 82° 16′.

REMEDIOS, or *Payaſal*, a town of Mexico, in the province of Yucatan, in lake Pue. N. lat. 17° 3′. W. long. 91° 46′.

REMEDIOS, a town of New Navarre; 120 miles S. of Caſa Grande.

REMEDY, in *Law*, is the action or means given by law for the recovery of a right.

REMEDY, *Remedium*, in *Medicine*, any phyſical agent by which a diſeaſe may be alleviated or cured.

Remedies are either *general* or *topical*; the former comprehending ſuch as influence the actions of the whole frame, as blood-letting from any large vein, the cold-bath, and almoſt all thoſe medicaments or drugs which are taken into the ſtomach; the latter including thoſe which are applied to, or in the vicinity of, any particular part which is diſeaſed: thus, among *topical* remedies, are blood-letting by leeches or cupping, bliſters, iſſues, cataplaſms, ointments, plaſters, &c.

The operation of remedies is rather a queſtion of experience than of logical inveſtigation. Some remedies, the number of which appears to be very limited, poſſeſs a *ſpecific* power of curing certain diſeaſes. There are, perhaps, not more than two medicines, however, that are fairly entitled to the appellation of *ſpecifics*: theſe are mercury, which cures the venereal diſeaſe, and ſulphur, which cures the itch. The bark of cinchona has, indeed, been deemed a ſpecific for intermittent fevers; but it is not entitled to ſuch a character: and the eau medicinale, which has recently been brought forward as a ſpecific for the gout, appears to have loſt much of its reputation. The pretended ſpecifics daily advertiſed for many diſeaſes by quacks, are mere impoſitions, being commonly diſguiſed forms of the moſt active and dangerous medicines which are employed cautiouſly by the faculty; ſuch as arſenic, corroſive ſublimate, and other preparations of mercury; laudanum, hemlock, and other narcotics. Of the former ſpecies are Ward's ague-drop, and his white drop; of the latter, are Dalby's carminative, Godbold's balſam, and many others. The danger reſulting from the uſe of theſe noſtrums, ariſes from the indiſcriminate adminiſtration of them in many diſeaſes which have a ſimilar name, but which vary much in different conſtitutions, and at different periods of life. Much injury is done by the conſtant ſale of theſe pretended ſpecifics, by the impreſſion which it contributes to maintain, that each diſeaſe has its ſpecific remedy; whereas no opinion can be farther from the truth. When it is conſidered that almoſt every diſeaſe, though ſimilar in name, ariſes from ſeveral cauſes (which we have already illuſtrated when ſpeaking of COUGH), it will be obvious that the ſame remedies muſt be applied, upon general principles, to diſeaſes of different name, and different remedies to thoſe which have the

ſame appellation; and that, therefore, the cure of diſeaſes is not to be effected by applying a certain remedy to a certain diſeaſe nominally the ſame, but only by firſt aſcertaining the laws of the living body, and of its various organs, both in a ſtate of health and of diſeaſe: in other words, the proper application of remedies can only be learned by much obſervation of diſeaſes, after a previous ſtudy of the anatomy and phyſiology of the animal frame.

Remedies *Appended.* See Appensa.

Remedy *for the Maſter of the Mint*, in *Coinage*, denotes a certain allowance for deviation from the ſtandard weight and fineneſs of coins. In ſome places the remedy is allowed in the weight, in others in the fineneſs; but moſtly in both weight and fineneſs. It is conſidered generally as an allowance for the fallibility of workmanſhip; but in ſome foreign mints it is made a ſource of emolument: and when governments iſſue coins at a rate above their intrinſic value, the profit thus made is called "ſeignorage." Out of every fifteen pounds of gold coined at the mint in London (according to the account publiſhed by the learned Mr. Folkes, in his curious tables of Engliſh ſilver coins), ſome pieces are taken at random, and depoſited in a ſtrong box, called the pix: at certain intervals, ſometimes of one year and ſometimes of ſeveral years, the pix is opened at Weſtminſter, in the preſence of the lord chancellor, the lords commiſſioners of the treaſury, and others; portions taken from the pieces of each coinage are melted together, and an aſſay made of the collective maſs by a jury of the goldſmiths' company. At this trial the mint-maſter is held excuſable, though the monies be either too baſe, or too light; provided the imperfection and deficiency together are leſs than the ſixth part of a carat, which amounts to forty grains of fine gold on the pound of ſtandard, or the one hundred and thirty-ſecond part of the value. It is ſaid that this remedy is contained within as narrow limits, as any workers can reaſonably be ſuppoſed to make themſelves anſwerable for. The remedy for ſilver coins is two pennyweights in the pound. If the deficiency or exceſs of the coin ſhould be more than this, either in the weight, or in the fineneſs, or in both together, the money muſt be recoined at the expence of the maſter of the mint; and no allowance is made for remedy unleſs the error is ſuppoſed to have caſually happened.

REMEE, in *Geography*, a town of Bengal; 16 miles S. of Koonda.

REMEMBRANCE, is when the idea of ſomething formerly known recurs again to the mind, without the operation of a like object on the external ſenſory. See Memory, Reminiscence, and Recollection.

REMEMBRANCERS *of the Exchequer*, are two officers, or clerks, therein, formerly called *clerks of the remembrance.*

They are now diſtinguiſhed by the appellations of the *king's remembrancer*, and the *lord treaſurer's remembrancer.* There is alſo another officer, called the *remembrancer of firſt-fruits.* Their buſineſs is to put the lord treaſurer and juſtices of the court in remembrance of ſuch things as are to be called upon, and dealt in for the king's benefit.

Remembrancer, *The King's*, enters into his office all recognizances taken there before the barons, for any of the king's debts; for appearance; or for obſerving orders; and makes out proceſs againſt the collectors of cuſtoms, ſubſidies, exciſe, and other public payments, for their accounts. All informations upon penal ſtatutes are entered in this office; and there all matters upon Engliſh bills in the exchequer-chamber remain. He makes the bills of compoſition upon penal laws; takes the ſtatement of debts; has delivered into his office all manner of indentures, fines, and other evidences whatſoever that concern the aſſuring of any lands to the crown: he every year, *in craſtino Animarum*, reads, in open court, the ſtatute for election of ſheriffs, and gives them their oath, and reads the oath of all the officers of the exchequer, where they are admitted.

Remembrancer, *The Lord Treaſurer's*, is charged to make proceſs againſt all ſheriffs, eſcheators, receivers, and bailiffs, for their account; proceſs of fieri facias, extent for any debts due to the king, either in the pipe, or with the auditors; and proceſs for all ſuch revenues as are due to the king, by reaſon of his tenures. He alſo makes record, by which it appears, whether ſheriffs, or other accountants, pay their proffers due at Eaſter and Michaelmas. He makes another record, whether ſheriffs, or other accountants, keep their days of prefixion: all eſtreats or fines, iſſues, and amerciaments, ſet in any of the courts of Weſtminſter, or at the aſſizes or ſeſſions, are certified into his office, and are by him delivered to the clerk of the eſtreats to write proceſs upon them, &c.

Remembrancer *of the Firſt Fruits*, he who takes all compoſitions and bonds for firſt fruits and tenths; and makes proceſs againſt ſuch as do not pay the ſame.

Remembrancer is alſo the title of an officer in the city of London, who is to attend the lord mayor on certain days, and whoſe buſineſs is to remind his lordſhip of the ſelect days, when he is to go abroad with the aldermen, &c. He is to attend daily at the parliament-houſe during the ſeſſions, and to report to the lord mayor their tranſactions.

REMI, St., in *Biography*, archbiſhop of Rheims, who converted Clovis to Chriſtianity, and baptized that monarch. He died about the year 535. There are ſome letters which paſs under his name, but they are of a very doubtful authority. There was another ſaint of this name, or, as he is ſometimes ſtyled, Remigius, who was archbiſhop of Lyons, and preſided in the council of Valentia in 855. He was a ſteady ſupporter of the doctrine of St. Auguſtine, on grace and predeſtination, in ſeveral works that are now extant. He died in 875.

Remi, Joseph Honore, an advocate in the parliament of Paris, was born in 1738. At the age of eight he loſt his ſight, and it was believed irrecoverably, by the ſmall-pox; but when he had attained the age of fourteen he was in the enjoyment of his eyes. He was author of a burleſque poem, entitled "Days," in oppoſition to Young's Night Thoughts; but his principal work is an eloge on the chancellor de L'Hôpital, which was crowned by the French academy in 1777, and cenſured by the Sorbonne. He alſo wrote the eloges of Moliere, Colbert, and Fenelon, and furniſhed the articles relating to juriſprudence for the French Encyclopædia. He died in the year 1782.

Remi of Auxerre. See Remigius.

Remi, *Order of St.*, or of the *Holy Vial*, an order of knighthood in France, which, according to the moſt approved hiſtorians of that kingdom, was inſtituted by Clovis, king of France, in the year 499. The reigning king of France is always ſovereign of this order, and the knights companions are never more than four; nor is it ever conferred on any perſons but the barons, Terrier, Beleſtre, Veneſtre, and Louverſe, who ſtile themſelves baron knights of the Holy Vial, and are the bearers of the canopy under which the vial is carried from the abbey of St. Remi to the cathedral of Rheims, for the inauguration of the kings of France at their coronations. The badge of this order, which is worn pendant to a black ribbon, is "a croſs of gold, enamelled white, cantoned with four fleur-de-lis; on the croſs,

croſs, a dove deſcending, dipping its beak into a vial held in a hand, all proper."

REMICH, in *Geography*, a town of France, in the department of the Foreſts, and chief place of a canton, in the diſtrict of Luxembourg, ſeated on the Moſelle; 12 miles E. of Luxembourg. The place contains 1480, and the canton 10,885 inhabitants, on a territory of 230 kiliometres, in 15 communes.

REMIGES, in *Ornithology*, denote the primary and ſecondary wing-feathers.

REMIGIO, Fiorentino, in *Biography*, a man of letters in Italy, was a native of Florence. He entered at an early period into the Dominican order, and was called to Rome by pope Pius V. to ſuperintend an edition of the works of St. Thomas. He was himſelf a conſiderable author, and publiſhed "A Commentary on the whole Scriptures;" tranſlations of "Ammianus Marcellinus;" "Cornelius Nepos;" and "Fazello's Hiſtory of Sicily;" "Reflections on Guicciardini's Hiſtory;" "Italian Poems;" and "A Tranſlation in Verſe of Ovid's Heroic Epiſtles," of which an elegant edition was printed at Paris in 1762. He died at Florence in 1580, about the age of 62. Moreri.

REMIGIUS. See Remi.

Remigius of Auxerre, a learned French Benedictine monk in the ninth century, derived his ſurname from the abbey of St. Germain, at Auxerre, where he embraced the religious profeſſion. He diſtinguiſhed himſelf by his proficiency in profane and ſacred literature, at a dark and barbarous period, and was placed at the head of the ſchools belonging to his monaſtery. About the year 882, he was called to Rheims by Foulques, the ſucceſſor of Hincmar in that ſee, who gave him the direction of the literary ſeminary which he had founded in his metropolitan city. Here he taught with great reputation for ſeveral years, after which he went to Paris, where he opened the firſt public ſchool in that city, after the decline of learning which followed the ravages of the Normans. In the life of pope Formoſus, by Platina, the name of Remigius of Auxerre is the only one that occurs of a perſon eminent for learning under that pontificate. He was author of "Commentarius in omnes Davidis Pſalmos," which was publiſhed at Cologne in 1536. It conſiſts very much of the collected opinions and explications of St. Ambroſe, St. Auguſtine, and Caſſiodorus, reduced into one maſs.—Another work of this author was entitled "Enarratio in poſteriores XI. minores Prophetas," publiſhed at Antwerp in the year 1545, with the "Commentaries" of Oecumenius upon the Acts of the Apoſtles, and their Epiſtles, and thoſe of Arethas upon the book of Revelation; and "Expoſitio Miſſæ," deduced from the ſentiments and authority of the fathers. Some critics have given, among the productions of Remigius, the "Commentary upon the Epiſtles of St. Paul," which by others has been aſcribed to St. Remi, or Remigius, but which in truth are ſuppoſed to belong to Haymo, a German biſhop, who flouriſhed in the ninth century, and who was author of a long liſt of theological works. Such at leaſt is the opinion of Du Pin, in oppoſition, indeed, to the authority of Moſheim. Moreri.

Remigius left behind him "A Commentary on the Muſical Treatiſe of Martianus Capella," which is ſtill ſubſiſting among the MSS. in the king of France's library, N° 5304. He acquired his ſcience from Heric. Heric was the diſciple of Rabanus, and Hayman of Halberſtadt, who had converſed with the Roman ſingers ſent into France by pope Adrian.

REMILLY, in *Geography*, a town of France, in the department of the Ardennes; 7 miles W. of Charleville.

REMINISCENCE, Reminiscentia, is that power of the human mind, by which it recollects itſelf, or calls again to its remembrance ſuch ideas or notions as it had really forgot: in which it differs from *memory*, which is a treaſuring up of things in the mind, and keeping them there, without forgetting them.

Hence memory may be conſidered as a continual remembrance; and reminiſcence as an interrupted memory.

How near akin ſoever the two faculties may ſeem, yet they are generally found ſeparated; ſo that they who excel in the one, are generally defective in the other.

The ancient Platoniſts were of opinion, that all learning and knowledge conſiſted in the reminiſcence or recollection of notices which had been in the ſoul before its union with the body.

REMINISCERE, the ſecond Sunday in Lent; anciently thus called from the firſt word of the introit of the maſs ſaid for that day, "Reminiſcere miſerationum tuarum."

REMIREA, in *Botany*, Aubl. Guian. 44. t. 16. Brown Prodr. Nov. Holl. v. 1. 236. (See Miegia.) We are unacquainted with Mr. Brown's reaſons for preferring the above name, whoſe origin does not appear, and which the claſſical Schreber rejected as barbarous.

REMIREMONT, in *Geography*, a town of France, and principal place of a diſtrict, in the department of the Voſges; 10 miles S.S.E. of Epinal. The town contains 3250, and the canton 14,916 inhabitants, on a territory of 235 kiliometres, in 15 communes. N. lat. 48° 1'. E. long. 6° 40'.

REMISIT. — *Recto quando dominus Remiſit.* See Recto.

REMISSAM, in *Geography*. See Remsa.

REMISSION, in *Law*, &c. denotes the pardon of a crime, or the giving up the puniſhment due to it.

Remission, in *Medicine*, is when a diſtemper abates, but does not go quite off, before it returns again: as is common in fevers which do not quite intermit. See Remittent.

Remission, *Remiſſio*, in *Phyſics*, the abatement of the power or efficacy of any quality. In oppoſition to the increaſe of the ſame, which is called its *intenſion*.

In all qualities capable of intenſion and remiſſion, the intenſion decreaſes as the ſquares of the diſtance from the centre of the radiating quality increaſe.

Remission, *Remiſſio*, ανεσις, in the *Ancient Muſic*, was uſed to ſignify the paſſage of the voice from acute to grave, being oppoſite to intenſion.

REMIT, in *Commerce*. To remit a ſum of money, bill, or the like, is to ſend a ſum of money, &c.

To remit is alſo uſed among bankers for what is accuſtomed to be given a banker, or, as it were, diſcounted with him, for his giving a bill of exchange.

To remit is alſo to give up part of one's due to a debtor; as, I would remit you a fourth of what you owe on condition of paying me the reſt in hand.

REMITTANCE, in *Commerce*, the traffic or return of money from one place to another, by bills of exchange, orders, or the like.

A remittance is properly a bill of exchange, or the like, ſent to a correſpondent, and the content of it to be received by him, or ſome other perſon, on whom it is drawn. By means of theſe remittances, large ſums of money are returned from one city to another, without danger, without carriage, &c.

In London it is eaſy to get remittances upon any city in the world; in the country it is more difficult.

REMITTANCES, *Book of.* See BOOK.

REMITTANCE is alſo uſed in ſpeaking of the payment of a bill of exchange.

REMITTANCE alſo denotes the due or fee allowed the banker or merchant, both on account of his trouble, and the different value of the ſpecies in the place where you pay the money, and where he remits it.

This remittance is more uſually called *change* and *rechange*.

REMITTENT, in *Medicine*, implying alſo the word *fever*, is a fever which is characteriſed by a regular decreaſe and exacerbation of its ſymptoms every day, and differs from an *intermittent*, inaſmuch as the ſymptoms never diſappear altogether, and the exacerbation is neither begun by the complete rigors, nor terminated by the profuſe ſweat, which occur in the latter. The remittent fever, however, originates, in common with the intermittent, from the influence of marſh effluvia, but under particular circumſtances, which will be ſtated immediately.

It is ſcarcely neceſſary to deſcribe minutely the ſymptoms of the remittent fever after the ample detail which we have given of thoſe of fever in general (ſee FEVER); and it varies extremely in its character, according to the ſeaſon, climate, and other circumſtances under which it appears. In its milder forms, the remittent begins with chillineſs, laſſitude, pains in the bones, head-ache, and a diſordered condition of the ſtomach, loſs of appetite, ſickneſs, and even vomiting. At night the febrile ſymptoms run high; the heat and thirſt are great, the tongue and mouth are parched, the pain of the head is violent, the patient is totally unable to ſleep, and is continually toſſing and tumbling about, and often becomes delirious. But generally in the morning, an imperfect ſweat brings on a remiſſion of all the ſymptoms. In the evening, the paroxyſm returns, but is not preceded by any cold fit or ſhivering; yet it is commonly more ſevere than the former. Next morning it remits as before; and theſe periodical changes recur daily, becoming, however, leſs marked, if the diſeaſe be neglected, until the fever inſenſibly aſſumes a continued form. The pulſe is full and quick during the exacerbations, and continues during the remiſſions to indicate fever; but rigors ſeldom precede the fits after the firſt attack. Many patients diſcharge a bilious matter from their ſtomachs by vomiting, and all are diſordered in that organ. In the more violent forms, which take place in hotter ſeaſons and climates, the diſeaſe often ſeizes the patient at once with a burning and violent head-ache, with little or no ſenſible chillineſs preceding it. The thirſt and heat are intenſe, and acute pains in the back and all the limbs, with extreme laſſitude and inquietude, haraſs the patient, and nauſea, vomiting, and pain of the ſtomach enſue. In ſome inſtances, indeed, the head becomes ſo ſuddenly and violently affected, that a violent delirium, aſſuming the appearance of inſanity, ſeizes the patient without any previous indication, until the remiſſion evinces the nature of the diſeaſe. Many of the ſick become yellow, as if affected with jaundice. Indeed, the remittent fever aſſumes every degree of violence, from the autumnal bilious fever of temperate climates, to the moſt ſevere *yellow fever* of tropical countries.

The circumſtances under which theſe varieties of form occur, have been amply aſcertained by experience. The combination of marſh effluvia and great heat are neceſſary to the production of theſe fevers; and they are violent, nearly in proportion to the degree of the latter. In cold climates, and in cool ſeaſons, as the ſpring, the miaſmata excite but the common intermittent ague. But in the autumnal ſeaſon, eſpecially when the heat is conſiderable, and the quantity of miaſma great, as in the Low Countries, in particular years, the production of theſe fevers is very extenſive; they become actually endemic, and affect eſpecially thoſe perſons who are not accuſtomed to the climate. The experience of all our military expeditions to Holland and Flanders, in the autumnal ſeaſon, affords fatal proof of this truth. (See the writings of ſir John Pringle, Dr. Home, &c. on the Diſeaſes of the Army in the Campaigns of 1742—1748, incluſive. And the ſevere epidemic of Walcheren, at a more recent period, cannot be forgotten.) In theſe climates, the *remittent* uſually commences at the cloſe of ſummer, in a milder form, and gradually aſſumes a more violent and formidable character, as the heats of autumn advance. But if we extend our inquiries to the hotter regions of the globe, we find the diſeaſe under its moſt ſevere and fatal forms. In the ſouth of Europe, eſpecially in Spain, and thoſe parts of the Mediterranean coaſts where miaſmata are found, the autumnal remittent becomes a formidable malady in particular ſeaſons; but we muſt proceed to the Weſt Indies and America to diſcover the diſeaſe in its moſt terrific form; for although there may be a contagious fever, which puts on the *yellow* or bilious character, Dr. Bancroft appears to have demonſtrated, ſatisfactorily, that the *yellow fever*, commonly ſo called, is but the ſevereſt form of the endemic remittent of the hot ſeaſons of hot climates. (See his able "Eſſay on the Diſeaſe called Yellow Fever, &c." 1811). He affirms, indeed, that all fevers, occurring in thoſe countries in which the atmoſpheric heat riſes, during certain ſeaſons, to the 85th degree of Fahrenheit's thermometer, have a tendency to aſſume that violent and dangerous appearance, which is uſually conſidered as characteriſtic of the yellow fever.

The teſtimony of all experienced medical obſervers concurs in proving the origin of remittent fevers from the influence of miaſmata. Thus, among the hiſtorians of diſeaſe, as it occurs among ſeamen in warm climates, Drs. Lind, Blane, Hunter, and others, have demonſtrated the excluſive attacks of theſe fevers to be among thoſe men who have gone on ſhore, in ſwampy grounds, for water, &c.; and eſpecially among thoſe who ſpend the night on ſhore. Many inſtances are recorded, in which all the men ſo employed have been ſeized with fevers, while the reſt of the ſhip's company have remained in health. (See Dr. Lind, on the Diſeaſes incidental to Europeans in Hot Climates, p. 27. 221, &c. 5th edit. Dr. Blane, on the Diſeaſes of Seamen, p. 92, and 392.) Again, ſir John Pringle, in his valuable work on the diſeaſes of the army, has not only ſtated many facts which occurred under his own obſervation, but has adduced many proofs from the writings of ancient phyſicians and hiſtorians, in corroboration of the evidence that theſe fevers have, every where, and at all times, originated in hot ſeaſons, in circumſtances where miaſmata exiſted. (Part 3. chap. iv. ſect. 3.) In times, indeed, not very remote, when the want of proper means of carrying off the filth and refuſe of large towns by proper drains, and ſcavengers were not employed, and when the materials for the production of miaſmata were accumulated even in the ſtreets, the remittent and intermittent fevers were epidemic, in favourable ſeaſons, for the generation of the miaſmata, and the ſource of conſiderable fatality. Thus, even in London, Dr. Short remarks that, early in the ſeventeenth century, "one of forty of the whole that died of fevers, died of agues." (See his New Obſervations, &c. on Bills of Mortality, p. 203.) And Burnet, in his Hiſtory of the Reformation, ſays, that in the laſt year of queen Mary's reign, they "raged like a plague." At a later period, we have

have the teſtimony of Sydenham and Morton, in proof of the great prevalence of remittents in London; and Morton affirms that they were extremely deſtructive for ſeveral years before the great plague, *viz.* from 1658 to 1664. He ſtates that Oliver Cromwell died of an attack of remittent fever in the former of theſe years, and that he loſt his own father, who was himſelf an experienced phyſician, from the ſame diſeaſe, which had gone through his whole family. (Morton, Pyretologia, append. ad Exerc. ii.) "The reſult of the whole, therefore, is," to uſe the words of ſir John Pringle, "wherever the greateſt cauſes of moiſture and putrefaction in the air exiſt, there alſo will be ſeen the greateſt number and the worſt kinds of the remitting and intermitting fevers." This truth is farther confirmed by the negative evidence, that theſe fevers have ceaſed to exiſt where marſhes have been drained, where towns have become cleanly, when armies have moved to dry ſituations, and when the heats of particular ſeaſons have ceaſed, or failed to occur.

What the nature of theſe miaſmata is, the inveſtigations of philoſophers have not yet taught us. Dr. Bancroft has entered at great length, and with great ability, into this queſtion, reaſoning from a large collection of important evidence. He details a number of intereſting facts, which ſeem to lead ſatisfactorily to the concluſion, that the mere exhalations from *putrefying animal matter*, however offenſive to the ſenſes, are never productive of fevers. The ſame inference has been deduced, not leſs ſatisfactorily, by Dr. Chiſholm, in a very elaborate and able diſſertation upon this topic, publiſhed in the Edinburgh Medical and Surgical Journal for October, 1810, vol. vi. p. 389. However contrary to the general opinion, this doctrine, that mere putrefaction is not the ſource of contagion and fever, appears, indeed, by theſe writers to be eſtabliſhed. The experiment, in fact, has been tried on a large ſcale in France, in the caſe of the prodigious exhumations made in the church-yard of St. Eloi, at Dunkirk, in 1783, and in that of the ſaints Innocents at Paris, in 1786. In the latter caſe, nearly 20,000 bodies were taken up, in every ſtage of putrefaction, and a conſiderable part of the work was carried on during the greateſt heats of ſummer, rendering the whole city offenſive; yet no fever was occaſioned by this immenſe maſs of corruption. (See M. Thouret's Memoir in the Journal de Phyſique, for 1791, p. 253; and the Annales de Chimie, vol. vi.) The good health of nightmen, of perſons living in diſſecting-rooms, of thoſe employed in the manufactory near Bath of a ſort of ſpermaceti from putrefying fleſh of all deſcriptions, and many other ſtriking facts, detailed by the two authors juſt quoted, conſtitute a ſtrong evidence in proof of the abſence of infalubrity from mere putrefaction.

Dr. Bancroft next proceeds to prove, by another ample collection of facts and teſtimonies, that it is not the mere *aqueous vapour* that conſtitutes the morbific quality of marſh-miaſms. The principal proofs that mere moiſture is incapable of producing theſe fevers, are, that ſailors at ſea for many months are generally very healthy; that no ſet of men are more uniformly ſo than the Newfoundland fiſhermen, who are uſually enveloped in the dampeſt fogs for ſeveral months together; that while perſons living on ſhore on unwholeſome iſlands, as at Walcheren, are ſpeedily attacked with fevers, thoſe who remain on ſhip-board, at a little diſtance from land, entirely eſcape them; and that the occurrence of theſe fevers has been frequently prevented by laying ſwampy ground under water, under which circumſtances the moiſture of the atmoſphere muſt be highly augmented.

Conſidering, then, that the mineral part of the ſoil is not vaporizable in any natural heat, and that animal ſubſtances in a ſtate of putrefaction are incapable of producing fever, as well as the mere aqueous vapour, Dr. Bancroft was diſpoſed to conclude, that the morbific exhalations in queſtion ariſe wholly from "the mutual decompoſition of vegetable matters and water;" and that thoſe ſwampy grounds are moſt likely to emit them, which contain the largeſt proportion of ſuch matters, and in which the decompoſition is moſt rapid and complete. This concluſion, he is of opinion, is confirmed by the facts that the exhalations from macerating hemp and flax are well known in Italy to produce fevers, and that thoſe ariſing from heaps of decaying indigo, in the Eaſt and Weſt Indies, have produced the ſame effects. See his Eſſay on Yellow Fever, above quoted.

Of the Treatment of Remittent Fevers.—As the violence of the ſymptoms, and conſequently the actual character of theſe diſeaſes, vary materially in different ſeaſons, climates, and circumſtances, under which they occur; ſo no uniform rule of treatment can be purſued for their cure. The ſame remedies, indeed, which at one period of the ſame fever are beneficial, are hurtful if reſorted to at another. This obſervation, however, is applicable to all febrile diſeaſes, and cannot be too often inculcated; ſince not only empiriciſm, but the routine of too many of the profeſſion, tends to the appropriation of ſome leading remedy, whenever the name of a particular fever is mentioned: with ſome it is bark, with others antimony, and with others mercury; the indiſcriminate uſe of any of which muſt be neceſſarily productive of injury.

In the more violent forms of the diſeaſe, which are common in hot climates, and in which the attack is marked by a ſudden and ſevere affection of the head, with a hard, full, and ſtrong pulſe, indicating, with other ſymptoms, an inflammatory affection of the brain, perhaps the only remedy which is capable of arreſting the diſeaſe, is ſpeedy and free *blood-letting*. In the moſt violent forms of all, this evacuation ſhould be reſorted to very early, as within the firſt twenty-four hours, or the miſchief will have advanced beyond the reach of this remedy. In milder caſes, a moderate bleeding from the temporal artery or jugular vein, or even from the arm, within the firſt day or two, will often remove the danger and feverity of the fever. The repetition and extent of the bleedings muſt be determined by a conſideration of the violence of the ſymptoms, the duration of the diſeaſe, and the vigour of the patient. The notion that theſe fevers of hot climates are of a *putrid* nature, becauſe they ſpeedily run on to ſymptoms of debility, or putreſcency, as they have been called, appear to be altogether erroneous; and it is now generally admitted, that the only effectual mode of preventing theſe ſymptoms, is by arreſting the violent inflammatory excitement in the beginning, of which they are the immediate effect.

The next moſt effectual remedy, if reſorted to alſo ſufficiently early, is purgation. The purgatives adminiſtered ſhould be ſuch as in bulk and quality are not calculated to offend the ſtomach, which is uſually in an irritable ſtate: calomel, with jalap, anſwers the purpoſe well; and it is in all probability by its purgative quality alone, that mercury has been found beneficial in theſe fevers. The efficacy of mercurial purgatives, indeed, ſeems to have been fully eſtabliſhed by the recent experience of our naval and military practitioners, in every quarter of the globe; while the mercurial practice, which had for its object the excitement of ſalivation, is ſhewn by Dr. Bancroft, from the teſtimony of Dr. Ruſh and others, its advocates, to have been by no means ſucceſsful.

This early excitement is alſo conſiderably alleviated by the application of *cold* in every mode. Almoſt all the modern

dern writers bear their teſtimony to the important auxiliary operation of the cold and tepid affuſion; although they admit that, alone, its effects are not ſufficiently powerful or permanent to be depended upon. *Coolneſs* of the patient is to be promoted by every means; by the free uſe of cold aqueous drinks, by frequent waſhing, by the full admiſſion of freſh air, and by the uſe of few and light coverings on the bed.

Theſe remedies ſhould be actively employed, and repeated on the return or non-ceſſation of the ſymptoms of excitement. For as an intelligent phyſician has remarked, "the great object is the removal of the local affection of the brain, or other organ, and the production of a complete remiſſion of the febrile ſymptoms, in the leaſt poſſible time, by which the dangerous ſymptoms of the latter ſtages are prevented or greatly mitigated, and a perfect and rapid recovery inſured." (See Dr. Burnett's Account of the Bilious Remittent Fever in the Mediterranean, p. 22. Lond. 1814.) This object is rather impeded, than aſſiſted, by the adminiſtration of emetics and ſudorifics; and altogether defeated by the uſe of bark, cordials, or ſtimulants of any kind, whether in the way of food or medicine. With reſpect to emetics, they are objectionable in all ſtages of the diſeaſe; for they not only fail in removing nauſea, but actually increaſe that diſtreſſing ſymptom: their operation aggravates the affection of the head, of which the nauſea appears to be ſympathetic; and as the tendency of the diſeaſe is to augment irritability of the ſtomach, which often becomes extreme and diſtreſſing in the latter ſtages, ſo they contribute to aggravate this and other dangerous ſymptoms. Sudorifics are alſo to be condemned; for, in the firſt place, they are unneceſſary, becauſe a natural perſpiration will readily enſue, as ſoon as the exceſs of heat above the ſtandard of health has been removed, which can be accompliſhed with certainty by the proper application of cold water to the ſurface of the body; and, in the next place, the ſudorifics which are uſed are apt to increaſe the irritability of the ſtomach; and if they fail to excite a diaphoreſis, they increaſe the heat and the determination to the head, and tend to lengthen the paroxyſm. With regard to the bark and cordials, they are invariably injurious in the firſt ſtage of the fever. When a diſtinct remiſſion has taken place, ſome writers recommend the immediate adminiſtration of cinchona; but even theſe admit, that "if it be given when there is a parched ſkin, a hard pulſe, a dry tongue, great heat and pain at the ſtomach, or delirium, it will generally be found to increaſe and prolong theſe ſymptoms." (See Bancroft, loc. cit. p. 76.) On the whole, however, the late experience in the Mediterranean led to the rejection of the uſe of bark, while any febrile ſymptoms whatever remained. "Under its uſe," ſays Dr. Burnett, "mortality has been great, relapſe frequent, and (as in the caſes of the Temeraire and Invincible) dyſentery attacked nearly all the patients who had fever in a ſevere form; nor was there an inſtance, as far as I could learn, that, when given during a ſuppoſed remiſſion of the ſymptoms, it prevented a return of the paroxyſm. Too often it has been given with wine at the commencement of this diſeaſe, when the tongue has ſoon put on a brown, dry, and furred appearance; the anxiety, delirium, and irritability of the ſtomach, have been much increaſed; the whole train of nervous ſymptoms ſoon became formidable, reſiſting every means of alleviation, till death has put a period to the ſufferings of the patient." Loc. cit. p. 34.

If any thing were wanting to corroborate the foregoing deductions from experience, in favour of the antiphlogiſtic and evacuant plan of treatment, in the commencement of remittent fevers, the detail of the appearances obſerved on diſſection, after the death of patients in theſe fevers, would amply ſupport them, by the proofs which it affords of the inflammatory condition of various organs of the body in theſe fatal caſes. In different inſtances, inveſtigated by Dr. Burnett and his colleagues in the Mediterranean, the veſſels of *the brain* were generally diſtended, and in many caſes completely gorged, with blood; the membranes of that organ were conſiderably inflamed, often preſenting what that writer calls "a blood-ſhot appearance," and depoſitions of coagulable lymph were ſeen among the convolutions: there were occaſionally alſo adheſions, and the ventricles were often diſtended with a fluid, ſometimes limpid, ſometimes yellow. Appearances of *high inflammation* preſented themſelves in the cavity of the cheſt, affecting the lungs, pericardium, and diaphragm; and theſe were connected with depoſitions of lymph and effuſions of ſerum. In the abdomen, the liver was generally found enlarged, and ſometimes exhibiting marks of inflammation; the ſtomach diſtended with air, more or leſs inflamed, and containing a dark coloured matter; and the inteſtines in a ſimilar condition, with frequent intus-ſuſception.

Theſe appearances, which are in fact the effect of the continuance of the febrile actions in the organs in queſtion, ſufficiently prove that the firſt ſtage is the time when active remedies, of an anti-inflammatory power, can be chiefly expected to produce a very decided removal of the diſeaſe. When the fever is a little more advanced, the principal object of the practitioner is to diminiſh the violence of any local affection that may be ſevere. Thus, if head-ache remains, with fluſhed countenance, ſuffuſion of the eyes, and a firm pulſe, a ſmall bleeding from the temporal artery (the pulſe being at the ſame time carefully examined) may be employed with advantage: a bliſter, applied to the head at this time, is alſo manifeſtly beneficial; and daily evacuations of the bowels ſhould be procured by gentle laxatives, ſuch as caſtor oil, or glyſters, the powerful cathartics being now laid aſide. Irritability of the ſtomach, which is often diſtreſſing at this period, is relieved by the effervеſcing draught, and by the application of leeches, or of a large bliſter to the pit of the ſtomach. A degree of ſtupor ſometimes ſupervenes, which is often removed by a bliſter applied to the neck or forehead, or by the application of leeches to the temples. If there is any obvious affection of the abdominal viſcera, which ſhould be carefully inquired into, bliſters, and, above all, the warm bath, ſhould be reſorted to, as well as copious emollient glyſters.

If, however, from want of the means of relief, or from the violence of the diſeaſe, it has advanced to that ſtage, in which the yellow ſuffuſion of the ſkin appears, and various nervous ſymptoms, ſubſultus, tremors, &c. come on, with increaſed uneaſineſs about the ſtomach, hiccup, or vomiting of a dark matter, reſembling coffee-grounds, with iſchuria, and a ſinking or intermiſſion of the pulſe, little more can be done than to look on, and endeavour to obviate ſymptoms as they occur. "Singultus," to borrow again the words of Dr. Burnett, "is a dangerous, and commonly a moſt haraſſing ſymptom at this time: it will often be relieved by camphorated julep, to which may be added opium and æther. If the pulſe ſink, the ſtimuli muſt be increaſed; and under theſe circumſtances, I have found the carbonate of ammonia, with aromatic confection, of ſingular benefit. But while we endeavour to reſtore the circulation, *care muſt be taken not to induce a ſtate of ſecondary excitement;* and as the pulſe riſes, the ſtimuli ſhould be decreaſed. Conſtant attention muſt ſtill be paid to the daily evacuation of the bowels; but at a period, when the excitability of the ſyſ-

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tem is nearly deſtroyed, powerful cathartics will be attended with the moſt deleterious conſequences: glyſters are particularly ſerviceable at this time. As the diſeaſe advances, the ſecretions are at times voided involuntarily: in a few I have obſerved a retention of urine, and in theſe laſt caſes the catheter ſhould be uſed; but as a general ſymptom, there is far oftener a deficiency in the ſecretion of that fluid. Frequently in this ſtate, the ſtomach rejects every thing. We may now ſafely indulge the patient *moderately* with any thing to which his fancy leads him. Bottled porter, wine, and brandy and water, have been found beneficial. But no remedy can be relied on with any degree of certainty: whatever calms the irritability of the ſtomach, and moderately ſupports the excitability of the ſyſtem, is uſeful. A few ſpoonfuls of arrow-root or ſago, with wine and ſpice, given occaſionally, will often be retained by the patient, and greatly at this period aſſiſt the cure." Burnett, loc. cit. p. 29.

During the *ſtate of convaleſcence* at every period, whether from a complete remiſſion being procured early, or from a gradual ceſſation of the diſeaſe, extreme caution is neceſſary in regard to preventing repletion: in the former caſe, it is apt to induce a relapſe; and in the latter, it will retard the cure. During the whole progreſs of recovery, attention ſhould be paid to the regularity of the bowels. Some light tonic, as an infuſion of quaſſia, gentian, or cinchona, with an aromatic or ſulphuric acid, may be adminiſtered. When the yellow ſuffuſion of the ſkin has been great, a protracted convaleſcence is commonly the conſequence; and is often attended with irregular affections of the bowels, and ſymptoms of indigeſtion. In theſe caſes, ſmall doſes of the mercurial pill, with an occaſional gentle purgative of caſtor oil or rhubarb, are very beneficial. It is almoſt excluſively, indeed, in theſe protracted caſes, where a morbid affection of the liver, brain, or ſome other viſcera, has been the reſult of the uninterrupted violence of the firſt ſtage of the fever, and eſpecially when there is reaſon to ſuppoſe that affuſion had taken place within the cranium, that mercury, in ſmall doſes, is of any actual utility. Small doſes of calomel, or of the pilula hydrargyri, ſhould be adminiſtered until ſome ſenſible, but ſlight, effect be produced on the ſalivary ſyſtem; after which the diſeaſe often ceaſes of itſelf, or is readily removed by the uſe of the Peruvian bark. See Burnett on the Bilious Remittent in the Mediterranean; Bancroft on the Yellow Fever; and Irvine on the Diſeaſes of Sicily. See alſo FEVER, *Yellow*, and MIASMA.

REMITTENT *Fever of Children*, the *febris infantum remittens* of Dr. Butter, which is a very common affection of children, when the abdominal organs are deranged, has already been deſcribed at length, under the head of INFANTS, § 5. *Febrile Diſeaſes of;* which ſee.

REMITTER, in *Law*. Where a man has two titles to land, and is ſeiſed by the latter; and, that proving defective, he is remitted or reſtored to the former more ancient title; this is called a *remitter*, from the Latin, *remittere*, *to ſend back*.

If land deſcend to him that had right to it before, he ſhall be remitted to his better title, if he pleaſe. 1 Inſt. 347. *b*. Litt. § 659.

Remitter is elaſſed (with *retainer*) by judge Blackſtone, among thoſe remedies for private wrongs, which are effected by the mere operation of law, and is thus deſcribed: remitter is where he, who hath the true property or *jus proprietatis* in lands, but is out of poſſeſſion thereof, and hath no right to enter, without recovering poſſeſſion in an action, hath afterwards the freehold caſt upon him by ſome ſubſequent, and of courſe defective title: in this caſe, he is remitted, or ſent back, by operation of law, to his ancient and more certain title. (Litt. § 659.) The right of entry, which he hath gained by a bad title, ſhall be *ipſo facto* annexed to his own inherent good one; and his defeaſible eſtate ſhall be utterly defeated and annulled, by the inſtantaneous act of law, without his participation or conſent. (Co. Litt. 358. Cro. Jac. 489.) As if A diſſeiſes B, that is, turns him out of poſſeſſion, and dies leaving a ſon C; hereby the eſtate deſcends to C, the ſon of A, and B is barred from entering thereon till he proves his right in an action: now, if afterwards C, the heir of the diſſeiſor, makes a leaſe for life to D, with remainder to B the diſſeiſee for life, and D dies; hereby the remainder accrues to B, the diſſeiſee; who thus gaining a new freehold by virtue of the remainder, which is a bad title, is by act of law remitted, or in of his former and ſurer eſtate. (Finch. L. 194. Litt. § 683.) For he hath hereby gained a new right of poſſeſſion, to which the law immediately annexes his ancient right of property.

If the ſubſequent eſtate, or right of poſſeſſion, be gained by a man's own act or conſent, as by immediate purchaſe being of full age, he ſhall not be remitted. For the taking ſuch ſubſequent eſtate was his own folly, and ſhall be looked upon as a waiver of his prior right. (Co. Litt. 348. 350.) Therefore it is to be obſerved, that to every remitter there are regularly theſe incidents; an ancient right, and a new defeaſible eſtate of freehold, uniting in one and the ſame perſon; which defeaſible eſtate muſt be *caſt upon* the tenant, not gained by his own act or folly. The reaſon given by Littleton (§ 661.), why this remedy, which operates ſilently and by the mere act of law, was allowed, is ſomewhat ſimilar to that given under the article RETAINER; becauſe otherwiſe he who hath right would be deprived of all remedy. For as he himſelf is the perſon in poſſeſſion of the freehold, there is no other perſon againſt whom he can bring an action, to eſtabliſh his prior right. And for this cauſe the law doth adjudge him in by remitter; that is, in ſuch plight as if he had lawfully recovered the ſame land by ſuit. For, as lord Bacon obſerves (Elem. c. 9.), the benignity of the law is ſuch, as when, to preſerve the principles and grounds of law, it depriveth a man of his remedy without his own fault, it will rather put him in a better degree and condition than in a worſe. *Nam quod remedio deſtituitur, ipſa re valet; ſi culpa abſit.* But there ſhall be no remitter to a right, for which the party has no remedy by action (Co. Litt. 349.): as if the iſſue in tail be barred by the fine or warranty of his anceſtor, and the freehold is afterwards caſt upon him; he ſhall not be remitted to his eſtate tail. (Moor. 115. 1 Ann. 286.) For the operation of the remitter is exactly the ſame, after the union of the two rights, as that of a real action would have been before it. As, therefore, the iſſue in tail could not by any action have recovered his ancient eſtate, he ſhall not recover it by remitter.

The determination of the law, according to the doctrine of remitter above ſtated, might ſeem ſuperfluous to an haſty obſerver; who perhaps would imagine, that ſince the tenant hath now both the right and alſo the poſſeſſion, it little ſignifies by what means ſuch poſſeſſion ſhall be ſaid to be gained. But the wiſdom of our ancient law determined nothing in vain. As the tenant's poſſeſſion was gained by a defective title, it was liable to be overturned by ſhewing that defect in a writ of entry; and then he muſt have been driven to his writ of right, to recover his juſt inheritance: which would have been doubly hard, becauſe, during the time he was himſelf tenant, he could not eſtabliſh his prior title by any poſſeſſory action. The law, therefore, remits him to his prior title, or puts him in the ſame condition as

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if he had recovered the land by writ of entry. Without the remitter, he would have had *jus, et ſeiſinam*, ſeparate; a good right, but a bad poſſeſſion: now, by the remitter, he hath the moſt perfect of all titles, *juris et ſeiſinæ conjunctionem*. Blackſt. Com. b. iii.

REMLINGEN, in *Geography*, a town of Germany, in the county of Wertheim; 9 miles E. of Wertheim.

REMNEY, or REMPNEY, a river of Wales, which riſes in Brecknockſhire, and, after ſeparating the counties of Monmouth and Glamorgan, falls into the mouth of the Severn, a little below Cardiff.

REMOLADE, in the *Manege*. See CHARGE.

REMOLLAN, in *Geography*, a town of France, in the department of the Higher Alps, on the Durance; 15 miles S.W. of Embrun.

REMON, a townſhip of Upper Canada, on the St. Laurence; N. lat. 44° 50′.

REMONSTRANCE, an expoſtulation, or humble ſupplication, addreſſed to the king, or other ſuperior, to beſeech him to reflect on the inconveniencies, or ill conſequences of ſome order, edict, or the like.

REMONSTRANCE is alſo uſed for an expoſtulatory counſel or advice; or a gentle and handſome reproof, made either in general or particular, to appriſe or correct ſome fault.

REMONSTRANTS, REMONSTRANTES, a title given to the Arminians, by reaſon of the *remonſtrance* they made, in 1610, to the ſtates of Holland, againſt the ſynod of Dort, in which they were condemned.

Epiſcopius and Grotius were at the head of the Remonſtrants. And as the patrons of Calviniſm preſented an addreſs in oppoſition to their remonſtrance, which they called their counter-remonſtrance, they received, in conſequence of this, the name of "Counter-remonſtrants."

REMONTER, Fr. in *Muſic*, to new-ſtring an inſtrument.

REMONTOIR, or REMONTOIRE, in *Horology*, is a ſpecies of eſcapement, in which a ſecondary ſpring frequently wound up, or a ſmall ſecondary weight frequently raiſed, by means of the maintaining power of a watch or clock, is ſubſtituted for the maintaining power itſelf, for the purpoſe of urging the balance or pendulum, at ſhort intervals, by more equable impulſes than can be conſtantly effected by the maintaining power alone, as varied by different degrees of friction in the train. When treating of ESCAPEMENTS in general, under their appropriate head, we deſcribed three only out of the four claſſes, and reſerved the fourth claſs, denominated *Remontoir*, till we arrived at our preſent article.

The firſt remontoir was invented and made by a German artiſt in 1600, according to Berthoud; but Huygens, who applied one to his marine clock, deſcribed it firſt in his "Horologium Oſcillatorium," page 17, and, in conjunction with his cycloidal cheeks, it promiſed to be a great improvement in his machine; but, as no compenſation had at that time been applied to the pendulum, and, as a pendulum is not calculated for a portable machine, particularly on the ſea, the utility of the contrivance remained to be proved by ſubſequent artiſts. The contrivance under our conſideration was a ſmall weight, ſuſpended by an endleſs well-made metallic chain, that was coiled round the crown-wheel of the eſcapement, and wound up a ſmall ſpace, at every vibration of a half-ſeconds pendulum, by the next wheel, which wheel took its motion from the maintaining power, through the medium of the train, as is uſual in common clocks; a ratchet and click, however, were a requiſite appendage, to act in the way that the endleſs cord was applied, in winding up the maintaining power without ſtopping the motion of the works; ſuch as we have already deſcribed in the fifth ſection of our article CLOCK-WORK. One half of the weight of the remontoir actuated the eſcapement wheel during its ſmall fall, and the other half was ſupported by the wheel that as often raiſed it again to its original height, while both parts of the folded chain were ſtretched alike by the ſaid weight. Leibnitz and Dr. Hooke alſo claimed the originality of a ſimilar invention, but do not appear to have put it in practice, as Sully afterwards did.

Mr. Harriſon and Mr. Mudge ſucceſſively applied remontoir ſprings, inſtead of ſuſpended weights, to the eſcapements of their time-pieces; but, as we have deſcribed theſe under our article CHRONOMETER with ſufficient minuteneſs, it is not neceſſary to repeat here what we have there detailed of their conſtructions.

Mr. Cumming and Mr. Nicholſon, on the contrary, had recourſe again to weights inſtead of ſprings in their aſtronomical clocks; but as theſe weights did not act during the whole period of the vibration, we have already deſcribed them in another claſs, in the 21ſt and 38th ſections of our ESCAPEMENTS.

After Huygens and Sully, who left no plans of their mechaniſm behind them for the advantage of future workmen, who had not acceſs to the original machines, Gaudron contrived a remontoir, which performed its office very well, but which was applied in a wrong place, ſo as not to produce the deſired effect of equalizing the impulſes given to the regulator; for, inſtead of being applied to either the balance or balance-wheel, it was made to actuate the wheel preceding the minute-wheel; and, therefore, permitted the irregular friction of a conſiderable portion of the train to affect the motions of the balance, which fault was avoided in the conſtruction of Harriſon's and Mudge's time-keepers: the former of which had its ſecondary ſpring wound up eight times in every minute, and the latter had its two remontoir-ſprings alternately coiled at every correſponding oſcillation.

Haley's.—In the year 1796, Mr. Charles Haley, of Wigmore-ſtreet, Cavendiſh-ſquare, London, watch-maker, took out a patent for his invention of a new remontoir ſpring for a marine time-piece, or chronometer; the ſpecification of which is contained in the 6th volume of the Repertory of Arts and Manufactures. *Figs.* 1 and 2, of *Plate* XLI. of *Horology*, exhibit, the firſt a perſpective ſide view, and the ſecond a plan of Mr. Haley's remontoir eſcapement, as originally drawn; and we propoſe to retain the ſame letters of reference as are inſerted in the original deſcription. The utility of the invention is ſtated to conſiſt of its property of communicating an invariable force to the balance, which it does 150 times in the minute, in a train of 9000 beats in the hour. The ſame letters of reference apply to both figures, and indicate the correſponding parts, which will mutually illuſtrate each other. A B is the potance plate, and T the balance, the pivots of which, P, X, turn in the cock C and potance D; above the balance T is fixed a pendulum ſpring S, in the uſual way; on the axis of the verge, below the balance, are placed two ſmall ſteel collets I and K, by friction, having each a ruby pallet projecting a little way beyond their ſurfaces. I is called the diſcharging pallet, and K the impelled one; which pallets, together with the pendulum ſpring, all vibrate with the balance, whenever it is put in motion. E is the balance-wheel of the uſual form, moving juſt clear of the potance plate, and having its pivots ſupported by the cocks F and G. W V is the axis of the remontoir, which the inventor calls the *renovating* ſpring; and the three axes, or arbors, juſt deſcribed, ſtand in the ſtraight line in the direction A B. Below the remontoir ſpring the round ſteel pallet M is fixed, ſo as

juſt to eſcape touching the ends of the balance-wheel's teeth in its reſting poſition, and the notch cut in this pallet is to receive the impulſe of any tooth of the ſaid wheel that may, at any time, act againſt it, in paſſing the line A B. Juſt above this large pallet is fixed, by friction, another ſmaller pallet N, of ſteel, in the form of a ſnail-piece, and having inſerted into it, near the centre of motion, and at right angles, a ſmall ruby pallet, which points directly to the radial end of the notch cut in the large pallet M. A ſmall collet, twiſted faſt to the axis of the remontoir, juſt above this ſnail-pallet, receives the lower end of the ſpring R, while the upper end is made faſt to a piece in the cock H, near W, in a manner ſimilar to that by which the pendulum-ſpring is fixed. On the arbor of the remontoir, and under the plate A B, is twiſted on a pallet I, which may be called the remontoir's impelling pallet, becauſe it gives motion to the balance by ſtriking the pallet K, which the author alſo called the *impelling* pallet; but is, as we have named it, more properly the *impelled* pallet, becauſe it *receives* the impulſe which pallet I imparts. From this detail of the pallets it is obvious, that whenever the balance-wheel impels the large pallet M, the remontoir-ſpring R, the ſnail-pallet N, together with its ſmall ruby pallet and impelling pallet I, muſt have a contemporary motion, and will deſcribe each its reſpective circle round the common arbor W V.

In *fig.* 2, *a* is a detent-ſpring, fixed by a ſcrew and ſteady pin to the upper face of the potance plate, and pointing directly to the axis of the verge, which it nearly approaches. Its ſhape and mode of being fixed will be better underſtood from an inſpection of *fig.* 3, which gives a ſide view of it, and from which it will be ſeen that it is placed high enough above the plate, to come in the way of the diſcharging pallet I, in each revolution of the latter. Upon the ſide of the ſaid detent-ſpring *a*, next to the balance-wheel, a ſecond, but very ſlender ſpring is pinned, ſo that its projecting end exceeds that of the detent-ſpring, and comes nearer to the balance verge than that of the detent, as repreſented at *m*, in *fig.* 3. To the detent-ſpring is made faſt a ſmall ruby pallet *r*, ſeen alſo in *fig.* 3. The cock *b* is ſcrewed to the potance, and the hole at *i* is tapped to receive the ſcrew *c*, the head of which, being turned towards the centre of the ſnail, forms a banking for the detent-ſpring *a*, when ſtruck by the ſnail-pallet. This ſcrew, *c*, is removed from its due place in the drawing, to avoid confuſion; and for a reaſon, which will preſently appear, this double ſpring *a* may be called the remontoir-detent. On another ſide of the balance-wheel a ſecond detent-ſpring *d* is fixed, pointing towards the centre of the remontoir axis, and forming nearly a right angle with the former detent: this ſecond detent is adjuſted by the ſcrew *y*. The ſhape and ſituation of this ſecond detent, which may be called the locking detent of the balance-wheel, is better ſeen in *fig.* 4, where its ſapphire pallet *s* may be diſtinguiſhed, againſt which the tooth 3 of the wheel is ſuppoſed to be reſting in *fig.* 2. The ſituation of this pallet *s*, as adjuſted by the ſcrew *y*, determines the reſting-places of the teeth 1 and 2, while they are equally free from the edge of the pallet M. The locking detent *d* is likewiſe made faſt by a ſcrew to the upper face of the potance plate; and the ſcrew *f*, placed in the cock *e*, but out of its place in the figure, forms a banking to the ſapphire pallet *s*, while the ſcrew *g*, in a ſmaller cock, limits the excurſion of the detent-ſpring *d* itſelf.

Having deſcribed the various pieces of mechaniſm that compoſe this remontoir eſcapement, we will now proceed to explain its mode of acting. Firſt, let us ſuppoſe all the parts at reſt with the wheel locked by the pallet *s* laſt deſcribed, but that the wheel is ready to move in the direction of the arrow Z, by the action of the main-ſpring, through the train, whenever the ſingle detent *d* is by any force impelled back to its banking. Let it alſo be conceived that, when the ſnail-pallet N is carried by any means in a direction contrary to that of the wheel till it reaches the pallet *r* of the remontoir or double detent-ſpring, the remontoir-ſpring is wound up by ſuch motion, and *vice verſâ*, and alſo that when the ſtroke of the ſnail-pallet has driven back this detent to its banking, by ſtriking the ſloped face of the ruby pallet *r*, the detent will inſtantly return by the force of its elaſticity, and the back part of the ſaid ruby pallet *r* will hold the ſnail-pallet locked at its return, till ſome other impulſe ſets it free again; but that when the unlocking takes place, the ſpring of the remontoir, now wound up, returns by its own force to its original ſituation; and that its axis brings back with it its affixed pallets. *Fig.* 1. will be of no uſe in deſcribing the action of this eſcapement, but in *fig.* 2. the parts are repreſented in a ſtate ready to commence motion; the wheel is locked by tooth 3 againſt the ſapphire pallet *s* of the ſingle detent *d*, and the remontoir-ſpring is wound up, and kept locked by the ſnail-pallet, reſting behind the ruby pallet *r* of the double detent: in this ſituation let the balance be wound round in ſuch direction that the diſcharging pallet I may ſtrike the end of the double or remontoir detent outwards, taking both its ſprings along with it, and thereby unlocking the ſnail-pallet; at this inſtant the remontoir-ſpring R begins to return, and brings all its four pallets with it, and during the return, pallet L, which we have called the impelling pallet, gives its ſtroke to pallet K on the verge, which we have called the impelled pallet, and through its medium to the balance itſelf, which now goes on in its oſcillation, till the pendulum or balance-ſpring is wound up; in the mean time the little unlocking ruby pallet, inſerted into the ſnail-pallet near its centre of motion, meets with the extreme end of detent *d*, and drives it back to its banking, thereby ſetting the tooth 3 of the wheel free from the ſapphire pallet *s*; the wheel, being urged by the train, now proceeds till tooth 2 falls into the notch of pallet M, and is checked, experiencing a little recoil; the balance-ſpring, being now wound up, returns, and alſo the wheel winds up the remontoir-ſpring, till it is again locked, by the ſnail-pallet, after its impulſe has driven back the detent: during this action the detent *d* returns by its own ſpring, and locks tooth 4 of the wheel, at the inſtant that tooth 2 eſcapes from the notch of pallet M, and the original ſituation of all the acting parts is now reſtored, except that the motion of the balance is not arreſted, the ſlender ſpring fixed to detent *a* allowing it to paſs in the return, without unlocking the ſaid detent; but when the backward oſcillation is finiſhed, and the balance returns, the ſame operation is repeated; *i. e.* the remontoir detent is unlocked, the pallets on its axis are brought back, the impulſe is next given to pallet K of the balance, to reſtore its loſs of momentum, and laſtly, the wheel is unlocked to wind up the remontoir-ſpring as before.

The obſervation we have to make on this ingenious remontoir eſcapement is this, that on enquiry from good authority we learn, that the theory could never be completely put into practice by the inventor, though he laboured to obtain his object full fourteen years. However well the parts of action were mechanically made, the locking of the remontoir-ſpring was never certain, for the *flirt* given to the ruby pallet *r* by the ſnail-pallet, drove back the detent ſo far, as frequently to enable the ſnail to be brought back by the remontoir-ſpring, before the detent returned to catch it, the conſequence of which was, that the pallets of the remontoir axis were all brought back, and the impulſe vainly ex-

pended by pallet L, before the pallet K of the balance returned to its place to receive it. Mr. Hardy, however, has lately contrived a ſpecies of locking that is quite certain, as well as ſafe, which we ſhall preſently have occaſion to deſcribe.

Breguet's.—We have not been able to aſcertain the exact date of the French watch-maker Breguet's invention of a remontoir eſcapement, but as Berthoud has placed it after Haley's in his "Hiſtoire de la Meſure du Temps," we muſt conclude that it is of more recent origin. The mechaniſm is ſo complex, that the deſcription given in the French work is divided into three parts, which plan we propoſe to follow. *Figs.* 5. and 6. of *Plate* XLI. of *Horology*, will ſuffice to explain the different parts of Breguet's remontoir; *fig.* 5. being a plan of the whole, and *fig.* 6. exhibiting a perſpective view of ſuch parts as could not be well underſtood without ſuch repreſentation. The firſt portion of the mechaniſm conſiſts of two wheels of unequal numbers of teeth, with their planes in contact, and revolving on one common arbor concentrically, namely, the wheel B B′, and the wheel D, the firſt having many teeth and a larger diameter, and the ſecond having few, for a reaſon which will appear hereafter: theſe wheels are actuated by a pinion *g*, connected with the train, and having juſt ſo many leaves as there are teeth in the large wheel B B′, contained in the ſpace between two contiguous teeth of the ſmall wheel D; on the arbor of this pinion, near the pivot, is inſerted a fly with unequal arms, repreſented by the letters *i g h* in both figures, the longer arm of which, *g h*, is armed with a piece of ſteel of peculiar ſhape, ſeen in *fig.* 6. A ſpring-detent *r* F, made faſt to the cock at *r*, lies at right angles to the fly, when in a ſtate of reſt, and has a ruby pallet V at about one-third of its length from its interior end, which ſtops the fly by oppoſing its end *h* near *o*, and conſequently prevents the train from urging the double wheel, ſo long as no force unlocks the pallet from the end of the fly; but if any impulſe happen to bend the detent in a direction towards the pinion *g*, then the ruby pallet ſlips through a notch made in the ſteel part of the fly, and the fly makes an entire revolution, while the pinion revolves and urges the large wheel the ſpace of as many teeth as the pinion contains; that is, a ſpace correſponding to the diſtance between two contiguous large teeth in the ſmall wheel, which wheel alſo moves the ſame quantity, before the fly is again oppoſed and ſtopt.

The ſecond portion conſiſts of the following parts; a ſpring G, curved at the interior, or moveable end, ſerves at the ſame time for a remontoir-ſpring, and alſo for a pallet to give the impulſe to the balance; it has conſequently a heel-piece *n*, by which it is urged into a ſtate of tenſion by the ſmall wheel D, at every revolution of the fly, and alſo a ruby pallet *m*, with a locking notch cut in it; *a* H, made faſt at *a*, is a detent-ſpring, placed nearly at right angles to the ſpring G, and having a ſlender ſpring N made faſt to its ſide; this detent-ſpring carries a ſmall ruby *p*, which locks into the notch of the piece *m* in the ſpring G, when this is in a ſtate of tenſion. Another ruby, inſerted into the extreme end of the detent *a* H at *s*, is ſo placed, that the ſlender ſpring N can move from right to left without impediment, but when urged in an oppoſite direction againſt the ruby *s*, it takes the large or detent-ſpring along with it, and unlocks the remontoir-ſpring G, by removing the ſmall ruby *p* from the notch of *m*. The detent-ſpring H has at its extreme end a claw, againſt which the ruby *m* falls when this detent eſcapes back from a tooth of wheel D; and this claw has a pin in it, againſt which the ſlender ſpring N reſts; again, at the extreme end of the ſlender ſpring N are fixed two parallel chamfered plates, ſo contrived, that any preſſure made on the upper ſlope, or inclined edge, will depreſs the ſpring, but a ſimilar preſſure made on the under ſlope will elevate it again, the downward preſſure being employed to diſengage the ruby *m* from the claw, and the contrary.

The third portion conſiſts of the pieces or pallets K and *b*, borne by the ſuperior end of the verge of the balance, and fixed at a quarter of a circle from each other. When the oſcillation of the balance is from right to left, or in the direction from *b* to K, the unlocking pallet piece K, in its motion, bends the ſlender ſpring, and paſſes over it, but as the pallet *b* is placed above the plane of the wheel B B′, and under the ſpring H, this oſcillation from right to left is performed in freedom, except that the ſlender ſpring N requires to be a little bent out of the way; but when the oſcillation is made from left to right, the pin at H preſſes this ſlender ſpring againſt the ruby *s*, the ſpring H then gives way, and bending, allows the ruby *p* to eſcape from the notch at *m*, and the ſpring G, being unlocked, is at liberty to perform its office, which we now proceed to deſcribe.

The action of theſe three portions of the mechaniſm may be thus explained: at the inſtant that the ruby *p*, in the detent *a* H, is diſengaged from the notch at *m* in the remontoir-ſpring G, the pallet *b* of the balance is found pointing towards the common centre of the wheels, and ready to receive an impulſe from the extreme end *q* of the curved part of the remontoir-ſpring G, which end now gives its ſtroke to the balance through the medium of pallet *b*; immediately after which ſtroke, the ſame end *q* proceeds till it falls on the end F of the fly's detent, to which it now gives a puſh, and remains quiet; this puſh unlocks the fly, as has been before explained, and an entire revolution is immediately performed by it, while its pinion *g*, now at liberty to advance, urges on the double wheel, till another tooth in the ſmall wheel, catching the heel-piece *n* of the remontoir-ſpring, puts this ſpring again into a ſtate of tenſion; and the ruby *p*, falling into the notch of *m*, locks it as before, the balance in the interim completing its oſcillations: and in this manner the operation is repeated.

De Lafon's.—In the year 1801, the Adelphi Society for the Encouragement of Arts, &c. rewarded Mr. John de Lafons with thirty guineas for his invention of a new remontoir watch eſcapement, which comes next under our notice. *Figs.* 1 and 2 of *Plate* XLII. of *Horology*, are a plan and ſection of this eſcapement, as given by the inventor in the Society's Tranſactions of the year above-mentioned. In both theſe figures, A is the eſcapement wheel; B, the lever-pallet on an arbor with fine pivots, which has, at its lower end, the remontoir ſpiral ſpring C, fixed with a collar and ſtud in the uſual way; D is the pallet of the verge, having a roller turning in ſmall pivots, for the lever-pallet to act againſt without friction; at E are the pallets for diſcharging the locking, with a roller between, containing a ſmall notch; F is the arm of the locking pallets, continued at the other end beyond the centre of motion, to preſerve the equipoiſe, and having ſtuds and ſcrews for adjuſtment of the banking; *a* and *b* are the locking pallets, being portions of circles faſtened on an arbor, turning on fine pivots at the midway between the pallets; G is the triple fork, at the end of the arm of the locking pallets. In *fig.* 1, tooth 1 of the wheel having caught the interior end of the lever-pallet B, has urged it forwards and wound up the remontoir-ſpring, and the inſtant that the verge pallet D comes nearly in contact with the remote end of the lever-pallet, the diſcharging pallet E, taking one prong of the fork, removes the arm F, thereby relieving the tooth 3 from the convex part of the claw *a*, that locks the wheels.

The wheel now advances a little way, juſt enough to allow the interior end of the lever-pallet to paſs back again, as urged by the ſpiral ſpring, while the remote end of the ſaid lever gives an impulſe to the balance, through the pallet D; the tooth 4 is then locked on the concave ſide of the locking claw *b*, and the interior end of the lever-pallet partly ſupports the following tooth; in this ſituation the oſcillation is finiſhed, and on the return of the balance pallet E, ſtriking the prong of the fork in a contrary direction, again unlocks the wheel from claw *b*, while the force of this wheel is partly ſuſpended by the end of the lever-pallet; being now at liberty, the wheel proceeds to wind up the remontoir-ſpring again, till another tooth falls on the claw *a*, now brought inwards, when the operation is completed, and the preſſure of the inner end of the lever pallet againſt its contiguous tooth again relieves the claw *a* from a part of the preſſure of the wheel, and thereby renders the unlocking as eaſy as before, when claw *b* was unlocked. This eſcapement appears to us an improvement on Haley's, both as to its ſimplicity and ſafety of locking, and the inventor propoſes a ſtill further ſimplification, by ſubſtituting a ſtraight remontoir-ſpring for the ſpiral one, particularly in time-pieces intended to remain in a ſtationary ſituation, where the weight of the ſpring would form no objection; but it does not appear that ſuch conſtruction was ever adopted. The ſimplicity of the locking of the remontoir-ſpring by the wheel itſelf, where this ſpring and the maintaining power mutually re-act, requires, as might be foreſeen, an unuſually ſtrong maintaining power, which is, perhaps, one of the greateſt objections to this mode of applying the remontoir; unleſs, indeed, what was remarked by the ſociety's committee be true, that the balance muſt vibrate in a large arc before the piece will continue to perform.

Maſſey's.—Mr. Edward Maſſey, of Hanley, in Staffordſhire, received a reward of fifty guineas from the Adelphi Society, in the year 1803, for his invention of two different clock eſcapements, one of which we have already deſcribed, under our article ESCAPEMENT, as being without a verge; and the other we ſhall make the ſubject of our preſent ſection. *Fig.* 3. of *Plate* XLII. repreſents ſo much of Maſſey's remontoir eſcapement as is ſufficient to explain all the eſſential parts; in which A is the ſwing-wheel; B, C, are two detached pallets, moving on ſeparate arbors, at oppoſite ſides of the ſwing-wheel; B is ſeen urged by the remontoir-ſpring E, by the aid of a tail-piece fixed on the arbor of pallet B, which receives the action; and the other pallet muſt be conceived to have a ſimilar ſpring and tail-piece, which cannot eaſily be repreſented in the drawing; F is the verge bearing two arms without pallets, which preſs under the pins of the detached pallets, and raiſe them alternately, at each vibration of the pendulum, from the teeth of the ſwing-wheel, which had been previouſly impelled by the maintaining power, and K is the pendulum ſuſpended in the uſual way, and having a crutch to communicate its force to the verge at the moment of withdrawing the pallets. All, therefore, that the pendulum has to do, is, to diſengage the pallets from the teeth of the ſwing-wheel that locks againſt the inclined planes of the pallets; for the remontoir-ſpring then oppoſes the aſcent of the pendulum, and aids its deſcent, by means of the connection between the pins of the pallets and the arms of the verge, which muſt, from the nature of the conſtruction, continue in contact during a large portion of each excurſion of the pendulum. It is not ſtated in the author's account (Tranſ. Adel. Soc. vol. xxi.) at what part of the arc of vibration the pendulum unlocks either of the pallets, but it ſeems to us capable of being made to effect this office at its point of *greateſt velocity*, if it does not do that as now conſtructed. An attention to this particular is of the utmoſt importance in any eſcapement, ſince the natural law of gravity is the leaſt deranged, when any force is given, or taken away, when the pendulum is at the *loweſt point* of its arc, for the velocity it has at *that point* determines the height to which the ball ſhall riſe; but any addition or diminution of the pendulum's momentum, beginning at any other point of the arc, either adds to, or diminiſhes the natural length of the vibration, and injures the iſochroniſm. Beſides, a ſpring commencing both its accelerating and retarding influence at the point of the pendulum's greateſt velocity, acts, not only by a law commenſurate with the law of gravity, but their various forces, thus exerted, are contemporary, and, therefore, act together as one; a conſideration which never ſhould be loſt ſight of in the conſtruction of an eſcapement of any denomination. The principal advantages that the author ſeems to inſiſt on in this eſcapement, are, that the friction is diminiſhed at the acting parts of the pallets, the impulſe being given by a direct *puſh*, without, or with very little, ſliding motion; and that a certain regular momentum is kept up in the pendulum, independently of any variation which may occur in the wheel-work, or in the acting part of the pallets during the ſhort time of unlocking; but, what is the principal object of ſuch a contrivance, he has not ſtated, perhaps not conſidered, how this *certain regular momentum* is, or ought to be, *modified.*—Indeed, in ſpeaking of his other eſcapement without arbors, he ſays, that one of its advantages over this is, that during a *part* of the vibration the pendulum is *diſengaged;* from which remark, it ſhould ſeem, that he thinks the conſtant action of this remontoir-ſpring, however modified, an objection to be avoided.

Antis'.—In vol. xxiii. of the Tranſactions of the Society laſt mentioned, it is ſtated, that Mr. John Antis of Fulneck, near Leeds, ſent this ſociety a model of a new clock eſcapement in 1805, with a correſponding deſcription, for which a reward was voted him of twenty guineas. The model is depoſited in the room at the Adelphi appropriated for the reception of models, but as the deſcription is not publiſhed in the Tranſactions of the Society, nor an engraving given of the model, we muſt infer, that the contrivance either is not new, or is not of ſuch importance as to merit the particular notice that has been given by them to the inventors of like contrivances, who both preceded and followed him. Indeed, in the letters of Mr. Antis to the Society, publiſhed with their account of the rewards, it ſeems that two eſcapements were ſent them, one a *detached* one, and the other, one that "*would equaliſe* the *power* of the *impulſe*," which muſt, therefore, have been of the *remontoir* deſcription; but he confeſſes that theſe contrivances by him "may have been practiſed before." With reſpect to the latter eſcapement, he remarks, what is worthy of being recollected by clock-makers in general, that, by its means "a ſpring-clock will be as perfect as one which goes by weight, and more ſo if the latter has no remontoir." Should any of our readers have a wiſh to ſee and examine Mr. Antis' productions, which, he acknowledges, are done in a rough manner, and under diſadvantageous circumſtances, but which may not be the leſs ingenious on that account, there will be no difficulty in gaining admiſſion to the model room, where the original work is preſerved with a view to public inſpection, provided the applicant be properly introduced.

Mendham's.—It frequently happens that conſiderable

improvements are made in mechanical contrivances, by men whose principal employment has no connection with the art to the improvement of which they contribute; this was probably the case with Mr. Antis, and is confessedly so with Mr. Mendham, who was rewarded with the silver medal of the Adelphi Society, in the year 1807, (see vol. xxv.) for a remontoir escapement for a chronometer, which next offers itself for our description. *Figs.* 4, 5, and 6, of *Plate* XLII. are copied from the plate given by Mr. Mendham, *fig.* 4. being a section of the whole escapement, *fig.* 5. a plan of the wheel and locking pallet, and *fig.* 6. a detached view of the pallets and their common arbor. The letters *a a*, in *fig.* 4, are the two plates of the frame that contain the works; *b* is the balance, nearly of the usual shape and size; *c* is the pallet that acts with the wheel, and *d* its arbor; *e* is the locking single spring; and *f* is the unlocking pallet in the form of a pin, attached to *e*, and seen better in *fig.* 6. At the lower end of arbor *d* is placed *g*, the remontoir-spring, that gives force both to the small pallet *f*, and also to the perpendicular pin *h*, that forms a part of the pallet *c*. The arbor *d* does not ascend above the upper plate of the frame, but the pin *h* does, and the plate being formed, as we suppose, like a rim, *h* is permitted to move in the vacant space within the rim, and sufficiently high to fall in the way of the finer pin *l*, inserted into and under the balance. The balance *i* has its verge immediately over the upper pivot of arbor *d*, point to point nearly, so that the motions of the balance-pin *i*, and of the pin *h*, that impels it, may be concentric. The cock *k* supports the upper pivot of the verge, and also holds the outer end of the balance or pendulum-spring. The action of these parts may be thus explained; before motion is given to the balance, we must conceive its pin *i* to be in contact, or nearly in contact with the pin *h* of the pallet *c*, and it must be remembered, that the wheel rests on the pallet during the vibration of the balance: suppose now that the remontoir-spring *g* is in the act of being wound up by the balance-wheel, as actuated by the train; and that the pin *i* of the moving balance has kept in contact with the impelling pin *h*, borne by the arbor of the remontoir, it is evident, that the force of the remontoir-spring is here opposed to the momentum of the balance and at last stops it, thereby forming a banking of an unlimited extent; but the tooth of the wheel in contact with pallet *c*, at the point of shortest radius, assists to oppose or wind up the said spring during a space of one-fifth of a circle, till the tooth has passed and the wheel is locked; on the return of the balance the remontoir-spring exerts all its force on the balance, but without a jerk, the pins *i* and *h* being already in contact, till it comes to the stop; the balance then maintains its motion, and the small pallet *f* having unlocked the wheel by forcing out the detent, the next tooth of the wheel falls on the pallet *c*, and waits the return of the balance, when the same operation is repeated.

Mr. Ramsay of Islington was consulted on the merits of this escapement, and, on considering its properties, he gave a written report to this effect; that the impulse is here given to the balance without friction, exactly as in Mudge's chronometer; and that the remontoir is wound up by the maintaining power in a similar way, except that the shape of Mudge's tooth limited the quantity of tension of the spring, which here depends on the amount of the maintaining power; but that this escapement, having but one remontoir-spring, is more simple than Mudge's, and allows an unlimited arc of vibration, which advantages compensate the foregoing disadvantage in the shape of the tooth; and lastly, that it is superior to the detached escapement, inasmuch as that it gives the impulse without friction.

G. Prior's.—The silver medal and twenty-five guineas were voted to Mr. George Prior, junior, of Otley, in Yorkshire, in the year 1809, by the Adelphi society (vol. xxvii.) for his invention of a new clock escapement, in which an impelling (not however called a remontoir) spring actuates, or professes to actuate, the pendulum at each alternate vibration. The account, particularly of the action, as printed in the society's Transactions, seems to us so extraordinary, that we beg leave to transcribe it verbatim, in order to make some remarks on it, that may enable the reader to judge of the escapement's peculiar qualities, or at least of the manner in which they are described. *Fig.* 7. of *Plate* XLII. already referred to, contains enough of this escapement to answer the purpose of the description in question, and therefore we will omit the references to *fig.* 1. in the original plate, and attend to its *fig.* 2. only. "*Fig.* (7) is a back view, which is supposed to be taken from behind the clock; *a* represents the axis of the swing-wheel, or last wheel of the train of the clock; *b d* is the swing-wheel fixed upon it, having thirty serrated teeth; it is turned round, in the direction from *b to d*, by the maintaining power of the clock; *g* is a spring-detent, which locks against one of the teeth of the swing-wheel, and this prevents its running down by the action of the maintaining power; *h* is another spring-detent, which is called the impelling spring; when left at liberty, it unlocks the former, by pushing against the end of the small arc *e*, fastened to the detent *g*, and thus removing the end of the detent which obstructed the wheel's motion; *l* is the rod of the pendulum, suspended by a cock screwed to the back plate of the clock; a small piece of brass, *k*, projects at right angles from the impelling spring *h*, so as to intercept the pendulum-rod in its vibration, and at this place a small screw is put through the pendulum-rod *l*, the point of which moves the impelling spring back: a small pin is fixed to the frame, in a line between the point of suspension of the pendulum, and the centre of the swing-wheel, against which the impelling spring stops when at liberty.

"Supposing the pendulum to be vibrating backwards and forwards, and the wheel locked as in the figure, the pendulum swinging from *m* to *n*, the impelling spring *h* follows by its elasticity, until the pendulum *l* arrives at its perpendicular (or lowest point of its arc); at this period the impelling spring comes *to rest* against the end of the arc *e*, which it *pushes back*, so as to release the tooth of the wheel from the detent-spring *g*; the wheel now moves round a very small space before it meets the end of the impelling spring *h*, and *is stopped thereby*; in the mean time the pendulum continues its motion the extent of its vibration towards *n*, when it returns, and arriving at the *perpendicular*, it meets the *impelling spring h*, and *carries it along with it*, until the tooth of the wheel which rests against it escapes from the end of it, and another tooth of the wheel comes to rest against the spring-detent *g*. The succeeding vibration of the pendulum repeats the same operation." This is the whole account, from which the reader is induced to believe that the pendulum, and impelling spring *h*, act and re-act on each other *ad infinitum*, without any aid from the maintaining power through the medium of the wheel, which is never said to raise, or otherwise to move the impelling (or remontoir) pallet, in order that it may, in its turn, impel the pendulum by its acquired force. Again, it is said, the impelling spring unlocks the detent *g* when it arrives at the perpendicular, or nearly, if not quite, at the point of its quiescence, where it has *no force*, and from that point, not

the

the wheel, but the pendulum unbends it into a ſtate of tenſion, to reſume its operation; that is, the pendulum raiſes the ſpring, that the ſpring may drive the pendulum back again; and thus the vibrations are maintained without the aid, and conſequently without the neceſſity, of either a maintaining power or train; and what is equally extraordinary, the impelling ſpring locks the wheel by its *reſiſtance*, near the perpendicular line (within the ſpace of one tooth), where it has almoſt the ſmalleſt force, or nearly the ſame ſmall force that it has when it *unlocks* the *detent*. According to this account, even ſuppoſing the action of the wheel on the remontoir pallet to be *omitted*, the pendulum is under the influence of the impelling pallet during nearly the whole of one excurſion, and free from it in the other. The model, however, is ſaid to be preſerved in the ſociety's room, and will explain itſelf.

G. Prior's improved.—Mr. George Prior, jun. again preſents an improved remontoir eſcapement for a clock to the ſociety we have repeatedly had occaſion to name in this article, in the year 1811 (vol. xxix.), and again receives a reward at their hands, of twenty guineas, for his improvement. The deſcription given of this eſcapement, and of its action, is ſufficiently clear, and the alteration made in the conſtruction is in many reſpects an improvement, though we ſhall take occaſion to ſhew, in our remarks on it, that it is ſtill liable to objections. In the plate laſt referred to, *fig.* 8. contains the original *fig.* 1, which will explain the account with ſufficient preciſion. "The ſwing-wheel A," ſays the author, "has thirty teeth cut in its periphery, and is conſtantly urged forwards by the maintaining power; C, D, are two ſpring-detents, catching the teeth of the wheel alternately; theſe are, at the proper intervals, unlocked by the parts marked 2 and 3 upon the pendulum-rod H, intercepting ſmall pins *a*, *b*, projecting from the detents, as it vibrates towards the one or the other; E is the renovating or remontoir-ſpring, fixed to the ſame ſtud, F, as the detents; it is wound up by the higheſt tooth of the wheel, its poſition, when unwound, being ſhewn by the perpendicular dotted line. This being the caſe, ſuppoſe a tooth of the wheel caught by the detent D, which prevents the wheel from moving any farther, and keeps the renovating ſpring from eſcaping off the point of the tooth; in this poſition the pendulum is quite detached from the wheel: now if the pendulum be cauſed to vibrate towards G, the part of it marked 2 comes againſt the pin *b*, projecting from the renovating ſpring E, and puſhes this ſpring from the point of the wheel's tooth; on vibrating a little further, it removes the detent D, which detained the wheel, by the part 3 ſtriking the pin *a*, which projects from the detent; the maintaining power of the clock makes the wheel, thus unlocked, to advance, until it is detained by a tooth reſting upon the end of the detent C, on the oppoſite ſide; by this means the renovating ſpring will be clear of the tooth of the wheel as it returns with the pendulum, and gives it an impulſe by its pin *b* preſſing againſt the part 2 of the pendulum, until the ſpring comes to the poſition ſhewn by the dotted line, in which poſition it is unwound, and reſts againſt a pin fixed in the croſs-bar of the plate; the pendulum continues vibrating towards I, nearly to the extent of its vibration, when the part 1 meets the pin in the detent C, and removes it from the wheel and unlocks it; the maintaining power now carries it forward, puſhing the renovating ſpring E before it, until another tooth is caught by the detent D, which detains the wheel in the poſition firſt deſcribed." Agreeably to this deſcription, the pendulum is oppoſed in its aſcent, and accelerated in its deſcent, in one of its excurſions from the centre, or perpendicular line, by both the impelling ſpring E, and detent D, after it is unlocked, though not the whole diſtance; but is alternately accelerated and retarded in the other excurſion by the detent C alone, and only after the unlocking; theſe unequal checks, given at different parts of the arc of vibration, we apprehend, are by no means favourable to the natural iſochroniſm of the pendulum.

Hardy's.—Mr. Hardy, chronometer-maker, of Coppice-row, Clerkenwell, London, whoſe ingenious improvements in clock and watch-making have placed him high in public eſtimation, on contemplating Mr. C. Haley's failure in the locking of his remontoir detent, contrived a remedy which fully anſwers its purpoſe, and which, on that account, merits our particular notice.

Fig. 7. of *Plate* XLI. of *Horology*, repreſents the plan of Hardy's new remontoir eſcapement, which, though it appears to differ conſiderably in conſtruction from Haley's, yet reſembles it ſo much in its action, as well as principle, that we will put the ſame letters of reference to the ſame correſponding parts, in order that the reader who has peruſed our deſcription of Haley's remontoir with attention, may the more clearly comprehend our deſcription of Hardy's, and perceive in what the improvement conſiſts. As in Haley's conſtruction, T T repreſents the balance, or rather the place of the balance not ſeen; E the eſcapement, or balance-wheel; P the pivot of the verge; S the balance-ſpring, ſuſpended as uſual; K the impelled pallet; I the unlocking pallet of the remontoir; N the remontoir detent, or locking pallet, on the ſame axis with *a*, the arm of the ſlender or unlocking ſpring, which lies parallel with it; *n* the cock, taking the pivot of the remontoir detent's arbor, and alſo the upper end of its ſpiral ſpring; *c* the head of the banking ſcrew, and *i* its ſtud; H the cock that takes the pivot of the remontoir, or cylindrical ſpring at W, and alſo one end of the ſaid ſpring, repreſented by the ſmall circle at R; L is the impelling lever or pallet, for giving motion to the pallet K of the balance; M is a lever, inſtead of the notch in Haley's large circular pallet, by means of which the wheel winds up the ſpring R of the remontoir; O is a lever, in place of the ſmall ruby unlocking pallet of Haley, fixed to the ſnail; *d* is the ſpring-detent of the wheel, and *s* its ruby, or ſapphire pallet, on which the wheel is locked, *f* and *g* being the banking ſcrew and its ſtud, and *y* the place where it is fixed by a ſcrew on the potance plate; and laſtly, the ſectoral piece Q, in which the improvement chiefly conſiſts, is the addition introduced for rendering the locking of the remointoir-ſpring, when wound up, both certain and ſecure. The acting faces of the pallets *s*, M, K, N, and of the circular portion of Q, are of ruby, or other precious ſtone nicely poliſhed, and are properly ſhaped for their reſpective offices. From this deſcription of the mechaniſm before us, it will be perceived that the double ſpring *a*, and the detent with a claw pallet at N, are both faſt to the arbor of the ſpiral ſpring, which gently preſſes the detent at all times down upon the ſectoral piece Q, thereby preventing its being thrown back from its poſition for locking, as was the caſe with Haley's remontoir detent. It will alſo be ſeen that the arbor W, of the remontoir-ſpring R, has the ſaid ſectoral piece, the impelling lever L, the lever M impelled by the wheel, and the diſcharging lever O, all faſt to it at different heights, the two firſt being above, and the two laſt below, ſo that when one of theſe four pieces is moved out of its firſt ſituation by any external force, they all move together, as do alſo the remontoir detent N and its ſpring *a* on their common arbor, and as do likewiſe the pallets K and I on the verge of the balance. Theſe particulars being underſtood, and that levers in Hardy's conſtruction are

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uſed for pallets in ſeveral inſtances, we may proceed to explain the action of the different parts, and to ſhew how they produce the deſired effects of producing equable impulſes on the balance at all times, and of effecting certain and ſecure locking of the remontoir-ſpring. In the figure before us, tooth 1 of the wheel has juſt proceeded far enough, by the action of the main-ſpring and train, to wind up the remontoir-ſpring, and its detent N, urged by its own ſpiral ſpring againſt the curved face of the ſectoral piece, after ſliding ſmoothly along it, has locked it; that is, by oppoſing it at right angles, prevents its return, which would take place when the wheel leaves the arm M, or, which is the ſame thing, when the remontoir-ſpring, on the ſame arbor with this arm, is wound up. The balance is now ſuppoſed to have commenced its motion, carrying the pallets K and I outwards from the wheel, but the ſmall pallet I has not yet arrived at the ſlender ſpring of the remontoir detent, though it is approaching it; the ſlender ſpring, however, ſoon yields to the outward impulſe of this ſmall pallet, without diſturbing its arm or the detent N, therefore the remontoir-ſpring remains locked: at the return of the balance, which takes place when its ſpring is wound up, the ſaid little pallet I diſplaces not only the ſlender ſpring but its arm alſo, which lies next towards the wheel, the one not being liable to move in this inward direction without the other; the conſequence is, that the detent N is now lifted by its connection with the arm of the ſlender ſpring, and at that inſtant the remontoir-ſpring, being wound up, and at liberty to act, throws back the ſectoral piece Q nearly its whole breadth, but not quite, for the claw of the detent in queſtion reſts on the curve of the ſector during the motion we have deſcribed, till the unlocking lever O ſtrikes the end of the ſingle detent-ſpring *d*, and forces the ruby pallet *s* out of the wheel, which wheel inſtantaneouſly reſumes its motion from the train, and meeting with lever M winds up the remontoir-ſpring a ſecond time; in the mean time the impelling lever L has given its impulſe to the pallet or lever K, and conſequently to the balance, which has thus had its momentum increaſed; and on its returning vibration exactly the ſame proceſs is repeated. Thus the force of the maintaining power is expended in winding up at each alternate oſcillation the remontoir-ſpring, which ſpring, ſo reinforced, impels the balance in its turn by quantities of force that are always the ſame, whatever may be the irregularities of the force tranſmitted through the train that winds up the remontoir-ſpring; therefore, properly ſpeaking, the remontoir-ſpring is the maintaining power that reſtores, at each alternate oſcillation, the loſs of momentum that the balance has experienced from the reſiſtance of the air, and friction of the parts in action. This eſcapement is, notwithſtanding, of the detached kind, ſeeing the balance performs the greateſt part of its oſcillations without any connection of even the auxiliary force derived at intervals from the remontoir-ſpring; and a chronometer of this conſtruction, made by Hardy for his royal highneſs the duke of Suſſex, anſwers the maker's moſt ſanguine expectation, and will probably become a model for other makers when its merit is proved, and made public. The ſame artiſt has made ſeveral experiments on the ſame principle, with this difference, that the remontoir-ſpring is retained by the lever reſting on the tooth of the wheel, in place of being locked by the ſectoral piece, as in the one before us.

Beſides the preceding eſcapement, Hardy invented one for the aſtronomical clock he made for the Royal Obſervatory at Greenwich, which at firſt ſight appears to reſemble Maſſey's and Prior's improved one, with ſpring pallets, but on cloſe examination we diſcovered that it has the following deſirable properties peculiar to itſelf: 1ſt, it gives the impulſe not only from remontoir-ſprings, but ſtrikes and unlocks the two ſeparate detents alternately, at the inſtant when the pendulum has the *greateſt velocity*; and, 2dly, the accelerating and retarding power imparted to the pendulum co-operates with the force of gravity, thereby deranging the natural law of gravity as little as poſſible. We feel not at liberty to enter more minutely into the deſcription of this eſcapement, becauſe we underſtand its inventor propoſes giving an account of his machine himſelf, to be read before the Royal Society, as conſtituting the companion to Troughton's tranſit circle, already deſcribed by the aſtronomer royal. We have permiſſion, however, to ſubjoin the rate of the clock in queſtion for three quarters of a year, as taken at the Royal Obſervatory, which will afford the beſt proof of its pretenſions to public notice. We have further to add, that the inventor has applied the ſame principle of movement to a chronometer of a large ſize, in which the balance has two metallic rods to adjuſt it for temperature, in place of the metal being fluxed on the rim of the balance, as is common. See COMPENSATION.

Trial of Mr. Hardy's clock at the Royal Obſervatory at Greenwich in the year 1811.

	Daily Rate.	Mean of Thermometer.
	″	°
April 12 to May 13 - -	— 0.86	61
May 13 to June 9 - -	— 0.74	63
June 17 to July 12 - -	— 0.74	64
July 18 to Auguſt 17 - -	— 0.83	68
Auguſt 17 to September 14 -	— 0.77	65
September 14 to October 4 -	— 0.61	60
October 17 to November 17 -	— 0.60	51
November 17 to December 10	— 0.50	46
December 10 to December 30	— 0.47	39

From the above ſtated authentic document it appears, that for the nine months of trial, and in oppoſite extremes of temperature, the daily rate never varied quite *four tenths* of a ſecond; and when the quantity of mercury proper for the compenſation of the pendulum is exactly aſcertained, it may be expected that the performance will be ſtill more accurate; ſeeing that the deviation in the rate depends evidently on the change of temperature, and not on the eſcapement.

REMORA, in *Natural Hiſtory*, the *ſucking-fiſh*; a little fiſh, reſembling a herring, called by the Greeks *echeneis*, famous for ſticking to the ſides of ſhips. It belongs to the genus of *echeneis* and claſs of *thoracici* in the Linnæan ſyſtem.

Its characters, according to Artedi and Linnæus, are theſe: the branchioſtege membrane on each ſide contains about ten bones; the head is thick, depreſſed, naked, and marked on the upper ſide with tranſverſe rough ſtriæ; the body is oblong, roundiſh, and naked, but ſomewhat compreſſed; the back-fin is oblong, and placed very far toward the tail; its under jaw is longer than its upper; it has a great number of teeth in both jaws; the colour of its body is hoary, and it has ſeven fins; two pectoral ones, two ventral ones placed farther from the ſnout than the pectoral ones, one at the anus, one on the back, and one at the tail; the ſtriæ of the head are from eighteen to twenty-four in number, they are rough and tranſverſe, but are divided as it were into two ſeries by a middle longitudinal line. By means of theſe ſtriæ or ridges the fiſh can fix itſelf to any animal

animal or other ſubſtance, and has often been found adhering to the ſides of ſhips and the bodies of ſharks, &c.

Linnæus enumerates two ſpecies of the echeneis; the remora and neucrates: the former has a forked tail, and eighteen ſtriæ on the head; the latter has an entire tail, which is longer than that of the former, twenty-four ſtriæ, a larger body, and ſharper fins. They are both inhabitants of the Indian ocean. The remora is much talked of by the ancients, who, as we find from Pliny, lib. ix. cap. 25. lib. xxxi. cap. 31. unanimouſly believed it had the force to ſtop a veſſel in full ſail, or a whale in ſwimming; and hence called it *remora, a remorando.* (See Ælian's Hiſt. de Animal. lib. ii. cap. 17. Plutarch. Sympoſ. lib. ii.) But Mr. Cateſby obſerves, that even ſeveral of thoſe fiſhes together can do no more than ſhells or corals, and other foulneſſes of the ſame bulk, which make a ſhip ſail ſomewhat the ſlower. And in the ſame manner only they may be ſome ſmall hindrance to a whale. The author laſt mentioned aſſures us he has taken five of them off the body of a ſhark. Vide Phil. Tranſ. N° 438. p. 113.

Remora, among *Surgeons*, is alſo an inſtrument uſed for ſetting broken bones.

Remora *Mutiani*, in *Natural Hiſtory*, a name given by ſome to the genus of ſhells called *concha venerea*, and *porcellana*. See Porcelain *Shell*.

REMOTION, Remotio, in *Rhetoric*, the ſame with what is otherwiſe called *metaſtaſis*.

REMOVAL *of the Poor*. See Poor.

REMOVELLE, in *Geography*, a town of France, in the department of the Voſges; 5 miles E. of Neufchateau.

REMOVING *Obſtructions to Tillage*, the means of removing ſtones and any other ſubſtances that may be in the way of the plough.

The operations which are to be performed in theſe intentions are of ſeveral different kinds, as the removing of various ſorts and ſtates of ſtony matters, both from above and below the ſurface of the lands; the eradicating and deſtroying different kinds of woody materials of the tree, root, and plant ſorts, the taking away of the ſuperabundant wetneſs; the deſtruction of many aquatic vegetables, and ſome others. See Land, Stone, Tillage, and Wood.

REMOULIN, in the *Manege*, is uſed to denote a ſtar upon a horſe's forehead.

REMOULINS, in *Geography*, a town of France, in the department of the Gard, and chief place of a canton, in the diſtrict of Uzés; 7 miles S.E. of Uzés. The place contains 905, and the canton 4758 inhabitants, on a territory of 135 kiliometres, in 8 communes.

REMOUNT, in *War*. *To remount the cavalry*, or *dragoons*, is to furniſh them with freſh horſes, in lieu of ſuch as have been killed or diſabled in the ſervice.

REMPHAN, in *Antiquity*, the Egyptian name for the planet Saturn. Some think that remphan was the moon, others Mercury and Mars, and others the ſun. See Chiun.

REMPLY, in *Heraldry*, ſomething *filled up*. The term is chiefly uſed to denote, that the chief is quite filled up with a ſquare piece of another colour, leaving only a bordure of the proper colour of the chief about the ſaid piece.

REMPORETTY, in *Geography*, a town of Hindooſtan; 30 miles N. E. of Travancore.

REMS, a river of Wurtemberg, which runs into the Neckar, 4 miles N.W. of Waiblingen.

REMSA, or Remissam, a town of Saxony, in the lordſhip of Schonburg; 2 miles N.N.E. of Glauchau.

REMSCHEIDT, a town of the duchy of Berg; 2 miles S.W. of Lennep.

REMSEN, a townſhip of America, in Oneida county, New York, E. of Leyden and adjoining it.

REMUNGOL, a town of France, in the department of the Morbihan; 7 miles S. of Pontivy.

REMURIA, among the Romans, a feſtival inſtituted in honour of Remus by his brother Romulus. See Lemuria.

REMUZAL, in *Geography*, a town of France, in the department of the Drôme, and chief place of a canton, in the diſtrict of Nyons; 6 miles N.E. of Nyons. The place contains 514, and the canton 3724 inhabitants, on a territory of 272½ kiliometres, in 17 communes.

REMY, a town of France, in the department of the Oiſe; 6 miles N. of Clermont.

REN, a town of Ruſſia, in the government of Novgorod; 16 miles S.E. of Uſtiuzna.

RENAISON, a town of France, in the department of the Rhône and Loire; 6 miles W. of Roanne.

RENAIX, a town of France, in the department of the Scheldt, and chief place of a canton, in the diſtrict of Audenaerde. The place contains 9499, and the canton 14,683 inhabitants, on a territory of 70 kiliometres, in 6 communes.

RENALIS, Renal, in *Anatomy*, an epithet applied to the parts belonging to the kidney; as to the artery and vein of the organ, alſo called *emulgent*, of which the former comes from the aorta, the latter joins the inferior vena cava; ſee Artery and Vein: to the plexus of nerves derived principally from the ganglia of the great ſympathetic; ſee Nerve: and to the ſmall bodies placed above the kidnies, called the *renal capſules*. See alſo Kidney.

Renalis *Lapis*, in *Natural Hiſtory*, the name given by many authors to a ſort of ſiderochitum, or cruſtated ferruginous body of that kind, containing a nucleus of a different matter from that of the cruſts. It is found about Prague, and in ſome other places, lying near the ſurface in ſtrata of a yellow clay. Its uſual bigneſs is that of a ripe peach, and its cruſts are of a duſky ferruginous brown colour: and its internal nucleus of a pale yellowiſh-green, compoſed of a marley earth, and uſually of a kidney-like ſhape, whence its name.

RENASSAU, in *Geography*, a town of Hindooſtan, in Dowlatabad; 114 miles N.W. of Hydrabad. N. lat. 18° 30′. E. long. 79° 10′.

RENATHIA, a town of Aſiatic Turkey, in Caramania; 10 miles S.W. of Satalia.

RENAU d'Elisagaray, Bernard, in *Biography*, a diſtinguiſhed engineer and naval architect, was born in the province of Bearn, in the year 1652. He was at an early age inſtructed in the mathematical ſciences, and was obſerved not to read a great deal, but to think moſt profoundly, and as he advanced in years, he was capable of thinking upon the moſt abſtruſe ſubjects, as well in the midſt of company, as in the cloſet. One of the firſt books that attracted his attention was Malebranche's "Reſearche de la Verité," and, it is ſaid, it made ſuch an impreſſion upon him, that nothing could efface it through the whole of life. It gave him a full conviction of the truths of religion, and preſerved his morals pure and uncorrupted. In 1679 he was placed with the count de Vermandois, admiral of France, as his inſtructor in naval affairs. When, by the royal command, conferences were held to determine upon a plan for bringing to perfection the conſtruction of veſſels, Renau was called upon for his opinion; and at length the ſyſtems of Du Queſne and that of Renau were alone left for conſideration, and to the honour of Renau, then young and almoſt unknown, his plan was adopted, and he himſelf was ſent to Breſt and the other ports to put it in execution.

In

In 1680, the Algerines having declared war againſt France, Renau propoſed the bombardment of Algiers, for which purpoſe he conceived the idea of bomb-veſſels, which were as yet unknown. This was at firſt regarded as viſionary; but reliance being placed on his talents, he was permitted to make the trial, and he brought five of theſe veſſels before the town, where, under the command of Du Quеſne, the bombardment was executed with complete ſucceſs. In 1684 he was employed, as engineer, at the bombardment of Genoa; from this place he went to join Vauban, who was fortifying the frontiers of Flanders and Germany, and he contracted an intimate friendſhip with that great man. In 1688 he accompanied Vauban to the ſiege of Philipſburg, and afterwards conducted, or was preſent, at ſome other ſieges; yet in the midſt of theſe active ſervices he found leiſure to attend to his ſtudies, and publiſhed in 1689 his "Theorie de la Manœuvre des Vaiſſeaux:" ſome of the propoſitions in this work were conteſted by the celebrated Huygens. In this ſame year he endeavoured to prove, by argument, that the navy of France might be rendered capable of making head againſt that of England and Holland united, and his obſervation produced ſuch an effect upon the government, that an order was made to change all the 50 and 60-gun veſſels, on the ſtocks, into ſhips of a higher rate. About the ſame time he invented a new ſeries of naval evolutions, ſignals, and orders of battle. His merits were well underſtood by the government, who rewarded him with a penſion, and conſiderable rank in the ſervice. He was now ſent to Breſt for the purpoſe of inſtructing the naval officers in his newly invented evolutions, &c. He met with an oppoſition, which is not uncommon in endeavouring to change old eſtabliſhed cuſtoms. Of his opponents, two of the moſt diſtinguiſhed were put under arreſt and broke, though he did his utmoſt to prevent the puniſhment being carried to that extremity. He afterwards ſerved under Vauban at the ſiege of Namur, from thence he repaired to St. Malo after the battle of La Hogue, to ſave the relics of the French fleet which had taken ſhelter there. Having conſtructed a veſſel of 54 guns upon his own plan, Renau put to ſea with the view of intercepting two rich Engliſh Eaſt Indiamen, one of which he captured after a deſperate engagement. Among the booty were ſome packets of diamonds, which he thought of too great value to be claimed by himſelf, though the naval cuſtoms would have juſtified him in it, and he carried them to the king, who accepted the prize, and remunerated the captor with an annuity. When Philip V. ſucceeded to the crown of Spain, he ſent to his grandfather, Lewis XIV., to requeſt that he might have Renau to direct his engineers in fortifying his moſt important towns. He found means to render the crown of Spain the moſt important ſervices, and was, in 1704, employed in the ſiege of Gibraltar, which, it has been aſſumed by the French biographer, was about to ſurrender, when it was relieved by the Engliſh fleet. To the diſgrace of the court of Spain, whoſe intereſts he had effectually promoted, and in whoſe cauſe he had expended his own property, he was ſuffered to return to France with a ſingle piſtole in his pocket, though his Catholic majeſty had given him the title of lieutenant-general of the armies of Spain. The high reputation which Renau had acquired as an engineer, cauſed the grand-maſter of Malta to requeſt that he might be ſent to that iſland on an alarm of an invaſion, which was readily granted. Soon after this Lewis XIV. died, and the duke of Orleans ſucceeded to the regency, who appointed Renau to be counſellor of the marine council, and grand-croix of St. Louis. He died of a dropſy in 1719, and his death was, like that of La Trappe, in ardent aſpirations after another life: "What a difference," he exclaimed, "from one moment to the following! I am going to paſs in an inſtant from the thickeſt darkneſs to perfect light." He had been twenty years an honorary member of the Academy of Sciences, and was among the firſt after that claſs was inſtituted.

RENAUDOT, Eusebius, a learned writer on the eccleſiaſtical hiſtory and antiquities of the Eaſtern church, was born at Paris in 1646. He was educated at the Jeſuits' college, and entered the congregation of the oratory when he was about 19 years of age, though he had no intention of entering into holy orders, or to the taking any eccleſiaſtical degree. He was particularly attached to the ſtudy of the oriental languages, in the knowledge of which he far excelled almoſt all his contemporaries; and he applied with ſucceſs to the ſtudy of ſo many other tongues, that he was ſufficiently maſter of ſeventeen different languages, to be able to ſpeak the greater number of them with facility. He became well known at court, where his genius, his talents, and his politeneſs, made him much eſteemed and admired. Here he was noticed by M. Colbert, who was deſirous of eſtabliſhing printing-preſſes for the oriental languages at Paris, and conſulted Renaudot upon the ſubject, as a perſon who might ably contribute to render ſuch an eſtabliſhment uſeful to the ſtate as well as the church. To engage his aſſiſtance, he promiſed him the reverſion of the poſt of keeper of the king's library; but the miniſter died before the place became vacant. He received a ſimilar promiſe from the archbiſhop of Rheims, and was again diſappointed. He was, however, employed by the king in various confidential concerns of great importance relating to the affairs of Rome, England, Spain, &c. So much was his time occupied by theſe engagements, that he almoſt entirely diſcontinued his favourite ſtudies. In the year 1689 he was received into the French Academy, and in 1692 into the Academy of Inſcriptions and Belles Lettres. He found a patron in the cardinal de Noailles, archbiſhop of Paris, whom he accompanied to Rome in the year 1700, and into the conclave which elected Clement XI. to the papal dignity. While he remained in that city, the collections of the Vatican furniſhed him with new matter relating to the oriental churches, and revived an intention, which he had long before encouraged, of preparing for publication ſome pieces which ſerve to illuſtrate their hiſtory and opinions. In this deſign he was aſſiſted by the new pope, who perſuaded him to remain in Rome ſeveral months after the departure of cardinal de Noailles. His holineſs would gladly have conferred upon him ſome valuable benefices, but he refuſed to accept of any thing beyond a ſmall priory. The abbé Renaudot afterwards went to Florence, where he met with moſt flattering reception from the grand duke, who aſſigned him apartments in his own palace, loaded him with preſents, and on his departure directed that he ſhould be conveyed on board one of his own veſſels to Marſeilles. At Florence, likewiſe, he was made a member of the Academy de la Cruſca. Soon after his return from France, he was rouſed by an attack upon father Nicole's "Perpetuity of the Faith of the Catholic Church reſpecting the Euchariſt;" and in 1708 he publiſhed "A Defence of the Perpetuity of the Faith againſt the Calumnies, &c." He afterwards entered more fully into the ſubject which he defended, and diſplayed all his erudition and ingenuity in endeavouring to ſhew the conformity between the doctrine of the Greeks, and all the oriental Chriſtians, with that of the Latin church. What he wrote upon the ſubject extended to two vols. 4to. which were publiſhed in 1711 and 1713, by way of

of ſupplement to father Nicole's work. During the regency of the duke of Orleans he made frequent efforts to obtain his encouragement of the plan for eſtabliſhing printing-preſſes for the oriental tongues, and was promiſed, but never obtained effectual ſupport. The latter years of his life he ſpent in completing numerous very learned and important publications, among which may be mentioned, "Hiſtoria Patriarcharum Alexandrinorum Jacobitarum:" "Liturgiarum Orientalium Collectio," in 2 vols., accompanied with very learned diſſertations: "Ancient Accounts of India and China, by two Mahometan Travellers in the 9th Century, tranſlated from the Arabic." Renaudot died in the year 1720, at the age of 74 years, greatly regretted by the literati of that age, to whom he was a communicative and moſt agreeable companion, and lamented by the poor, to whoſe relief he had dedicated a large portion of his income. Moreri.

RENAY, or Ronse, in *Geography*, a town of France, in the department of the Jemappe, with a magnificent chateau; 7 miles S. of Oudenarde.

RENCHEN, a town of the duchy of Baden; 4 miles N.N.W. of Oberkirch. — Alſo, a river of Baden, which riſes in the Ortnau, and runs into the Rhine, 10 miles N. of Oberkirch.

RENCOUNTER, formed from the French, *rencontre*, *meeting*, in the *Military Art*, the encounter of two little bodies or parties of forces.

In which ſenſe, rencounter is uſed in oppoſition to a pitched battle.

Rencounter, in ſingle combats, is uſed by way of contradiſtinction to duel.

When two perſons fall out, and fight on the ſpot, without having premeditated the combat, it is called a rencounter.

RENCOUNTRE, or Rencontre, in *Heraldry*, is applied to animals when they ſhew the head in front, with both eyes, &c. or when the face ſtands right forward, as if they came to meet the perſon before them.

Indeed, in deer, this is called *maſacre*; and, in the leopard, it is the natural ſituation. He bears ſable, in rencountre, a golden fleece.

RENDE, in *Geography*, a town of Naples, in Calabria Citra; 5 miles N.N.W. of Coſenza.

RENDER, in *Law*, a term uſed in levying a fine. A fine with render, is that by which ſomething is rendered back again by the cognizee to the cognizor.

The lawyers alſo ſay, there are certain things in a manor, which lie in *prender*, *i. e.* which may be taken by the lord, or his officers, when they pleaſe, without the tenant's leave; and others which lie in *render*, that is, muſt be rendered or anſwered by the tenant, as rents, reliefs, heriots, and other ſervices. See Prender.

Some ſervice conſiſts in ſeiſance, ſome in render.

RENDERING, in *Building*. See Pargeting.

Rendering, in *Sea Language*, is generally underſtood to be the effect of yielding or giving way, without reſiſtance, to the efforts of ſome mechanical power. It is uſually expreſſed of a complicated tackle, laniard or laſhing, when the effect of the power applied is communicated with facility to all the parts, without being interrupted in its paſſage. It is therefore uſed in contradiſtinction to jamming.

RENDEZVOUS, or Rendevous, a place appointed to meet in, at a certain day and hour.

The word is French, and is found ſo commodious, that moſt nations uſe it in its purity, for want of a word of equal import in their reſpective languages.

Thus, in a military ſenſe, the rendezvous is the place appointed by the general, where all the troops that compoſe the army are to meet at the appointed time, in caſe of an alarm; and the regiments have their particular rendezvous, called their quarters of aſſembly.

In a naval ſenſe, it denotes the port or place of deſtination, where the ſeveral ſhips of a fleet, or ſquadron, are appointed to rejoin the whole, in caſe of a ſeparation, occaſioned by tempeſtuous weather, or other unforeſeen accident.

Rendezvous *Bay*, in *Geography*, a bay on the S. coaſt of Antigua, W. of Falmouth harbour.

Rendezvous, *Iſland of*, an iſland, or rock, in the ſouthern Indian ocean, diſcovered in 1773 by M. de Kerguelen, near the N. coaſt of Kerguelen's land, and called by captain Cook "Bligh's Night-cap."

Rendezvous *Key*, a ſmall iſland in the bay of Honduras, near the coaſt of Mexico. N. lat. 16° 59′. W. long. 88° 40′.

RENDS, in a *Ship*, are the ſame as the ſeams between her planks.

RENDSBORG, in *Geography*, a town of Germany, in the duchy of Holſtein, ſeated on a canal which communicates with the Baltic, on the borders of Slefwick, ſuppoſed to be one of the ſtrongeſt towns in the Daniſh dominions, and generally well garriſoned. The number of inhabitants is about 3600; 15 miles W. of Kiel. N. lat. 54° 22′. E. 9° 52′.

RENE′, a town of France, in the department of the Sarthe; 15 miles N. of Le Mans.

RENEALMIA, in *Botany*, a new genus of Mr. Brown's, has lately received that name from him, in juſt commemoration of Paul Renealmus, or Renaulme, a phyſician at Blois, who publiſhed, in 1611, a thin quarto volume at Paris, entitled *Specimen Hiſtoriæ Plantarum*, with expreſſive, but ſtiff, and not neatly finiſhed, engravings in copper, in which each plant is diſtinguiſhed by an appropriate Greek name, moſtly of the author's invention. Mr. Brown obſerves, that this author was the firſt who paid attention to the differences in the number, ſituation, and proportion of the ſtamens. Linnæus, in his own copy of the work, has expreſſed a well-founded ſurprize, at its being never quoted by the Bauhins. Plumier was the author of the firſt *Renealmia*, now ſunk in the Linnæan *Tillandſia*. Linnæus, or his ſon, dedicated a monandrous genus, in the Supplementum Plantarum, to the memory of this meritorious botaniſt; but it proved not diſtinct from a more generally-received genus, of the ſame date, *Alpinia*. We wiſh the preſent *Renealmia* may be found ſufficiently different from *Siſyrinchium*, to which its ſpecies were originally referred by its learned author.—Brown Prodr. Nov. Holl. v. 1. addend. (Siſyrinchium; ibid. 304.)—Claſs and order, *Monadelphia Triandria*. Nat. Ord. *Enſatæ*, Linn. *Irideæ*, Juſſ. Brown.

Eſſ. Ch. Calyx none. Petals ſix, regular; three inner ones largeſt, contracted at the baſe. Style one. Stigmas three, thread-ſhaped, involute, acute. Capſule inferior, obovate, of three cells. Seeds angular.

The ſpecies are herbaceous, ſmooth, inhabitants of woods. *Roots* fibrous, ſometimes tuberous. *Leaves* graſſy, lax, ribbed. *Stem* roundiſh, ſometimes divided. *Flowers* in alternate umbellate bunches, with ſhort permanent ſheaths. *Corolla* regular, white, ſpreading, ſoon falling off; the outer petals generally greeniſh at the back; the inner often furniſhed with claws. *Filaments* either combined below, or diſtinct; their upper part ſpreading. *Capſule* membranous. *Seeds* in two rows, black.

1. R. *paniculata*. Panicled Renealmia. Brown n. 1.—Stem panicled. Leaves ribbed; roughiſh at the edge. Outer petals

petals linear-lanceolate; inner ſcarcely twice as large, obovate-oblong. Filaments united half way up.—Gathered by Mr. Brown, near Port Jackſon, New South Wales. The *leaves* are all from ten to eighteen inches long, and for the moſt part rough-edged.

2. R. *grandiflora*. Large-flowered Renealmia. Brown, under the former.—Stem panicled. Leaves ribbed; roughiſh at the edge. Inner petals four times as large as the outer. Filaments united half way up.—Gathered by the Rt. Hon. ſir Joſeph Banks, in New Zeeland. Akin to the former, but differing in the proportion of its inner *petals*, which are four or five times the ſize of the outer.

3. R. *pulchella*. Elegant Small Renealmia. Brown n. 2.—Stem nearly ſimple. Leaves with ſmooth edges. Outer petals oval-oblong; inner obovate, with ſhort claws. Filaments diſtinct.—Gathered by Mr. Brown near Port Jackſon. The *leaves* are only three or four inches long.

RENE'E DE FRANCE, in *Biography*, ducheſs of Ferrara, born at Blois in 1510, was daughter of Lewis XII. and Anne of Britanny. She was affianced, when very young, to Charles of Auſtria, afterwards emperor, and ſome years after was ſought in marriage by Henry VIII. of England, but neither of theſe matches took place, and Francis I. gave her to Hercules II. of Eſte, duke of Ferrara. This princeſs is celebrated for her talents: ſhe had a great capacity, and an inſatiable thirſt for knowledge, and her ſtudies were not limited to hiſtory, the languages, and mathematics, but embraced various other topics, eſpecially aſtrology and theology. The religious controverſies of the time greatly intereſted her, and ſhe became zealouſly attached to the tenets of the reformers; her court at Ferrara became the refuge of all who were ſuſpected of hereſy; and her conduct gave ſo much offence to the court of France, that Henry II. ſent a doctor to the duke with the following inſtructions: "If the ducheſs perſiſt in her errors, ſhe muſt be ſeparated from all converſation: her children muſt be taken from her, and all her domeſtics who are ſuſpected of hereſy, and who are to be proſecuted; with regard to the princeſs herſelf, the king refers to the prudence of her huſband to proceed againſt her as he ſhall judge proper, avoiding, nevertheleſs, what might occaſion too much ſcandal." After the death of the duke, in the year 1559, this princeſs returned to France, and reſided at her caſtle of Montargis. In the religious wars the duke of Guiſe ſummoned her to deliver up ſome partizans who had taken ſhelter with her, ſhe replied, "I will never deliver up thoſe who look to me for protection; and if you attack the caſtle, I will be the firſt to appear in the breach, to ſee if you will have the audacity to kill a king's daughter." She was, however, at length obliged, much againſt her will, to ſend away 460 perſons, to whom ſhe had afforded an aſylum. She parted with them in tears, after providing for the expences of their journey. At the maſſacre of St. Bartholomew ſhe was the means of ſaving the lives of a great number of Proteſtants. Her four children were taken ſucceſſively from her, and brought into France, to be educated in the principles of the Catholic church. She died at Montargis, in the year 1575. Moreri.

RENEGADO REEF, in *Geography*, a rocky ſhoal in the bay of Honduras, near the coaſt of Mexico. N. lat. 16° 16′. W. long. 88° 50′.

RENEGATE, RENEGADO, a perſon who has apoſtatized, or renounced the Chriſtian faith, to embrace ſome other religion, particularly Mahometaniſm.

They are the renegadoes who prove the moſt barbarous to the Chriſtians when they fall into their hands. The renegate is thus called, *quaſi re-negat Chriſtum*.—Hoveden mentions this in the year 1192, under the name of *renier*, from the French, *renier, to deny again*.

RENDLE, in *Geography*, a river of France, which runs into the Seine near Rouen.

RENDLING CURD, in *Rural Economy*, a term uſed provincially to ſignify the broken curd in cheeſe-making. See CHEESE and DAIRYING.

RENES, in *Anatomy*, the Latin name for the kidnies. See KIDNEY.

RENES *Succenturiati*, the two ſmall bodies, of which one is placed above each kidney. The literal tranſlation of the expreſſion, *reſerve kidnies*, ſeems to indicate a notion, entirely unwarranted by our knowledge of their organiſation and functions, that they might ſupply the place of the kidnies if they failed in their office. Theſe bodies are alſo called capſulæ renales or atrabilariæ, and glandulæ ſuprarenales. They are deſcribed in the article KIDNEY.

RENESBONA, in *Geography*, a river of America, which runs into lake Erie, N. lat. 41° 47′. W. long. 81° 55′.

RENETTE, in the *Manege*, is an inſtrument of poliſhed ſteel, with which they ſound a prick in a horſe's foot.

RENEWING *of Leaſes and Lives*. See REVERSION, ANNUITY, POLITICAL *Arithmetic*, &c.

RENFORCER, Fr., in *Muſic*, to reinforce, to paſs from ſoft to loud, from loud to very loud, not all at once, but by degrees, ſwelling and augmenting the ſound, whether a ſingle note ſuſtained, or a ſeries of notes, till the order to reinforce the note or paſſage is fulfilled, and then return to the common degree of force.

RENFREW, in *Geography*, a royal borough-town in the county of Renfrew, Scotland, is ſituated near the ſouth bank of the river Clyde, at the diſtance of ſix miles from Glaſgow, and 49 miles W. by S. from Edinburgh. Though much inferior in magnitude and population to Paiſley, it is the head-town, or capital of the county. This diſtinction it derives from its ſuperior claims to antiquity, and from the circumſtance of its being incorporated under a royal charter, originally granted by king Robert II., who had a palace in the immediate vicinity. In virtue of that deed it is governed by a provoſt, two baillies, and ſixteen counſellors. In former times it ſent one repreſentative to the parliament of Scotland, and is now a contributary royal borough with Rutherglen in returning a member to the Britiſh legiſlature. About 200 years ago the Clyde paſſed cloſe to the town, but the river afterwards deſerted its ancient courſe, which has been converted into a canal communicating with its preſent channel. By this canal veſſels of 200 tons burthen are enabled to reach the town in ſpring tides; but notwithſtanding the advantage of that conveyance, the trade of Renfrew is very inconſiderable; owing, as Mr. Forſyth juſtly remarks, "to the pernicious effects of borough politics, in withdrawing men from induſtrious habits and purſuits." A ſmall manufacture of thread, and ſome ſoap and candle works, on a confined ſcale, conſtitute the chief ſupport of the town; but many of the lower orders are likewiſe employed in weaving for the manufacturers of Paiſley and Glaſgow. With reſpect to buildings, Renfrew conſiſts chiefly of one principal ſtreet, about half a mile in length, with ſeveral lanes diverging from it. The houſes are wholly conſtructed of ſtone, but are extremely irregular as to ſize, form, and poſition. The public buildings are the church, which is parochial, the town-hall, and a grammar-ſchool. The laſt is under the patronage of the town-council, and is at preſent conducted with much ability. There is no regular market held here, but proviſions of all kinds may always be obtained at a reaſonable price. The

fairs

fairs take place on the third Tuesday in May and July, the 29th of September, and the first Friday in December. A general post-office is established at Renfrew. The revenue of the corporation exceeds 500*l. per annum*, arising from the rents of lands, customs, a salmon fishery on the Clyde, and the profits of a public ferry over that river. This ferry is perhaps the object most worthy of notice of any connected with the town. There is a ferry-house on each side of the river, the property of the corporation; and a ferry-boat constructed in so convenient a manner, that a carriage, with a pair of horses harnessed, can be ferried over and delivered by one man in five minutes. This is accomplished by fixing, on both banks of the river, a rope which runs upon rollers at each end of the boat, and being pulled by the boatman puts it in motion. Renfrew, as the shire town, is the place where all county meetings are assembled, and where the county quarter sessions of the peace are held.

Renfrew parish extends between three and four miles in every direction. The whole is level, inclosed, and in a high state of cultivation. The soil is a rich loam, and the climate is peculiarly healthy, though subject to occasional heavy rains. The burgh lands consist of about a hundred acres. This parish is intersected by the great road between Glasgow and Greenock. Ecclesiastically considered, it is within the presbytery of Paisley, and the synod of Glasgow and Ayr. According to the parliamentary returns of 1811, the number of its houses is estimated at 344, and its inhabitants amount to 2305. Beauties of Scotland, 8vo. vol. iii. Carlisle's Topographical Dictionary of Scotland, 4to. 1813.

RENFREWSHIRE, a county in the south-western division of the kingdom of Scotland, is bounded on the east by Lanarkshire, on the west, north, and north-east by the river Clyde, and on the south-west by the hills of Ayrshire. This county is of small extent, and of irregular shape; and contains, according to the parliamentary returns of 1811, 8409 houses, and a population of 92,596 persons. In general, and especially along the northern parts of it, the surface of the ground is level; but there are nevertheless several ridges of hills within its boundaries, some of which, upon the borders of Ayrshire, are of considerable elevation. The hills of Balagich and of Dunware rise to the height of 1000 feet above the level of the sea; and the isolated hill, called the Craig of Neilston, to 820. This last is covered with fine grass to its very summit. Those adjoining to Ayrshire, however, are bleak and barren, but command very fine views. On the south and west sides, the fertile vale of Cunningham, which seems at a distance to be wholly covered with wood, stretches itself to the shore of the Clyde; while on the north and north-east are beheld the level parts of Renfrew and the city of Glasgow, with the lofty Ben-Lomond towering above the clouds, in the back ground.

The rivers and lakes of this county are not of very considerable consequence in relation to themselves, but by the industry of the inhabitants on their banks, they have been rendered of great importance and utility to society. Unlike the romantic waters of Ayrshire, adorned with wood and exciting interest by the vestiges of ancient magnificence which they every where display, the streams of this district are made subservient to the purposes of human industry. If they descend from a height, it is not to add to the charms of the surrounding scenery, but to give motion to extensive machinery, inclosed within immense piles of building, where hundreds of mortals toil in the service of luxury, or form the materials which are to furnish clothing to distant nations. Here, if a stream spreads abroad its waters, it is not to embellish a park, but to afford convenience to a bleach-field, or to serve a reservoir for the mills in case of drought. In proportion as Glasgow is approached, every thing assumes an aspect of activity, of enterprise, of arts, and of industry. The principal streams are the White-Cart, the Black-Cart, and the Grif, which fall into the Clyde below Inchinnan bridge. The White-Cart, which generally receives, by way of eminence, the Cart, runs in a direction from south-east to north-west, nearly parallel with the Clyde. It takes its rise in the moors of East Kilbride, Lanarkshire, and is particularly celebrated in ancient record for its fine large pearls. These, however, have long disappeared; but the river is become a source of more certain and beneficial wealth by its utility to the manufacturing interests of the county. Above Paisley, which stands upon its banks, it winds its way through a variety of small hills capable of cultivation to their summits; sometimes disappearing altogether, and again spreading its waters abroad into the plain. Below the town it is navigable for small vessels, and is thus beneficial to commerce and trade by facilitating the conveyance of goods. The Black-Cart rises out of Castle-Semple loch, in the parish of Lochwinnoch. From that beautiful lake it descends northward, and receives in its course the waters of the Grif. This last stream has its source in the elevated territory above Largs, which looks down upon the angle formed by the frith of Clyde. After its union with the Black-Cart, these conjoined rivers flow into the White-Cart at Inchinnan bridge. The lakes in the county, besides that of Castle-Semple above mentioned, are Queenside loch, in Lochwinnoch parish, two lochs in Neilston parish, and various other smaller ones, all of them appropriated to useful purposes.

The mineralogy of this county, though not so important as that of some others in Scotland, is nevertheless deserving of attention. In the parishes of Eaglesham and Kilbarchan, the mineral called the osmund stone is frequently found. This remarkable stone is of various colours, and when newly quarried, is so soft that it may be cut with a chissel; but afterwards becomes much harder. It breaks in all directions with unequal and harsh surfaces, readily absorbs water, and if recently heated, the absorption is attended with a hissing noise. Acids do not affect it, nor is it rent or melted by a strong heat. Hence it is much used for paving ovens, furnaces, &c. When burnt, it assumes a darkish colour, and loses three *per cent.* of its weight, but afterwards regains it by absorption. Some of it is considerably porous, and almost semivitrified, in which case, when struck, it emits a clear and strong sound. It is found in large masses in the form of rocks, having the intervening spaces filled with siliceous or calcareous spar, and occasionally with zeolite, steatites, and barytes. This last mentioned substance is found in abundance at Balagich hill in the parish of Eaglesham, where are likewise two very noted mineral springs. But the chief field of minerals in Renfrewshire is that in the vicinity of Paisley, which extends on the one side into the parish of Kilbarchan, and on the other towards Glasgow. That part of it which is most singular is the coal at Quarrel-town, which is undoubtedly one of the most extraordinary masses of that mineral hitherto discovered in the British dominions. Its thickness, measured at right angles, is fifty feet; and it consists of five layers or strata in contact with each other. In consequence of its enormous depth, it is wrought in different floors, in the mode practised in great open quarries. It is difficult to form a just conception of the manner in which this singular mass of coal lies. In a field of fifteen acres, it is found to dip in various directions. At least, conceiving a nearly circular area of these contents, the coal, from the north, the east, and south quarters of that circle, dips pretty uniformly towards the centre. This,

however, is in ſome meaſure interrupted by ſeveral hitches, at one of which the maſs of coal is ſuddenly thrown up about fifty feet, at another above thirty. Theſe hitches interrupt not only the direction, but the degree of the dip. On one ſide of the northern hitch, it is about one foot in three; on the other ſide, only one in ſix. Some years ago, this bed of coal having taken fire, the pillars gave way and the ground ſunk, leaving the ſurface in a very rugged ſtate. The difficulties thus produced, however, have been ſurmounted, and this mineral treaſure reſtored to all its utility. The other coal-mines in the county of Renfrew, are thoſe of Hawkſhead, Cathcart, and Kilbarchan. The firſt has been wrought above 200 years. In the ſame neighbourhood, lime is quarried in great quantities, alſo in Cathcart pariſh. Iron-ſtone accompanies all the coal ſtrata, but is more particularly abundant along the ſhores of the Clyde.

On the agriculture of Renfrewſhire, it will be unneceſſary to offer many remarks. Almoſt every portion of the county is incloſed and cultivated, but graſs lands are far more predominant than arable fields. This ariſes from the great demand which exiſts for the products of the dairy, the garden, and the fold, in conſequence of the vicinity of trading and manufacturing towns, and the vaſt importation of grain which takes place from other parts of the country, or from abroad. Here the farmers are more ſenſible than to object to a free commerce in that article; becauſe they do not envy the inhabitants of leſs populous diſtricts, who find no better employment for their lands than that of ſcourging them by endleſs crops of grain. One would imagine that the practice in this diſtrict alone ought to decide the principle of the corn laws. Here, free importation, ſo far from injuring the farmer, augments the value of the ſoil in every reſpect, ſimply by increaſing the ratio of population.

The lands here differ according to their vicinity to the Clyde, or in the lower part of the county, according to their proximity to the waters of the Cart. In the pariſhes of Eaſt-Wood and the abbey of Paiſley, the lands are beautifully interſperſed with ſmall riſing hills, although the ſoil is generally of a thin clay. Here the farmers keep one half of their grounds in graſs, which they conſider as the moſt important crop. In the upper diſtrict of the county, which comprehends the pariſhes of Mearns, Eagleſham, Neilſton, Lochwinnoch, Kilbarchan, Erſkine, and Kilmalcolm, the lands are peculiarly adapted for paſturing ſheep, but none of them are ſo ſtocked, excepting ſome incloſures about gentlemen's ſeats, and a few parks in Neilſton pariſh. The pariſh of Mearns is perhaps unequalled in Scotland for numerous ſmall hills. The farmers here make large quantities of butter. The cows are ſmall, of a brown and white colour, and are chiefly of the Ayrſhire breed. Twelve of them afford, during the ſummer months, about ſixty Engliſh gallons of milk daily. Towards the northern part of the county, in Kilmalcolm pariſh, the incloſures are generally formed of ſtones piled up to the height of four feet. The rotation of crops is three ſucceſſive crops of oats, and ſix years of paſturage. Farm ſervants are uſually unmarried, and live in the farmers' houſes. The horſes are of the beſt kind, and draw, in a ſingle horſe cart, from 17 cwt. to a ton. Farms throughout the whole county are on a ſmall ſcale; few of them exceed ſeventy acres.

Renfrewſhire contains one borough-town, Renfrew, and three large manufacturing and commercial towns; *viz.* Paiſley, Greenock, and Port-Glaſgow, all of which are noticed under their reſpective names. Here are likewiſe ſeveral populous and thriving villages, ſuch as Pollockſhaws, Bridge of Johnſton, and Lochwinnoch, which are chiefly inhabited by weavers, who derive employment from the manufactories of Glaſgow and Paiſley. The principal manufactured products are thread, ſilk-gauze, and different kinds of cotton goods.

Various remains of antiquity are ſtill viſible in this county. At Paiſley was a celebrated abbey for monks of the order of Clugni, the ruins of which are much admired. Here is alſo an old chapel, in the early pointed ſtyle, which is noted as the burial place of Margery Bruce, and ſeveral of the earls of Abercorn. In the pariſh of Kilbarchan, near Caſtle-Semple, is one of thoſe monſtrous maſſes of whinſtone, believed to be a druidical altar. It is twelve feet in height, and ſixty-ſeven feet in circumference; and is known by the name of Clochodrigſtone, a corruption of the Gaelic, Cloch-a-Drugh, the Druid's ſtone. It is compoſed of the ſame ſort of whinſtone of which the neighbouring hills are formed, and has probably been hewn from an elevated rock to the eaſtward, on which is a farm-houſe, called alſo Clochodrig; but by what mechaniſm it was conveyed cannot, in the preſent application of the mechanical arts, be eaſily determined. It reſts upon a narrow baſe; but the lower part of it has been covered with ſtones gathered from the land. At ſome diſtance are ſeveral large grey ſtones, ſuppoſed to have been part of a ſacred circle ſurrounding the altar. The pariſh of Cathcart is noted for being the ſcene of the battle of Langſide, the laſt conteſted by the unfortunate queen Mary, to regain her authority. The place where the action was fought is an eminence riſing rapidly on the north and weſt ſides, and deſcending very gradually on the ſouth and weſt ſides. On the ſummit is an elliptical intrenchment, commonly called queen Mary's camp; but which is undoubtedly of much higher antiquity, and probably of Roman origin. On an hill, oppoſite to Langſide, is the old caſtle of Cathcart, near which queen Mary ſtood during the battle, and witneſſed the diſcomfiture of her friends, and the annihilation of her hopes. On the other ſide of this range of hills is another ancient caſtle, now in ruins, which belonged to the anceſtors of the great reformer Knox; and at a ſhort diſtance from it, on an elevated rock, may be ſeen one of thoſe green artificial hills, uſually called moats. It is of a ſquare form, the ſides facing the four cardinal points; the weſtward reſts on the precipitous edge of the ſteep rock; and the remaining ſides are defended by a deep trench, cut out of the ſolid ſtone. Each ſide of this mount meaſures ſixty feet in length at the baſe, and nineteen at the ſummit; and is twenty-one feet high. The top appears to have been a hollow ſquare, ſurrounded by a parapet, with an entrance on the eaſtern ſide. No fewer than five other artificial mounts can be ſeen from the one deſcribed; alſo a Roman encampment near Paiſley, diſtant about five miles. On the top of Barhill are the remains of a rude encampment, which occupies the ſummit of a precipice, formed of a perpendicular rock of a baſaltic appearance, which defends it on the north; and on the ſouth it has a parapet of looſe ſtones. The tradition in the neighbourhood is, that it was an encampment of the celebrated ſir William Wallace. The pinnacle of rock is ſhewn where they ſay Wallace ſat while he enticed the Engliſh forces into a bog at the bottom of the rock, where they were all deſtroyed; but no hiſtorian confirms this ſtatement. In an iſland of Caſtle-Semple loch is ſtill to be ſeen the Pail or Peel, an old caſtle, to which the lairds of Semple were accuſtomed to retreat in times of unuſual danger. In the lake, canoes hollowed out of ſingle trees, like thoſe of the Indians, have been occaſionally diſcovered. Lower down the country the ruins of the caſtle of Newark chiefly claim attention. It ſtands on the eaſtern point of the bay, on which the town and harbour of Port-Glaſgow is

ſituated. When entire it conſiſted of a ſquare court, with a tower at one angle, which is by far more ancient than any other portion of the building, When, or by whom it was erected, is unknown: this caſtle was long the property of the Dennieſtouns of that ilk, and afterwards came into the poſſeſſion of the family of Maxwell. In this county is a variety of objects bearing the name of the renowned and patriotic Wallace, who was a native of the village of Elderſlie, in the neighbourhood of the town of Paiſley. See WALLACE.

The only other objects of antiquarian intereſt we ſhall mention, are four communion cups, ſtill preſerved in Kilmalcolm pariſh, and which were uſed by John Knox in adminiſtering the ſacrament of our Lord's ſupper. They appear to have been originally candleſticks; and it was perhaps only from the neceſſity of the times that they were converted to this pious purpoſe. They are of the pureſt ſilver; and, whether from the aſſociation of ideas, or their actual faſhion, have a very antique and venerable appearance. Beauties of Scotland, vol. iii. 8vo. 1806.

RENGAH, a town of Sweden, in Weſt Bothnia; 30 miles N.N.W. of Umea.

RENGO, a town of Sweden, in the province of Tavaſtland; 8 miles S.S.W. of Tavaſthus.

RENI, GUIDO, in *Biography*, the principal painter of the Caracci ſchool, was born at Bologna in 1574. At an early age he became the diſciple of Denis Calvart, a Fleming of great reputation, but afterwards ſtudied under the Caracci, preferring the ſtyle of Ludovico to that of Annibal, becauſe there appeared more of grandeur and of grace in his compoſitions than in thoſe of the others.

When he left the Caracci, he went to Rome; and with a mind intent upon forming a ſtyle of art for himſelf, ſtudied the works of Raphael, with which he ſeemed enraptured; but the vigour and force with which the recent works of Caravaggio were conducted attracted him, and for a while he attempted to follow it. Happily he was diverted from it by an obſervation of Annibal Caracci; *viz.* that the beſt mode of rivalling the renown of Caravaggio might perhaps ariſe from a different mode of art, by contraſting his confined and lamp-like effects with a broader and more ample light; and for his vulgar forms, and obſcure outline, ſubſtituting clearneſs in the parts and forms, built upon the pure models of antiquity. This remark, made in ſpleen by Caracci, operated powerfully on the mind of his ſkilful pupil, and induced him to try its truth. He immediately devoted himſelf to the ſtudy of what was graceful and agreeable in form, colour, and effect; and his ſucceſs is teſtified by numberleſs beautiful productions, of which we poſſeſs many in England; and France is ſtill more rich in them.

His compoſition is not, however, ſo free from affectation as the nature of the ſubjects he choſe demanded; the very attempt to make them graceful, too frequently militated againſt its object, and he ſubſtituted the grace of the theatre for that of nature. In his female heads and proportions, his model was the antique: and the character and features of the daughter of Niobe is diſcernible in moſt of them. He dreſſed them with becoming elegance, and executed the different parts with great freedom and truth of pencil; not unfrequently, however, in a tone of colour too light, or too leaden for fleſh; with a greeniſh hue, which rather characterifes the hand of death, or the coldneſs of marble, than the glowing warmth of life, and the flexile ſoftneſs of nature.

His diſpoſition of draperies was elegant; judiciouſly applied to the filling up of voids in the grouping of limbs, or figures, and was wrought with the greateſt freedom; yet finiſhed with almoſt minute attention to the foldings. Theſe he arranged in a grand ſtyle, but they not unfrequently exhibit the ſtudy which he beſtowed upon them; and appear to ariſe rather from the neceſſities of art, than the actions of the figures. The execution of his pictures is of the moſt free and agreeable kind; manifeſting a perfect underſtanding of nature; the touch being light, full, and delicate; and though they are finiſhed very highly, yet there remains no appearance of labour. In expreſſion, he ſometimes attained the greateſt perfection; as in the head of our Saviour in the Louvre, and of which the preſident Weſt has a very fine duplicate: but, in general, it was rather the grace and artifice of the theatre which guided him; and his figures appear to act more than to feel. Such was the reſpect paid to his abilities, that he was crowned with honour and riches; but it is lamentable to add, that one vice, in which he indulged after he had paſſed the meridian of life, *viz.* gaming, robbed him of both, and reduced him to poverty and diſgrace; from which he was not able to free himſelf during the remainder of his life, which continued till he had attained the age of 67.

In the gallery of the Louvre there are between 30 and 40 of the works of Guido, large and ſmall, and in his various manners; and as he there comes in immediate competition with his maſters, connoiſſeurs have an excellent opportunity of judging of his comparative merit. We have alſo a great many of his eaſel pictures in England, but they are ſcattered about in various collections.

RENI, in *Geography*, a town of European Turkey, in Beſſarabia, on the Danube; 40 miles W. of Iſmail. N. lat. 45° 23′. E. long. 28° 44′.

RENIFORME FOLIUM, in *Botany*, a kidney-ſhaped leaf. See LEAF.

RENITENCY, RENITENTIA, or *Reniſus*, among *Philoſophers*, that force in ſolid bodies, by which they reſiſt the impulſe of other bodies; or re-act as much as they are acted on.

RENKY, in *Rural Economy*, a term provincially ſignifying tall or high, when applied to animals, &c.

RENNEBAUK, in *Geography*, a river of America, in the province of Maine, which runs into the Atlantic, N. lat. 43° 20′. W. long. 70° 27′.

RENNEBO, a town of Norway, in the province of Drontheim; 36 miles S. of Drontheim.

RENNEL's SOUND, a bay of the North Pacific ocean, on the W. coaſt of Queen Charlotte's iſland. N. lat. 53° 28′. W. long. 133°.

RENNERSDORF, a town of Sileſia, in the principality of Neiſſe; 8 miles E. of Neiſſe.

RENNES, a city of France, and chief city of the department of the Ille and Vilaine; and, before the revolution, the ſee of a biſhop, and capital of Bretagne; ſituated on the Vilaine, by which it is divided into two parts. It is large and populous, containing eight pariſh churches, beſides the cathedral and ſeveral convents. The four parts which it comprehends are denominated the north-eaſt, ſouth-eaſt, ſouth-weſt, and north-weſt The firſt contains 5950 inhabitants, and its canton 13,147, on a territory of 142½ kiliometres, in 7 communes; the ſecond contains 5253 inhabitants, and its canton 12,064, on a territory of 97½ kiliometres, in 4 communes; the third contains 3081 inhabitants, and its canton 12,254, on a territory of 142½ kiliometres, in 9 communes; and the fourth part contains 11,620 inhabitants, and its canton 14,332, on a territory of 37½ kiliometres, in 3 communes. N. lat. 48° 7′. W. long. 1° 36′.

RENNET,

RENNET, in *Rural Economy*, a term applied to the coagulum for making cheeſe. It is prepared from the bag, maw, or ſtomach, of the young calf, by a ſort of ſalt pickle. It is of vaſt advantage in the art of cheeſe-making to have good ſweet rennet, the particular mode of managing which may be ſeen under the heads CHEESE, DAIRY, and DAIRYING.

The preparation is formed in different modes, in different cheeſe diſtricts, in the different parts of the kingdom; but moſtly either in the manner of a ſolution, or that of a dry ſkin. As there is, however, much variation in the quality or ſtrength of the different ſkins, it is probably the beſt method to reduce them into the ſtate of a ſolution; as, by that means, the neceſſary quantity, in every caſe, may be the beſt aſcertained.

In ſome places, it is found the moſt certain practice to prepare the whole of the dried maw ſkins, which are required for a ſeaſon, at one time, by pickling and ſteeping them in different ſeparate quantities of pure ſpring water and ſalt, in an open veſſel, or veſſels, mixing the different infuſions together, and then paſſing them through a fine linen ſieve, afterwards adding rather more ſalt to the whole than can be retained in the ſtate of ſolution, as ſhewn by the appearance of ſome at the bottom of the veſſel. The extraneous ſcummy matter, that comes to the ſurface, is continually to be removed as it riſes, and freſh portions of ſalt occaſionally ſupplied, as they may be wanted. In this ſtate it is ready for uſe, about four ounces being ſufficient for a large cheeſe.

In other parts, the maw ſkins are ſimply well ſalted, and ſteeped in ſalt pickle for ſome length of time; then well dried, by being ſpread out by means of ſmall pieces of ſticks; in which ſtate they are made uſe of, by cutting pieces from the top and bottom parts of them, about the ſize of a half-crown for a middling-ſized cheeſe, as thoſe parts are in general the ſtrongeſt.

And the following method of preparing rennet is practiſed in the northern parts of the iſland, and deſcribed as the moſt approved method in the Report on Agriculture for Argyleſhire. Take the maw ſkin of a calf, which has fed entirely upon milk: after it is cold, waſh it gently in water, fill it nearly with ſalt, and place it on a layer of ſalt in the bottom of an earthen mug. One or two more, with ſalt between, and a good deal above them, may be put in the ſame mug, and kept in a cool place, with a ſlate on the top, for ſix or eight months, or till cheeſe-making time next year. The ſkins are then taken out, and the brine allowed to drain from them; after which they are diſtended on ſmall hoops or ſplinters put croſs-wiſe within them, till they dry. Put the ſkins then in an open veſſel, with three pints of pure ſpring water for each ſkin. Let them ſtand twenty-four hours; after which take them out, and infuſe them other twenty-four hours in other water, but not more than a third of the former quantity. Mix theſe two infuſions together, paſs them through a fine linen ſieve, and give them ſalt till the water is more than ſaturated, and ſome remain undiſſolved at the bottom. Rather leſs than a gill will ſerve for thirty-eight pounds of cheeſe. It is remarked, that, inſtead of two infuſions, ſome uſe only one, giving four Engliſh pints to the ſkin, and direct the water to be firſt boiled, and mixed with ſalt into brine that will ſwim an egg, and then to let the heat go off till it is lukewarm, before the ſkin is put in twenty-four hours to ſteep.

It was formerly the practice to mix different kinds of aromatic herbs with the rennet; but the cuſtom is much laid aſide at preſent. The manner of doing it is this: when the maw ſkin is well prepared, two quarts of ſoft pure water ſhould be mixed with ſalt, in which ſhould be put ſweet briar, roſe-leaves, and flowers, cinnamon, mace, cloves, and, in ſhort, almoſt every ſort of ſpice and aromatic that can be procured. Boil them gently till the liquor is reduced to three pints, taking care it be not ſmoked. Strain it clear from the ſkins, and, when milk-warm, pour it into the maw; a lemon may then be ſliced into it, and remain a day or two, after which it ſhould be ſtrained, and put in a bottle well corked, and it will keep good for a year or more. A ſmall quantity will turn the milk, and give the cheeſe a pleaſing flavour.

RENNO, in *Geography*, a town of the iſland of Corſica; 3 miles N.E. of Vico.

RENO, a river of Italy, which riſes a little to the N. of Piſtoia, and runs into the Po, 4 miles above Ferrara.

RENO, a department of Italy, ſo named from the above-mentioned river. It conſiſts of part of the Bologneſe, and contains 199,300 inhabitants, who elect 15 deputies. The capital is Bologna.

RENOGRUND, a ſmall iſland on the E. ſide of the gulf of Bothnia. N. lat. 63° 59′. E. long. 23° 3′.

RENOVATOR, in *Horology*, is a watch that has the property of *renewing* the power of its main-ſpring, or of winding itſelf up, by periodic jerks that it receives from the human body in motion. Recordon of Charing-Croſs, London, took out a patent for this contrivance ſome years ago, which is more ingenious than uſeful: for, while it profeſſes to keep the watch going, without the uſual winding up, ſo long as the watch is worn in the pocket, it foregoes the more uſeful property of the fuſee, and renders the maintaining power very unequal at different times of the day. And ſhould the watch remain ſuſpended, or laid down in a ſtate of reſt, for more than 24 hours, it will ceaſe to perform; ſo that inſtead of being a watch that will go without winding, it requires to be wound many hundred times in the day, by ſmall ſucceſſive quantities, before it will continue to perform throughout the night. We have been favoured by the inventor with a copy of ſo much of the ſpecification as will ſuffice to give our readers an idea of the mechaniſm, and of its mode of action; both which we have examined, and found correſponding with the ſpecification. Others have varied the conſtruction; but the original, we conceive, will be deemed ſufficient for us to particularize, which we will do by a reference to *figs.* 1, 2, and 3, in *Plate* XLIII. of *Horology*, which are copied from the inventor's drawing.

Exact Copy of the Specification, N° 1.—"Letter H repreſents a weight of ſilver, or other metal, which is in equilibrium in the poſition it is viewed, being ſuſtained ſo by a ſpiral ſpring fixed to its arbor, as deſcribed by *fig.* 3. In wearing the watch, or by any external motion that lifts the watch up, it loſes its ſtate of reſt; and by its vis-inertiæ (matter) overcoming the ſtrength of the ſpring, it yields to the laws of gravity, and falls upon the lower ſpring, marked *e e*. When the watch, by the motion of the body, deſcends, the ſpring *e e*, and the aforeſaid ſpiral ſpring, are left at liberty to exert themſelves, and return the weight upwards, till it touches the other ſpring *e e*; and thus, by the motion of the body, is this weight alternately thrown up and down, which turning the ratchet-wheel, marked C in *fig.* 2, which is fixed on the arbor of the weight juſt below the ſpiral ſpring, gathers a few teeth every motion in the wheel P, and being prevented from returning by the click M, carries forward the wheel with a pinion of 10, marked E, which turns the wheel B; which having a pinion of 12 at G, takes into and turns a wheel under the barrel A, which is fixed on the barrel arbor, and by that means is the ſpring wound up.

The upper part of the barrel arbor, marked *b*, has a tooth, which gains a tooth in the wheel, *a*, every revolution; and that brings the pin *c* nearer to the centre, which, when it arrives in a certain poſition, raiſes the piece K (*fig.* 1.), of which the centre, B, (not ſeen in the figure) is conical, in order that when the ſaid pin *c* comes near it, it raiſes it with eaſe, and forces it into the holes, marked N, N, N, in the weight marked H (*fig.* 1.), which effectually ſtops its motion, and prevents the ill conſequence of over-winding.

L is a cock that carries the pivot of the barrel's axis.

I is a cock that carries the pivot of the wheel H.

A is the barrel which carries a wheel, that catches the pinion D, which carries the minute-hand."

The patent was obtained in July 1780; and part 2d of the ſpecification contains drawings, and a plan for applying the ſame principle to the fuſee; but we do not underſtand that it has yet been made to anſwer.

RENRITH, in *Geography*, a town of Germany, in the county of Henneberg; 3 miles S. of Schleuſingen.

RENS, Rense, or *Rees*, a town of France, in the department of the Rhine and Moſelle; near which, in the Rhine, is a remarkable monument of antiquity, called the "Königſtuhl," or "Thronus regalis," conſiſting of a round vault, built of free-ſtone, and reſting upon nine ſtone pillars, one of which ſtands in the middle. This vault is 80 feet in circumference, furniſhed above with ſeven ſeats, agreeable to the number of electors at that town. The aſcent to it is by ſtairs of ſtone, conſiſting of 28 ſteps, and it has two ſtrong doors. On this regal chair the electors formerly held previous conſultations for ſome time, concerning the election of a king and emperor; and when that election could not be performed at Francfort, it was done at this place; and here were alſo tranſacted the notification and elevation of the elected perſonage, and alſo the conſultations of the electors concerning the weighty matters of the empire, as well as a ſolemn confirmation of their privileges on the part of the emperors. Here alſo was eſtabliſhed, in the year 1338, the electoral league. Maximilian I. is thought to be the laſt emperor who was brought hither; 5 miles S. of Coblentz. N. lat. 50° 18′. E. long. 7° 37′.

RENSEN, a lake of Pruſſia, in the palatinate of Culm; 10 miles N.N.E. of Culm.

RENSSELAER, a county of New York, bounded N. by Waſhington county, S. by Columbia, E. by part of the ſtates of Maſſachuſetts and Vermont, and W. by Hudſon river. It contains eight townſhips, *viz.* Troy, Greenbuſh, Schodack, Stephentown, Peterſburg, Hoſick, Pittſtown, and Schaetekoke. It contains 36,309 inhabitants.

RENSSELAERVILLE, or Rensselaerwick, a townſhip of Albany county, New York, bounded S. by Columbia county, and W. by Hudſon river. In this townſhip, oppoſite to the city of Albany, is a medicinal ſpring, combining moſt of the valuable properties of the celebrated waters of Saratoga.

RENT, Reditus, in *Law*, a profit, ſuch as a ſum of money, or other conſideration, iſſuing yearly out of lands or tenements, alienated on that condition.

The word rent, or render, *reditus*, ſignifies a compenſation, or return; it being in the nature of an acknowledgment given for the poſſeſſion of ſome corporeal inheritance. Co. Litt. 144.

It is thus called from the corrupt Latin, *rendita*, for *redditа*, of *redditus*; becauſe, as Fleta tells us, *retroit, et quotannis redit.*

The original of rents is to be ſought for in the conſtitution of the ancient feuds, which were of a military nature, and in the hands of military perſons: however, the feudatories, being under frequent incapacities of cultivating and manuring their own lands, ſoon found it neceſſary to commit part of them to inferior tenants, obliging them to ſuch returns in ſervice, corn, cattle, or money, as might enable the chief feudatories to attend their military duties without diſtraction; which returns, or *reditus*, were the original of rents.

Under the pure feudal ſyſtem, this reditus, return, or rent, conſiſted, in chivalry, principally of military ſervices; in villenage, of the moſt ſlaviſh offices; and in ſocage, it uſually conſiſts of money, though it may ſtill conſiſt of ſervices, or of any other certain profit.

Rent is regularly due and payable upon the land from whence it iſſues, if no particular place is mentioned in the reſervation (Co. Litt. 201.); but, in caſe of the king, the payment muſt be either to his officers at the exchequer, or to his receiver in the country. (4 Rep. 73.) And ſtrictly the rent is demandable, and payable before the time of ſunſet of the day in which it is reſerved; though ſome have thought it not abſolutely due till midnight. 1 Saund. 287. Prec. Chanc. 555. Salk. 578.

The uſual remedy for non-payment of rent is diſtreſs; however, by the common law, diſtreſſes were incident to every *rent-ſervice*, and by particular reſervation to *rent-charges* alſo, but not to *rent-ſeck*, till the ſtatute 4 Geo. II. c. 28. extended the ſame remedy to all rents alike. Moreover, by this ſtatute it is enacted, that every landlord, who hath, by his leaſe, a right of re-entry in caſe of non-payment of rent, when half a year's rent is due, and no ſufficient diſtreſs is to be had, may ſerve a declaration in ejectment on his tenant, or fix the ſame upon ſome notorious part of the premiſes, which ſhall be valid, without any formal re-entry or previous demand of rent. And a recovery in ſuch ejectment ſhall be final and concluſive, both in law and equity, unleſs the rent, and all coſts, be paid or tendered within ſix calendar months afterwards. Other remedies are action of debt, an aſſiſe of mort d'anceſter or novel diſſeiſin, the writ de conſuetudinibus et ſervitiis, which compels a ſpecific payment of the rent, the writ of ceſſavit, and the writ of right ſur diſclaimer.

For an account of the rental of England and Wales, ſee Political *Economy*.

The lawyers ordinarily reckon three ſorts of rents, *viz.* *rent-ſervice*, *rent-charge*, and *rent-ſec*.

Rent-*Service*, is where a man holds lands of his lord by fealty, and certain rent; or by fealty-ſervice, and certain rent; or that which a man, making a leaſe of lands to another for term of years, reſerveth to be yearly paid for them.

Rent-ſervice is ſo called, becauſe it hath ſome corporal ſervice incident to it, as at the leaſt fealty, or the feudal oath of fidelity. (Co. Litt. 142.) For, if a tenant holds his land by fealty, and 10*s.* rent; or by the ſervice of ploughing the lord's land, and 5*s.* rent: theſe pecuniary rents, being connected with perſonal ſervice, are therefore called rent-ſervice. And for theſe, in caſe they be behind, or in arrear, at the day appointed, the lord may diſtrein of common right, without reſerving any ſpecial power of diſtreſs; provided he hath in himſelf the reverſion, or future eſtate of the lands and tenements, after the leaſe or particular eſtate of the leſſee or grantor is expired. Litt. § 215.

Rent-*Charge*, is where a man makes over his eſtate to another by deed indented, either in fee, or fee-tail, or for term of life; yet reſerves to himſelf, by the ſame indenture, a ſum of money yearly to be paid to him, with a clauſe of diſtreſs

diſtreſs for non-payment: ſo called, becauſe, in this manner, the land is charged with diſtreſs for the payment of it. Co. Litt. 143.

Rent-*Sec*, or *Dry-Rent*, or *Barren-Rent*, is that which a man, making over his eſtate by a deed indented, reſerveth yearly to be paid to him, without any clauſe of diſtreſs mentioned in the indenture. There are alſo other ſpecies of rents, which are reducible to theſe three.

Rents *of Aſſize*, are the certain eſtabliſhed rents of the freeholders, and ancient copyholders of a manor; thus called, becauſe aſſized and certain, in oppoſition to *reditus mobiles*.

Thoſe of the freeholders are often called *chief rents*, *reditus capitales*, and both ſorts are indifferently denominated *quit rents*, becauſe by them the tenant goes quit and free of all other ſervices. When theſe payments were reſerved in ſilver or white money, they were anciently called *white* rents, or blanch-farms, *reditus albi*; in contradiſtinction to rents, reſerved in work, grain, or baſer money, which were called *reditus nigra*, or black-mail. 2 Inſt. 19.

Rent, *Fee-farm*, is a rent-charge iſſuing out of an eſtate in fee; of at leaſt one-fourth of the value of the lands at the time of its reſervation. (Co. Litt. 143.) *Rack*-rent is only a rent of the full value of the tenement, or near it. For a grant of lands, reſerving ſo conſiderable a rent, is indeed only letting lands to farm in fee-ſimple, inſtead of the uſual method for life, or years.

Theſe are the general diviſions of rent; but the difference between them (in reſpect to the remedy for recovering them) is now totally aboliſhed; and all perſons may have the like remedy by diſtreſs for rents-ſec, rents of aſſize, and chief-rents, as in caſe of rents reſerved upon leaſe. Stat. 4 Geo. II. c. 28.

Rents *Reſolute*, are reckoned among the fee-farm rents to be ſold by the ſtat. 22 Car. II., being ſuch rents or tenths as were anciently payable to the crown from the lands of abbeys and other religious houſes; which lands, upon the diſſolution of abbeys, being demiſed to others, the ſaid rents were ſtill reſerved, and made payable to the crown.

Rents, *aſſart*, *chauntry*, *chief*, *gold*, *paſchal*, *rack*, *quit*, and *white*. See the ſeveral adjectives.

Rent, in *Agriculture*, the price paid for lands as farms by the tenants of the proprietors. The rents of lands are ſo extremely various, according to the nature of the ſoil, ſituation, markets, the ſtate of the fences, buildings, and other conveniences, the eaſe of obtaining manures, and many other circumſtances, as to be almoſt incapable of having any general ſpecific prices affixed to them. They were formerly, eſpecially in the northern parts of the iſland, paid in produce and perſonal ſervices; but at preſent, according to Mr. Donaldſon, over the greateſt part of the iſland, they are paid in money, and at two periods or terms in the year. In England, Michaelmas and Lady-day are the cuſtomary terms of payment; the firſt payment commences ſix months after entry to the poſſeſſion of the farm. But that in Scotland, the ordinary terms are Martinmas and Whitſuntide, or Whitſuntide and Martinmas, the tenant being allowed twelve months' credit of the firſt half of the rent in the one caſe, and in the other eighteen. And he obſerves, that this difference in the terms of the payment of rents is material in the purchaſe of landed property, being in general nearly one year's purchaſe in favour of England. And it is farther ſtated, that it was the cuſtom of former times, in various parts of Great Britain, for the tenants to pay what was called *fore-hand* rents, that is, paying the half, and in ſome caſes, the whole year's rent immediately on entering to the farm, and before any benefit was derived from the poſſeſſion of it. This practice is, however, now generally diſuſed, although ſtill kept up in ſome parts of Staffordſhire and Perthſhire, in ſome degree. And we believe that it ſtill prevails in ſome places in Ireland. It is likewiſe added, that letting lands for a term of years at the former rent, but making the farmer pay a conſiderable ſum in ready money by way of fine, was alſo a very common cuſtom; but is now chiefly confined to the crown and church lands in England. This mode was evidently attended with bad conſequences. By draining the tenant of all, or greateſt part of his ready money, he was prevented from improving his farm. Leaſes of lands are conſidered in law as heritable property; therefore, in the event of the demiſe of the tenant, ſoon after having completed a tranſaction of this nature, his eldeſt ſon ſucceeded to the leaſe, and the widow and other children were of courſe, in many inſtances, reduced to poverty; all that was left to them being their proportion of the ſtock on this farm, and often thereby the heir was rendered incapable of keeping poſſeſſion of the farm. In a word, in nine caſes out of ten, it was robbing the tenant of the well-earned reward of his induſtry, during the exiſtence of the former leaſe, and depriving him of the means of turning his new acquiſition to the beſt account; without giving any ſolid advantage in return for it.

It is remarked alſo, that along the greateſt part of the eaſt coaſt of Scotland, which is the principal corn country in the kingdom, a conſiderable proportion of the rent of almoſt every farm is paid in grain and oatmeal. Theſe articles being leſs fluctuating in their value than money, this appears the moſt equitable mode in which the rents of corn farms can be paid. It may indeed affect the farmer's intereſt when any ſudden and unexpected riſe takes place in the price of grain; but if a judgment can be given from experience, it will be found this very ſeldom happens. On the contrary, for theſe laſt twenty years, with only two exceptions, 1783 and 1795, the price of grain, owing to the operation of the corn laws, has been extremely moderate, while every other production of a farm has been doubled in value, and in many caſes tripled. Since theſe periods, the price of this article has, however, riſen, and continued high. The public are often eſſentially benefited by ſo great a proportion of the rents being paid in this way. Many of the proprietors have granaries erected on their eſtates, where, in times of plenty, they ſtore the grain and meal which they receive from their tenants. And every perſon, who is in any degree acquainted with the agricultural exports and imports which take place between ſome diſtricts in Scotland and others, muſt, he thinks, know that the ſupplies afforded on many occaſions from theſe ſtore-houſes have been the means of preventing ſcarcity, and an unreaſonable advance in the price of theſe articles in the large manufacturing towns and other populous places. In Eaſt Lothian, according to the agricultural report of that diſtrict, it has been ſuggeſted by ſome proprietors, that one half of the rent ſhould only be paid in money, the other in kind; and aſſigned as a reaſon, that the profit or loſs ariſing from any material, as the riſe or fall in the price of grain, would, in that way, be equally divided between the landlord and tenant. This is a mode probably founded on equity and juſtice. And it is further ſtated, by the firſt writer, that in the moſt northern parts of Scotland, the rents are, to a certain extent, paid in perſonal ſervices. The tenants are bound to plough and harrow a certain portion of the landlord's farm, to reap, carry home, threſh, dreſs, and mill a certain quantity of the crop. They are alſo bound to pay poultry, eggs, butter, cheeſe, ſheep, ſwine, linen

linen yarn, fiſh, &c. ; in a word, they are more the ſlaves of the landlord than their own maſters.

Theſe are ſhameful feudal practices, which the proprietors of ſuch lands ſhould remove as ſoon as poſſible, as without it their intereſts muſt ſuffer greatly from the lands remaining without improvement. Beſides, it is a ſpecies of bondage highly diſgraceful to civilized ſociety. The able author of the Agricultural Report of the county of Argyle in Scotland, thinks that all ſervices, whether paid to the maſter or to any under him, ſhould be entirely aboliſhed ; and all rents formed into one ſum of money, including public burdens, ſuch as miniſters' ſtipends, ſchoolmaſters' ſalary, road money, &c. Thus, ſays he, the tenant would have always a clear view of the amount of his rent, and ſave time and trouble, and perhaps expence, by having to ſettle with one only inſtead of many. His time is precious, and ſhould never be thrown away without neceſſity.

In regard to the parliamentary and parochial taxes, they may be ſaid to be paid, the firſt writer ſays, by the tenants over the greateſt part of both kingdoms ; and many leaſes contain a clauſe, he obſerves, binding the tenants to pay, not only all the taxes that are impoſed, but alſo all that may be impoſed. But, he thinks, that it appears abſurd that the proprietors, whoſe intereſt it is to attend to the increaſe or decreaſe of all ſuch taxes as more immediately concern their property, ſhould devolve the payment of thoſe taxes on their tenants. They muſt know, that whoever pays them in the firſt inſtance, to them the lands are of leſs value, in conſequence of ſuch taxes having been impoſed. They ought alſo, he thinks, to conſider that their influenee might be the means of keeping the moſt extravagant of them, ſuch as the tithes and poors' rates, within more reaſonable bounds, than it is to be expected the utmoſt exertions of the tenants can be able to effect. And that, further, proprietors could aſcertain the value of their property with more minute exactneſs, were they, on the one hand, to receive from their tenants the full rents which their lands are worth, and, on the other, pay all taxes to which they are ſubjected. The intereſt of agriculture, and the eaſe and comfort of the farmers, would at the ſame time, he thinks, be eſſentially promoted, were they relieved from theſe teaſing exactions and compoſitions with which they are ſo frequently moleſted, particularly in this part of the kingdom.

And he ſuggeſts, in reſpect to the general price of renting lands, that when it is conſidered how many circumſtances operate in determining the rent of land, and how much theſe frequently vary in the ſame pariſh or lordſhip, it will be found impoſſible to form any correct idea in regard to the rents payable by the acre for the various kinds of ſoil over the whole iſland. Any conjecture that may be formed (for the ſubject admits, he ſays, no more) muſt be vague and incorrect. It is ſuppoſed, that the remarkable change that has taken place in the ſituation of the kingdom and the manners of the people, by the abolition of the feudal ſyſtem, the increaſe of commerce, manufactures, and agricultural improvements, with the immenſe additional quantity of paper-money introduced within theſe few years into circulation, have had the effect of enhancing both the value and rent of lands. While theſe flouriſh, and paper-money ſupports its nominal value, lands in property or leaſe muſt neceſſarily, he thinks, continue to advance. But that, ſhould any croſs accident interrupt the former, or depreſs the value affixed to the latter, the recent great advance in the rent of lands, in various parts of the iſland, would render ſuch calamities more univerſal in their effects, and of courſe of more ſerious conſequence to the country.

The rent of land is kept up by a great variety of local cauſes, as the particular nature of the farms, their extents, the goodneſs of the roads and markets, the convenience of canals and other ſorts of water carriage, and many other circumſtances of a ſimilar nature. In dairy and graſs diſtricts, as well as ſome others, rents are kept up by the particular modes of occupation, in many inſtances. Many little advantages are connected with the former ; while the latter has not any heavy expences to contend with. Small farms are conſtantly higher rented than thoſe of the larger kind. Convenient carriage and large markets are always favourable to rents. Local convenience has invariably great influence in raiſing the rent of land. In ſhort, it has been ſuggeſted by an able writer, that every ſort of improvement in agriculture, as well as manufactures, has a tendency to advance the rent of land ; and that, if, to the practical excellence of the former, improvements in the latter ſhould be added, with a more extended commerce, rents may be raiſed to an extraordinary degree. While the contrary of theſe matters is calculated to reduce the quantity of wealth, and, of courſe, to lower the rent of land ; conſequently rent riſes and falls with the proſperity or declining ſtate of the agriculture, the manufactures, and the commerce of the country, the former of which is only to be preſerved by peace.

But though the rents of land have been greatly increaſed within theſe few late years, it is probable that they muſt feel the effects of the vaſt load of taxation and other charges which bear ſo hard upon agriculture at preſent.

But the aſcertaining of the rents of lands in the different diſtricts of the kingdom is a point of conſiderable importance both in a political and agricultural view, as by ſuch means the produce of them may be better and more certainly calculated.

Mr. Smith, in his valuable Agricultural Survey of Argyleſhire, ſtates, that the quality of the ſoil is there extremely different ; ſo that ſuch valuations as have been lately made, differ, ſometimes on the ſame farm, from 2*s.* to 15*s.* the acre of arable ground. The paſture, too, being partly green hill, but moſtly heath, differs no leſs in its quality than the arable land. Some of it is valued below 4*d.* and ſome above 4*s.* the acre. In the neighbourhood of Campbelton, a few ſpots of arable land let from 2*l.* to 3*l.* the acre. But this price may be ſaid to be put, not altogether upon the land, but partly upon the accommodation. But what proportion the rent of a farm ſhould bear to its produce, depends ſo much on ſoil, climate, ſituation, and other circumſtances, that no general rule can, he thinks, be laid down on the ſubject. In regard to arable lands more particularly, it is a common, though perhaps not a juſt remark, that one-third of the produce ſhould go for rent, one-third for expence and management, and one-third for the farmer's profit, intereſt, &c.

But Mr. Middleton remarks, that the method practiſed by ſome gentlemen, of eſtimating the produce of land by trebling the rent, is very fallacious : three times the rent is not by any means equal to the value of the produce of the land under the beſt ſyſtem of huſbandry now in uſe ; though under the old exploded courſe of fallow, wheat, oats, in the ſcanty produce of common fields, and when taxes and the expences of living were at one-half of the preſent amount, it was not very diſtant from the truth. But under the more improved courſes of huſbandry on land, at and under twenty ſhillings an acre, the produce is now, he thinks, more generally worth from five to ſeven times the rent.

In the North Riding of Yorkſhire, as ſtated in the report of that diſtrict, the average rent of farms of pretty good ſoil is from 15*s.* to 21*s.* *per* acre, in which there may be land rated

at from 5*s.* to 35*s.* *per* acre, ſo that the average value of a farm will vary according to its proportion of good and bad land. Some farms of the latter kind may be let as low as 5*s.* *per* acre, and ſome let cheaper at 30*s.*; ſo great is the inequality of the ſoil, that nothing accurate on this head can be ſtated. Near large towns, land for convenience in ſmall parcels, and in the aggregate to no great amount, is let at 3*l.* or 4*l.* *per* acre.

But in the weſtern diſtrict of that county, as about Skipton and Settle, the lands were found to let as high as 40*s.* and 50*s.* the acre; while from the beſt information in the corn part of the county at the ſame time, 20*s.* and 30*s.* were conſidered as a high rent, and in many places it was ſtill much lower.

In Shropſhire, the rents of lands, where the roads are bad, and the grounds little improved, are from 8*s.* to 12*s.* the ſtatute acre, and in more favourable diſtricts and ſituations, from 15*s.* to 20*s.* the farm together. But near towns, the price is much higher, as from 2*l.* to 6*l.* the acre.

And in Norfolk, according to Mr. Young, in the light ſand diſtrict, as marked in the Survey, the average price of letting is 6*s.* the acre; the various loams at 16*s.*; the better ſands at 12*s.*; the rich loams 26*s.* and the marſh land clays 28*s.* In Suffolk the ſeveral ſoils are ſtated to be rented as below, the whole county included, ſheep-walk, waſte commons, &c. which are very large deductions from the rate of the cultivated lands:

	s.	*d.*
Strong, wet loam, *per* acre	13	0
Rich loam	14	0
Sea diſtrict of ſand	10	0
Weſtern diſtrict of ditto	5	0
Fens	2	6

But in all the diſtricts, with the exception of the fen, there are tracts that are let at 20*s.* to 25*s.* and even higher, eſpecially meadows.

In the county of Eſſex, the average rent of good landed farms may be ſtated at about 20*s.* or 25*s.* the acre. They have lately increaſed very much in ſome places.

In Suſſex, good land is rented at from 20*s.* to 30*s.* the acre, but there is a great deal let at much lower rents. Land has riſen much of late years in many parts of the country.

In the county of Oxford, the rent of land is very various. The red land lets on the average at 30*s.*, the miſcellaneous loams at 25*s.*; the ſtone-braſh at 20*s.*; and the Chiltern at 16*s.* the acre. There are, however, large portions of land let at ſtill lower rents in different parts.

In Cheſhire, the land averages full 30*s.* the acre in rent as farms; and in Lancaſhire, the rent of land is equally as high, if not higher.

In the very ſouth-weſtern diſtrict of Cornwall, the rents of land fluctuate very greatly, as from 5*s.* to 50*s.* the acre in farms properly ſo named. The circumſtances affecting rents here, beſides the quality of the ſoil, and the aſpect or ſituation, are the vicinity to ſea ſand, and to market towns. There are inſtances of land letting very high in particular ſituations, as at 13*l.* the acre about Penzance. And in the ſame pariſhes the rents of land ſometimes vary from 8*l.* to 5*s.*; nay, even on the ſame farm, not exceeding 150 acres, ſome parts are worth 50*s.*, and others not 5*s.* the acre.

The neighbourhood of towns and large markets, as well as of extenſive manufactories, has, in all caſes, a tendency to raiſe the rent of land, whether as farms or otherwiſe, in every part of the kingdom.

In all parts of Scotland, even in the Highlands, the riſe of rents has been gradual and progreſſive for many years, and in ſome places they have been more than doubled within theſe laſt twenty-five or thirty years.

It has been ſtated by Mr. Collingſworth, of Daventry, in the fourth volume of Communications to the Board of Agriculture, that in reſpect to the principle of increaſing rents, where liberty is given to break up old graſs or paſture lands that are under leaſe, that he has known, within this five years paſt, a double rent given for leave to plough up an old paſture for cropping for three years; and that conſequently it appears to him that a ſtatement of the expences and profits upon arable and paſture lands ſhould be ſeverally made out, to aſcertain by how much the balance of profit of the one exceeds that of the other. He therefore ſtates them, upon a probable calculation, in the following manner:

TABLE of Expences.

	1. Peaſe.			2. Wheat.			3. Peaſe.			4. Wheat.			5. Beans.			6. Sp. Wheat.			7. Total.		
	£	*s.*	*d.*	£	*s.*	*d.*	£	*s.*	*d.*	£	*s.*	*d.*	£	*s.*	*d.*	£	*s.*	*d.*	£	*s.*	*d.*
Rent and taxes	1	15	0	1	15	0	1	15	0	1	15	0	1	15	0	1	15	0	10	10	0
Seed	0	18	0	0	16	0	0	18	0	0	16	0	0	10	0	0	14	0	4	12	0
Ploughing	0	12	0	0	12	0	0	12	0	0	12	0	0	12	0	1	4	0	4	4	0
Harrowing	0	2	6	0	2	6	0	2	0	0	2	6	0	2	6	0	2	6	0	14	6
Manure and carting	0	0	0	0	0	0	2	10	0	0	0	0	2	10	0	0	0	0	5	0	0
Frightening birds	0	2	0	0	2	0	0	2	0	0	2	0	0	2	0	0	2	0	0	12	0
Weeding and hoeing	0	1	6	0	1	6	0	1	6	1	6	0	0	3	6	0	1	6	0	11	0
Reaping and mowing	0	6	0	0	10	6	0	6	0	0	10	0	0	6	0	0	10	6	2	9	6
Cocking and raking	0	2	0	0	0	0	0	2	0	0	0	0	0	1	0	0	0	0	0	5	0
Carrying and ſtacking	0	4	0	0	4	0	0	4	0	0	4	0	0	2	0	0	4	0	1	2	0
Thatching	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0	0	6	0
Threſhing and winnowing	0	6	0	0	9	0	0	6	0	0	9	0	0	7	6	0	9	0	2	6	6
Carrying to market	0	4	0	0	4	0	0	4	0	0	4	0	0	4	0	0	4	0	1	4	0
Contingencies	0	4	0	0	4	0	0	4	0	0	4	0	0	4	0	0	4	0	1	4	0
	4	18	0	5	1	6	7	7	6	5	1	6	7	0	6	5	11	6	35	0	6

Produce.

Produce.

	£	s.	d.
1. Peaſe, three quarters, at 48*s.*	7	4	0
2. Lammas wheat, three quarters and a half, at 52*s.*	9	2	0
3. Peaſe, three quarters, at 48*s.*	7	4	0
4. Lammas wheat, three quarters and a half, at 52*s.*	9	2	0
5. Beans and turnips; five quarters of beans, at 30*s.*; turnips, 30*s.*	9	0	0
6. Spring wheat, three quarters, at 48*s.*	7	4	0
Straw	5	4	0
	54	0	0

Tillage produce	54 0 0	
Ditto expences	35 0 6	
	6)18 19 6	(= 3*l.* 3*s.* 3*d.* profit *per* acre for the farmer.

Grazing Expences.

	£	s.	d.
Rent and taxes *per* acre	1	15	0
Labour ditto	0	10	0
	2	5	0

Grazing Profit.

	£	s.	d.
A bullock and a half to three acres, at 5*l.* *per* head	7	10	0
Three ſheep upon ditto, at 25*s.* *per* head	3	15	0
	11	5	0

Grazing produce of three acres	11 5 0	
Ditto expences of ditto	6 15 0	
	3)4 10 0	(= 1*l.* 10*s.* 0*d.* profit *per* acre to the grazier.

	£	s.	d.
Then ſay, grazing profit *per* acre	1	10	0
To which add for graſs ſeeds	1	0	0
The additional rent to make up the ſum as *per contra*, will be	0	13	3
	3	3	3

By this means the rent that can be afforded to be given may be aſcertained with tolerable correctneſs in many inſtances of farming. See GRASS *Land*.

The author of the Argyleſhire Agricultural Survey, after remarking that there is very little arable land in that county but which is capable of higher cultivation, beſides the great quantity of waſte ground that may be improved in almoſt every farm, ſays, that the land is therefore capable of being made to yield a much higher rent when better cultivated; though not a great deal of it, as is generally thought, can bear much more, in the preſent ſtage of improvement, than what is laid on already, unleſs it be under a different management, which in ſheep lands might be by the introduction of better woolled breeds, and in arable lands by adopting a better ſyſtem of huſbandry.

It is conceived, that the idea of high rents being a ſpur to improvement and exertion, is a common, and, to a certain extent, a juſt maxim. No doubt there may be ſome who, if they had the land for nothing, would be ruined by their indolence. But the more common caſe is, that when a tenant ſees that all his exertions will not do, he becomes diſpirited and deſperate, and allows himſelf to be carried along by the ſtream which he cannot ſtem. The land ſuffers, the tenant fails, the farm gets a bad name, and the rent muſt be lowered. Thus the landlord, as well as the tenant, ſuffers, by raiſing the rent higher or faſter than the improvement of the land will bear. But he adds, that a ſubſtantial tenant is generally cautious of engaging to pay a rent that is exorbitant. He ſees the ſucceſs of thoſe who inveſt their money in other branches of buſineſs; and he follows their example, if he has not the proſpect of a farm's yielding him full intereſt for his money, and an adequate return for his diligence and labour. Whereas he who has leaſt to loſe, is often the moſt forward to offer, and the landlord is often tempted to accept the offer, without conſidering that a capital is neceſſary for paying the rent, and improving the land. Inſtances of ruin to the tenant, and loſs to the landlord, from too high rents, are not unfrequent, eſpecially on ſome of the ſmaller eſtates. Moſt of the farmers toil hard, live poorly; and for one who has a trifle for his pains, perhaps two give their pains for nothing. Many who have old leaſes obtained before the late riſe in land, and in its produce, took place, are very well, as are alſo many of thoſe who have ſheep ſtocks; as their poſſeſſions are managed with leſs expence, and the value of ſome of them was not well known till they were tried under the ſheep ſyſtem. But even bad

bargains are become good by the late riſe on every article of produce; and moſt of thoſe who have leaſes are at preſent at their eaſe.

It is concluded that the occupiers of land, whether in paſturage or tillage, ought certainly to be able, like labourers or tradeſmen, to live by their occupation, and to ſupport their families by their daily care and labour. The intereſt of money inveſted in their ſtock, with the proper allowance for tear, wear, and riſk, they ſhould be able to ſave as a proviſion for their families, and for old age; as the money ſo inveſted would give this return, if laid out on intereſt, without any trouble whatever. It cannot be conſidered as any part of the produce of the ground; and therefore no part of it ought, in equity, to enter into the payment of the rent; and yet not one in ten, perhaps, is able to ſave it; nor do they commonly advert that ſo much ought to be ſaved in juſtice. They are generally ſatisfied if they can keep their ſtock undiminiſhed; ſo that the buſineſs, in general, returns much leſs to thoſe engaged in it than almoſt any other. A happy predilection in favour of the occupation in which they were brought up, is, he thinks, what induces ſo many to follow it. Perhaps it may be alſo ſaid, that there is implanted in the human mind, for wiſe purpoſes, a certain innate diſpoſition, or inſtinct, which leads it to delight in rural occupations.

Theſe remarks ſhould be well attended to by the proprietors of farms, as their advantages, as well as that of their tenants, may be greatly promoted by ſuch means.

In regard to the receiving of rents where they are of different kinds, as for cottages, tithes, in the form of compoſitions, chief rents, quit rents, and ſome other ſorts, beſides thoſe of the farm kind, they require ſome attention and method, ſuch as the fixing of diſtinct times in the ſame, or different days, for the reception of each, when on a large ſcale, ſo that the exact times of attendance for each may be known to thoſe who have any thing to ſettle. So far as farm rents are concerned, the fixing of proper periods for receiving them is of great importance, though the matter has hitherto been little attended to, there being often no fixed time known to the holders, until ſignified by the precept of the receiver. And that is, in many caſes, liable to alteration. This is very inconvenient to the farmers in many inſtances, as they muſt either ſell their corn and live-ſtock to great diſadvantage, many times, before it was neceſſary, and have large ſums of money lying uſeleſsly by them, or meet the receiver, perhaps, with only part of the rent. The propriety and neceſſity of having certain exact times for receiving rents are therefore evident, and, of courſe, the moſt ſuitable times for theſe are to be aſcertained, as whatever enables the holders of land to turn their produce to the moſt advantage, increaſes the proſperity of the farms, and ultimately benefits the proprietor.

In this country it is ſaid, by the author of the work on Landed Property, farm rents moſtly become due at Lady-day and Michaelmas. But the proper times of paying them depend on the marketable produce of the land, and the ſeaſon of the year at which it goes, and can be beſt ſold in the markets. The holders of farms ſhould never be forced to improper regulations in theſe reſpects, or be ſuffered to withhold the payment of their rents when they have obtained the money for their produce.

Upon corn farms, which are numerous in moſt parts of this country, Michaelmas is the moſt improper time in the whole year to call upon tenants for their rents. It is at the cloſe or height of harveſt, as the ſituation may be, when their pockets are drained by extra expenſive labour, and when the grain cannot be threſhed out to repleniſh them; alſo when much of the off-going live-ſtock is not ready for the market.

In the county of Norfolk the above writer paid great attention to this matter, and found that there, the latter end of February, or beginning of the ſucceeding month, was the moſt proper ſeaſon for Michaelmas farm rents to be paid; and the month of June for thoſe of Lady-day. And, by correct examinations, thoſe moſt proper in other places may be found, keeping the above principles conſtantly in view. Farmers ſhould never be obliged to do any thing improper in the diſpoſal of their articles at unſuitable ſeaſons or markets, or to raiſe money in any improper ways; nor be led into ſpeculations with money while it lies idly by them.

The beſt ſeaſons having been aſcertained, the exact periods are to be fixed on, from the particular nature of the farms, the cuſtoms of the diſtricts in reſpect to fairs and the dealers in different ſorts of produce, which may generally be readily managed without much difficulty.

Rent *Accounts*, ſuch as are kept on eſtates, whether of farms, cottages, chief rents, or any other ſorts of annual payments, by the managers. They ſhould be clear and comprehenſive, containing every thing of importance about them, as their different circumſtances may direct.

The management of the farms, in rent accounts, whether yearly or half yearly, muſt be the ſame as in the receiving rentals, as they appear on the general map; and as they naturally lie on the face of the eſtate, according to the ideas of the writer of the work on Landed Property. See Map *of Eſtates*.

The pariſhes, or manors, lying wholly or partially within the eſtate, are to be firſt geographically arranged, and then the farms on the ſame principle as they lie within the reſpective pariſhes. In this way it is conſtantly the ſame, and has the advantage of not being liable to be diſturbed by changes of any ſort, which affords much facility and convenience in all ſuch accounts on many occaſions.

Rent *Charges*, the fixed payments to which an eſtate or farm is ſubject to, ſuch as chief rents, quit rents, annuities, endowments, ſchoolmaſters' ſalaries, charitable donations, &c.

Rent *Days*, the particular days or times when the rents of eſtates or farms become due. They ſhould, in all caſes, be exactly and properly fixed as to ſeaſon and other circumſtances. See Rent.

Rent-*Roll*, a general ſtatement of the groſs annual income of an eſtate, or receiverſhip, whether it ariſes from farms, woods, lands, quarries, cottages, or any other ſimilar things; or from tithes, quit rents, or any other ſort of rents, &c.

In forming rent-rolls, this ſort of general view of income is beſt arranged, according to the writer of the work on Landed Property, in columns, as being the moſt plain and perſpicuous; and for a ſchedule of farms, the following heads are proper. Firſt, the numerals identifying the ſeveral farms in the general map. Secondly, the names of the farms. Thirdly, the contents or admeaſurement of each. Fourthly, the names of the preſent holders. Fifthly, the amount of the exiſting rents. Sixthly, the amount of the outgoings, if any payable by the proprietor. And, ſeventhly, the expirations of the terms, if any. The farms ſhould be arranged according to their ſituations.

In the receiving of rentals, they are the particulars. Theſe are few where the rents are regularly paid, the farms under proper management, and the holders pay the taxes and repairs. But it may be neceſſary to ſee in the receiver, at one view, the name of the farm, and the name of the holder, as well as the amount of his half year's rent.

And where arrears are ſuffered, and, of courſe, accounts created, more particulars are neceſſary, ſuch as the name of the farm and the tenant, his arrear at the laſt payment, his half year's rent, and any other charge that may be againſt him, as well as any allowance which is to be made to him, and the neat ſum that is receivable—a blank being left for the ſum received, and another for the arrear left. Theſe things ſhould be done in the manner of the beſt accountants, the arrangements being made in the ſame way as the rent-roll with an alphabetical index.

RENTA, in *Geography*, a lake of Albania, near Scutari.

RENTAL, a roll in which the rents of a manor are written and ſet down, and by which the lord's bailiff collects the ſame; it diſtinguiſhes the lands and tenements, and the names of the tenants, the ſeveral rents ariſing, and for what time, uſually a year. See RENT-*Roll*.

RENTER WARDEN, an officer in moſt of the companies of London, whoſe buſineſs is to receive the rents or profits belonging to the company.

RENTERBACH, in *Geography*, a river of Saxony, which runs into the Elbe near Wittenberg.

RENTERIA, a town of Spain, in Guipuſcoa; three miles S.E. of St. Sebaſtian.

RENTERING, FINE-DRAWING, in the *Manufactories*, the ſewing of two pieces of cloth, edge to edge, without doubling them; ſo as that the ſeam ſcarcely appears at all: hence it is called *fine-drawing*.

The word is formed from the French, *rentraire*, which ſignifies the ſame thing; and which Menage, after Salmaſius, derives from the Latin, *retrahere*, of *re*, *in*, and *trahere*, by reaſon the ſeam is drawn out of ſight, and covered.

Serges, &c. are to be ſewed: cloths fine-drawn. The author of one of the Let. Edif. et Cur., ſpeaking of the great dexterity of the fine-drawers in the Eaſt Indies, aſſures us, that if you tear a piece of fine muſlin, and give it one of them to mend, it ſhall be impoſſible for you to diſcover the place where it is rejoined, even though you had made a mark to know it by.

The dexterity of our own fine-drawers, though inferior to that above-mentioned, is nevertheleſs ſuch, as puts them in a condition to defraud the king, by ſewing a head or ſlip of Engliſh cloth on a piece of Dutch, Spaniſh, or other foreign cloth; or a ſlip of foreign cloth on a piece of Engliſh, ſo as to paſs the whole, as of a piece; and by that means avoid the duties, penalties, &c. The trick was firſt diſcovered in France by M. Savary, author of the Diction. de Commerce.

To renter, in *Tapeſtry*, is to work new warp into a piece of tapeſtry damaged, eaten by the rats, &c. and on this warp to reſtore the ancient pattern, or deſign. The warp is to be of woollen, not linen. Among the titles of the French tapeſtry-makers, is included that of renterers.

Fine-drawing is particularly uſed for a rent, or hole, happening in the dreſſing or preparing of a piece of cloth, artfully ſewed up or mended with ſilk.

All fine-drawings are reputed defects or blemiſhes; and ought to be allowed for in the price of the piece. Hence, M. Savary eſtabliſhes it as a rule, which is certainly founded on natural equity, that every manufacturer mark the fine-drawings of his cloth with a piece of packthread tied to the liſt; to direct the draper to the ſpot: and that the draper apprize the taylor, or other perſon to whom he ſells it, of the ſame, that he may not come to damage in the cutting; there being inſtances of drapers condemned to take back their cloth, when cut to pieces, for omitting to mention the fine-drawings, and other flaws.

On this occaſion, M. Savary extols the procedure of an Engliſh merchant, who, ſending a piece of cloth damaged in one ſpot, to his correſpondent at Paris, put a piece of gold in the damaged place, to make up the damage. But as this example is perhaps the only one of its kind, that author recommends it to the merchant, or draper, to unfold all the pieces entirely, as they come to him; to diſcover the fine-drawings, and other flaws, in order to make the clothier accountable for them.

RENTERSHAUSEN, in *Geography*, a town of the duchy of Wurzburg; 7 miles E. of Lauringen.

RENTOWN, a town of Scotland, in Dumbartonſhire, conſiderable for its manufactures; 5 miles W. of Dumbarton.

RENTRE'E, Fr. in *Muſic*, a return to the ſubject of a muſical compoſition, after a pauſe, or ſome excurſion or deviation from the theme; or in a fugue, an imitation of ſome particular paſſage or deſign.

RENTY, in *Geography*, a town of France, in the department of the ſtraits of Calais, on the Aa; 9 miles S.S.W. of St. Omer.

RENTZ, a town of the iſland of Rugen; 11 miles S.S.W. of Bergen.

RENUENTES, in *Anatomy*, a pair of muſcles of the head, thus called as being antagoniſts to the annuentes; and ſerving to throw the head backward, with an air of refuſal.

From their ſituation they are alſo called rectus capitis, major et minor.

RENVERSE', Fr. in *Muſic*. With reſpect to intervals inverted, this term is oppoſed to direct. (See DIRECT.) With reſpect to chords, it is oppoſed to *fundamental*; which ſee.

RENVERSE', *inverted*, in *Heraldry*, is when any thing is ſet with the head downward, or contrary to its natural way of ſtanding: thus, a chevron renverſé is a chevron with the point downwards.

The ſame term they alſo uſe when a beaſt is laid on its back.

RENVERSED VOLTE. See VOLTE.

RENVERSEMENT, Fr. in *Muſic*, an inverſion in the order of ſounds which compoſe the chords, and in the parts which conſtitute the harmony: which is done by ſubſtituting, by octaves, treble notes for the baſe, and baſe notes for the treble. It is certain that every common chord has a fundamental and natural order pointed out by the harmonics of a ſingle ſtring, a great bell, or organ pipe. (See HARMONICS, and RESONANCE.) But the circumſtances of the ſucceſſion, taſte, expreſſion, ſelection of notes for melody, variety, approximation of the harmony, frequently oblige a compoſer to change this order, by inverting the chords, and conſequently the diſpoſition of the parts. As any three things may be arranged in ſix different ways, and four things in twenty-four ways, it ſeems at firſt as if a common chord was ſuſceptible of ſix changes, and an accompanied diſcord of twenty-four; as the one is compoſed of three ſounds, and the other of four; and that the inverſion only conſiſts in the tranſpoſition of octaves. But it muſt be remembered, that in harmony a change in the upper parts is not regarded as an inverſion, provided the baſe or fundamental ſound remains the loweſt. Thus, theſe two orders of ſounds, C *e g*, or C *g e*, are not regarded as inverſions of the harmony. And in the chord of the 7th no change in the upper parts conſtitutes an inverſion.

As long as the fundamental ſound is the loweſt part, the order is direct. But when this order is changed, or the fundamental ſound is given by tranſpoſition to one of the upper parts, the harmony is inverted. In whatever part a diſcord is prepared, it muſt be reſolved by the ſame part;

a ſharp

a ſharp 7th muſt aſcend, a flat 7th muſt deſcend; falſe relations muſt be avoided. This is the key to the chief myſteries of compoſition. Binding notes in ſyncopation in the treble and baſe muſt be differently treated: in the 9th the chord is direct; in the 2d it is inverted, the diſcord being in the baſe.

Upon the organ, and other keyed-inſtruments, inverſions are neceſſarily made for the convenience of the hand, in giving different faces to the ſame chord. See FACE.

RENVERSING. See REVERSING.

RENUKA, or RENUCI, in *Mythology*. See RUNEKA.

RENUNCIATION, RENUNCIATIO, the act of renouncing, abdicating, or relinquiſhing any right, real or pretended.

Renunciations are ſometimes *expreſs*, as by contracts, &c.; ſometimes *tacit*, as by contrary acts.

To renounce an inheritance, a community, &c. is to paſs a ſolemn act before a notary, or public officer, by which a perſon declares he will not intermeddle in an inheritance, or profit in a company; but ſurrenders his part, and quits all pretenſions.

RENVOI, Fr. in *Muſic*, a reference to a ſtrain, or part of a ſtrain that is to be repeated; either implied by dots in the ſpaces of the ſtaff, or by an 𝄋 dotted, which is the initial of *ſegno*, Ital. a ſign. See REPEAT.

RENWEZ, in *Geography*, a town of France, in the department of the Ardennes, and chief place of a canton, in the diſtrict of Méziéres; 7 miles N.W. of Méziéres. The place contains 1202, and the canton 6061 inhabitants, on a territory of 140 kiliometres, in 16 communes.

REOLLE, LA, a town of France, and principal place of a diſtrict, in the department of the Gironde. N. lat. 44° 35′. E. long. 0° 2′.

REORDINATION, REORDINATIO, the act of conferring orders on one already ordained.

The ceremony of ordination impreſſes what the divines call an indelible character; and cannot, therefore, be repeated: yet is reordination practiſed in England, with regard to the diſſenting miniſters, who conform to the church; the biſhops pretending that they alone have a right to confer holy orders, and that every prieſt or miniſter, who does not receive them at their hands, has no lawful or regular vocation.

This has formerly proved a great obſtacle to the re-union of thoſe miniſters to the church of England; many of whom, otherwiſe diſpoſed to conform, have ſcrupled to be re-ordained; inſomuch as re-ordination implies their former vocation to be null; that they had adminiſtered the ſacraments without any right thereto; and that all their miniſterial acts were invalid.

In the 11th century, the crime of ſimony having been very flagrant, many people fell into the error to believe, that the ſimoniacal biſhops could not ordain validly, and thoſe who had received orders at their hands ſhould be reordained. The people of this opinion made a party of themſelves, and were diſtinguiſhed by the title of "Reordinantes."

REORTHE, LA, in *Geography*, a town of France, in the department of the Vendée; 13 miles W. of Châtaigneraye.

REPAIR *a Statue, To*, or other piece of ſculpture, is to touch up a ſtatue, &c. (caſt in a mould) with a chiſſel, graver, or other inſtrument, to finiſh the places which have not come well off.

To REPAIR *a Caſt*, figure, or the like, they clear off the barb, and what is redundant in the joints and projectures. See STATUE.

To REPAIR *a Medal*, is to retouch it; ſo as, from ruſty and defaced as it was, to render it clean, neat, and perfect. In order to this, they take off the ruſt with a graver, touch up the letters, poliſh the ground, and raiſe and reſtore the figures which before were ſometimes ſcarcely ſeen. When the figures are eroded or broken, they fit a piece of cement on the ſpot; and on this cut with a graver ſo dexterouſly, that the figures appear entire, and well kept; yet nothing ſpoils medals ſo much as repairing them. See MEDAL.

To REPAIR *a Ship*, is to amend any injuries, or ſupply any deficiencies, which a ſhip may have received by age, battle, tempeſtuous weather, &c. The repair is neceſſarily greater or ſmaller in proportion to the loſs or damage the veſſel has ſuſtained. Accordingly a ſuitable number of the timbers, beams, or planks, or a ſufficient part of either are removed, and new pieces fixed in their places. The whole is completed by *breaming*, *calking*, and *paying* the body with a new compoſition of ſtuff.

REPAIRERS, artificers who chaſe figures and beautify ſword-hilts, &c.

REPAIRING, in *Building*, &c. See REPARATION, and RESTAURATION.

The repairing of large walls, doors, ceilings, coverings, &c. belongs to the proprietor or landlord: the tenant is only charged with ſmall repairs, as glaſs windows, locks, &c. by the French called *locative* repairs.

REPAIRS, in *Hunting*, are the haunts and places which the hare runs to.

REPAIRS *of Farm Buildings*, in *Rural Economy*, the neceſſary means of putting and keeping them in proper order. This properly belongs to different ſorts of workmen, as maſons, carpenters, &c. It is a bad practice to let buildings of this nature fall much into decay, as by ſuch neglect a great deal of expence is frequently incurred that might otherwiſe have been avoided. See FARM-*Buildings*.

REPANDUM FOLIUM, in *Botany*, a leaf whoſe outline is undulating, without the ſurface, or ſubſtance, being otherwiſe than even. See LEAF, where, for *nyphæoides*, read *nymphæoides*.

REPARANDIS PONTIBUS. See PONTIBUS.

REPARATION, REPARATIO, the act of repairing, reeſtabliſhing, retrieving, or mending a building, or other work, damaged, or gone to decay.

The enemy repaired the breach as ſoon as it was made. The eſtabliſhment of turnpikes is for repairing of the roads. An eccleſiaſtical patron is by ancient cuſtom obliged to repair the choir or chancel of a church, and the pariſhioners the nave.

REPARATIONE FACIENDA, in *Law*, is a writ which lies in divers caſes, *e. gr.* where there are tenants in common, or joint tenants of a houſe, &c. which is fallen to decay, and the one being willing to repair it, the other two will not; in this caſe, the party willing ſhall have this writ againſt the other two.

REPARO, in *Geography*, a ſmall iſland near the coaſt of Braſil. S. lat. 29° 23′.

REPART, in the *Manege*, is to put a horſe on, or make him part a ſecond time.

REPARTEE. See REPARTY.

REPARTITION, REPARTITIO, a dividing or ſharing a thing a ſecond time.

REPARTY, or REPARTEE, a ready, ſmart reply: eſpecially in matters of wit, humour, or raillery.

The word in the original French, *repartie*, has the ſame ſignification.

Wicquefort obſerves, that there is a great difference between

between a free, ſprightly reparty, and an offenſive *ſarcaſm*; which ſee.

REPAST, Repastum, a meal or refection, taken at a ſtated hour.

In old law-books repaſt is particularly uſed for a meal's meat given to ſervile tenants, while at work for their lord.

The French call their meal *repaſt*; the Latins, *paſtus*; the Italians and Spaniards, *paſto*.

In antiquity the repaſts were frequently ſacrifices; for which reaſon we find them often prepared by kings themſelves.

REPEALING, in *Law*, the revoking or annulling of a ſtatute, deed, or the like. See Abrogation, Revocation, &c.

No act of parliament ſhall be repealed in the ſame ſeſſion it was made in. A deed or will may be repealed for a part, and ſtand good for the reſt.

Brook uſes the word *repellance* in the ſame ſenſe.

REPEAT, in *Muſic*, a character ſhewing that what was laſt played or ſung muſt be repeated, or gone over again.

The repeat ſerves inſtead of writing the ſame thing twice over. There are two kinds of repeats; the *great* and the *ſmall*.

The *great* repeat is only a double bar, dotted on each ſide; or two parallel lines drawn perpendicular acroſs the ſtaff; with dots on either hand. See its form under Characters *of Muſic*.

This mark ſhews, that the preceding ſtrain is to be repeated; that is, if it be near the beginning of the piece, all hitherto ſung or played is to be repeated; or, if towards the end of a piece, all from ſuch another mark.

In gavots, we uſually find the repeat at about the third part of a piece; in minuets, borees, courants, &c. towards the end.

Some make this a rule, that if there be dots on each ſide the bar, they direct to a repetition both of the preceding and the following ſtrain; if there be only dots on the ſide, then only the ſtrain on that ſide is to be repeated.

The *ſmall* repeat, is where only ſome of the laſt meaſures of a ſtrain are to be repeated: this is denoted by a character ſet over the place where the repetition begins (ſee Characters, in *Muſic*), and continues to the end of the ſtrain.

When the ſong ends with a repetition of the firſt ſtrain, or part of it, inſtead of a repeat, they uſe the word *da capo*, *i. e.* from the beginning.

REPEATING Circle, an inſtrument uſed in *Navigation*, *Aſtronomy*, and *Surveying*. This inſtrument derives its name from the property it has of giving the average of ſeveral repeated meaſures of an angle, made round the whole circle, ſo as to diminiſh the errors of diviſion and of excentricity; which is a very uſeful property, where the art of dividing is not brought to that perfection which it is in England. When the lunar method of determining the longitude, by the help of improved tables of the moon's motion, was propoſed to be put in practice, Mayer offered a conſtruction of the circle, which, by repeating the meaſure of a lunar diſtance, promiſed to increaſe the accuracy with which ſuch diſtance could be meaſured; and after him, Borda went a ſtep farther towards the attainment of the deſired object, both whoſe contrivances we have deſcribed under our article Circle. Theſe inſtruments, like Hadley's octants, meaſured the angles by reflection, and were conſequently uſed at ſea; but the principle of repetition is not confined to reflecting inſtruments; and Borda conſtructed, or contrived the conſtruction of, a repeating circle, which will meaſure either vertical or horizontal angles without reflection, with a degree of accuracy that has placed it high in the eſtimation of the French, among whom accurate dividing is yet a deſideratum. This inſtrument we have alſo deſcribed, and likewiſe Troughton's improvement on it, in the article already referred to.

But the repeating principle was extended by Joſeph de Mendoza Rios in the reflecting circle, ſo as to meaſure both backwards and forwards, and to give *double* reſults by means of a moveable or *flying* circle, which we have likewiſe deſcribed under the article Circle, together with our obſervations on the peculiarities of its conſtruction. It remains, therefore, that we now deſcribe a recent conſtruction of a reflecting and repeating circle, contrived by profeſſor Haſsler of Philadelphia, who is a native of Switzerland, and who has reſided ſeveral months in London, for the purpoſe of collecting ſuperior aſtronomical and ſurveying inſtruments, at the expence of the American government. The object of this ingenious foreigner was to unite the repeating principle of Borda, with the firm conſtruction of Troughton's reflecting circle, ſo that his new inſtrument might be free from the objections of the repeating circles that preceded it, ariſing from ſhallow centre-work, and clamping after the contacts were made in an obſervation; and in the conſtruction he has adopted, by the aid of Troughton, he has rendered his inſtrument free from theſe objections, and given it every advantage which its original contriver contemplated: we cannot, however, admit, that in practice it is ſuperior in accuracy, and certainly not in ſimplicity, to Troughton's *reflecting circle*, which we have before deſcribed, as giving the average of ſix readings at two operations, in inverted poſitions, at the different ſides of zero on the fixed circle. The union of Borda's and Troughton's conſtructions is thus effected by Haſsler; the circular border of Troughton's inſtrument is made moveable round the centre, like his three armed verniers, and is graduated like his, while a pair of oppoſite verniers move round the ſame centre, above the plane of the moveable or flying circle, having a clamping apparatus for ſlow motion at one of the two oppoſite verniers, ſo that the pair of verniers may be made to revolve with or without the graduated flying circle; another pair of verniers, ſimilar to the former, and having alſo a clamping apparatus for ſlow motion, are made faſt to the frame, and have the extreme ends of their connecting diametrical bar united by a graduated ſemicircle, that lies under the flying circle, and is hid thereby when the graduated face of the circle is uppermoſt; the uſe of this ſemicircle is, to receive a pair of ſliding pieces of braſs that act as ſtops to the indices, when they are properly placed at the rough angle, to the right and left of zero on the flying circle, by a previous operation; ſo that, when the bar of the verniers comes in contact with either of theſe ſtops, it is known, even in the dark, that the place where a contact is to be made is nearly aſcertained, and the vernier-bar may be made faſt, for the ſcrew of ſlow motion to be brought into action to complete the contact. The principle on which the meaſurement is effected is this; the revolving verniers move forward from zero of the graduated circle, when the ſtops are previouſly ſet to the rough angle, till the index or vernier-bar touches the ſtop to the left, when the graduated face is uppermoſt, and is clamped to the fixed verniers; the clamping apparatus then fixes the verniers, and the tangent-ſcrew completes the contact; the two revolving verniers might now give the angle, by two readings, but the repeating principle has not yet been introduced, and conſequently no advantage is yet derived from this firſt obſervation, over a common circle with a double vernier; the fixed verniers are in the next place unclamped, but as they have no motion, the flying circle and revolving verniers are brought back to the right together, acroſs the point zero,

till

till the vernier-bar touches the ſecond ſtop, and during this motion, the revolving verniers have moved backwards juſt *double* the rough diſtance with the attached circle, that they did forwards before without it; conſequently the fixed verniers will now read the ſame angle at the right of zero, that the revolving verniers did on the left, when the clamping is again made and the contact completed; but ſtill this is only a ſecond mode of reading a ſingle meaſure of the angle, and nearly all that is yet gained in accuracy, is the extermination of the index error, and that of the dark glaſs, if uſed; theſe errors having been alternately poſitive and negative, if any exiſted. Theſe two meaſures, ſeparately read, are equivalent to Borda's *croſſed* obſervation, as he calls it, becauſe the motion of the vernier-bar *croſſes* the point zero in his fixed circle: here it is preſumed that the two objects, that include the angle, are equally luminous; but if not, it will be neceſſary to invert the face of the inſtrument before each ſecond, fourth, ſixth, &c. contact, and then the motions will all be forward, or from right to left, which otherwiſe would be alternate: the ſecond reading, however, may be omitted; the revolving verniers, being unclamped, muſt be moved again to the firſt ſtop in the original poſition, where, the contact being complete, they will give a *double* meaſure if examined; but the readings are yet omitted: the fixed verniers are now unclamped, the inſtrument again inverted, and the contact completed, when theſe verniers, if examined, will alſo give double meaſures; and thus treble and quadruple meaſures muſt be had ſucceſſively at both the revolving and fixed verniers, or even more, if the circle has not been paſſed over by each pair of verniers, before the readings are required to be examined, and then the average of all the meaſures by the fixed verniers, added to an average of all the meaſures by the revolving verniers, will afford the means of getting an average of the whole number of meaſures.

From this deſcription of Haſsler's mode of applying the repeating principle, it will be obvious to the reader, that the diametrical bars of the two pair of verniers muſt not be contiguous to each other, when the glaſſes called the horizon-glaſs and index-glaſs are parallel; and accordingly we find, on examining an inſtrument of this conſtruction, that theſe bars croſs one another at right angles before the operations begin; but as there is but one zero in the circle, one pair of the verniers muſt neceſſarily begin at 90°, when the other pair begins at 0; conſequently ninety degrees muſt be deducted from the ſum of the meaſures of this pair before their average is taken: otherwiſe, if neither pair of the verniers begin at zero, the two numbers from which they reſpectively commence muſt both be deducted before the averages are taken, in which caſe it will be of no importance at what part of the flying circle the operations begin. Should the reader find any difficulty in comprehending this deſcription of Haſsler's repeating circle, without a reference to a drawing, we recommend that he refer to our account of reflecting circles, deſcribed under the article CIRCLE, where he will find the account of the two ſeparate inſtruments of which this forms an union; and at the ſame time will ſee how it differs from Mendoza's, which gives *double* reſults.

By way of illuſtrating the uſe of Haſsler's repeating circle, we will ſuppoſe that ſome known ſtar is to the eaſt or weſt of the moon, and that the longitude of the place of obſervation is required from an actual meaſurement of the diſtance of the ſaid ſtar from the moon's limb, when compared with its computed diſtance as given for a certain hour on the ſame evening at Greenwich, in the Nautical Almanac: we will ſuppoſe the glaſſes of the circle adjuſted, and the ſmall teleſcope ſcrewed into its ſocket, and ſo adjuſted both for diſtinct viſion, and comparative brightneſs of both objects, that the ſtar can be brought to touch the moon's limb, and have a ſenſible contact; in the firſt place, hold the plane of the circle in ſuch an inclined poſition that it may paſs through both objects, and get the ſtar into the field of view, while the revolving verniers are at zero, and the fixed ones clamped at 90°; in the next place, move the revolving verniers with an equable motion, and let the eye follow the ſtar, or rather the image of it, till it comes to the edge of the moon, which it may be made to approach by a proper motion of the body; then clamp the index there till the ſtop is put on the ſemicircle very nearly to touch the edge of the index, where it muſt remain; the ſecond ſtop muſt alſo be put to the ſame diviſion on the ſemicircle at the other ſide of its zero, provided this zero be co-incident with the zero of the circle; or, which is the ſame thing, the diſtance between the ſtops muſt be ſomewhat more than double the angle to be meaſured; the contact may now be completed by the tangent-ſcrew; let the fixed verniers be unclamped, and the releaſed circle and revolving verniers be made to recede together till the ſecond ſtop gives them a check, there they muſt be clamped and the circle inverted, when the ſtar will again be ſeen nearly in contact, which muſt now be made entirely ſo by the ſcrew of ſlow motion; in the next place the moveable verniers, being firſt unclamped, muſt be carried again to the firſt ſtop and clamped, to make the contact as before, after the inverſion of the circle has again taken place; and in this manner the revolving verniers muſt be moved to the firſt ſtop, and the verniers and circle together to the ſecond ſtop, before each inverſion and contact, till five, ſix, ſeven, or more alternate operations have been gone through, and the whole circle has been travelled over, which may always be known from the poſition of the ſtops. The exact times muſt be noted at the beginning and end of theſe operations, which by an expert obſerver will be gone through in a few minutes, and the mean time will be had of the moment correſponding to the mean of the repeated obſervations: at theſe times the aſſiſtants muſt alſo take each their two altitudes. Say now that the ſtops were required to be nearly at 40° at each ſide of zero of the ſemicircle, or that the diſtance between them was 80°, within a few minutes over, and that there were nine obſervations thus made with the revolving verniers, and eight with the fixed ones, which numbers ſuppoſe the firſt and laſt meaſures to be taken with the ſame pair of verniers, or with the ſame face of the circle uppermoſt; ſay alſo, that the final readings by this pair of verniers were reſpectively 1° 10′ 20″, and 181° 10′ 0″, or rather 361° 10′ 20″, and 541° 10′ 0″, becauſe theſe verniers completed the entire circle; then if we diminiſh the latter reading by 180°, its diſtance before the other, we ſhall have 361° 10′ 0″, and the average of the pair of oppoſite verniers will be 361° 10′ 10″, which quantity divided by 9, the number of meaſures taken by them, will give a quotient of 40° 7′ 8″.9 for the firſt average of the diſtance, reſulting from the operation of the revolving verniers alone; again, let the final readings of the fixed verniers be reſpectively 50° 57′ 20″ and 230° 57′ 30″; but if we increaſe the firſt reading by 360°, we ſhall have 410° 57′ 20″, which muſt be diminiſhed by 90°, becauſe it ſtarted from this number, and the remainder will be the correct reading, namely 320° 57′ 20′; alſo 230° 57′ 30″ increaſed by 360° is 590° 57′ 39″, and this number diminiſhed firſt by 90°, as before, and then by 180°, the diſtance by which it precedes its fellow-vernier, will be 320° 57′ 30″, and conſequently the average of the two final readings of the fixed verniers will be 320° 57′ 25″, which ſum divided by 8, the number of repeated

peated meaſures in the inverted poſition, will give a quotient of 40° 7′ 10″.6 for the diſtance averaged by the fixed verniers; and laſtly $\frac{40° 7' 8''.9 + 40° 7' 10''.6}{2} = 40° 7'$ 9″.75, the exact *apparent* diſtance, which may be converted into the *true* diſtance by any of the methods uſed for clearing it of the joint effect of *parallax* and *refraction*. See Longitude, and Lunar *Obſervations*.

Repeating *Mechaniſm*, in *Horology*, is a mechanical contrivance that, when acted on by a pull or puſh, will make the ſtriking part of a clock or watch repeat the hours and quarters of exiſting time, ſo that a perſon in the dark, or even in bed, may know within a quarter of an hour what it is o'clock, as well by night as by day. The firſt contriver of the repeating mechaniſm of a clock was Barlow, a London clock-maker, who in the year 1676 produced to the world his ſpecimen of ingenuity, which aſtoniſhed all the admirers of the mechanical arts, and excited in others a deſire to vary the conſtruction, with a view to the improvement of the original contrivance; and the conſequence has been, that Quare, Tompion, and others in London, as well as after them Julien le Roy, Thiout, Collier, Larçay, Berthoud, &c. on the continent, have given ſo many different kinds of repetition, for both clocks and watches, that a particular deſcription of each conſtruction would require ſeveral plates, and a whole volume to give the details. Under our article Clock we have already explained at conſiderable length the particulars of the repeating mechaniſm of two ſeveral clocks, as it is conſtructed at this time, from which the reader will ſee how the acting parts may be varied in many ways to anſwer the ſame purpoſe; but in moſt of the modern contrivances the *rack* and the *ſnail* conſtitute the baſis of the plan, and regulate the action of all the metallic parts employed. For the repeating mechaniſm of a watch, ſee our article Watch.

REPELLENT Medicines, are thoſe which prevent ſuch an afflux of fluids to any part as would excite tumour or inflammation, or which tend to diminiſh ſuch an afflux, when it is already produced. Medicines of this quality are principally refrigerants and aſtringents, eſpecially the former. The moſt effectual repellent is cold; and thoſe applications, therefore, which moſt effectually obſtruct the heat, are the moſt efficacious repellents; and many of the drugs, which are applied in combination with cold liquids, are of little value; the cold menſtruum, that is the water, being the principal agent in the curative proceſs.

REPELLING Power, *vis repellens*, in *Phyſics*, is a certain power or faculty reſiding in or exerted by the minute particles of natural bodies, by which, under certain circumſtances, they mutually fly from each other.

This power is the reverſe of the attractive power.

Sir Iſaac Newton having eſtabliſhed the attractive power of matter from obſervation and experiment, argues, that, as in algebra, where poſitive quantities ceaſe, there negative ones commence; ſo in phyſics, where the attractive force ceaſes, there a repelling force muſt begin; and adds, that there is ſuch a force, does likewiſe appear from obſervation.

As the repelling power ſeems to ariſe from the ſame principle as the attractive, only exerciſed under different circumſtances, it is governed by the ſame laws: now the attractive, we find, is ſtronger in ſmall bodies than in great ones, in proportion to the maſſes; therefore the repelling is ſo too. But the rays of light are of all others the moſt minute bodies we know of; therefore, of all others, their repelling force muſt be the greateſt.

Sir Iſaac Newton computes, that the attractive force of the rays of light is above 10000000000000000 times as ſtrong as the force of gravity on the ſurface of the earth: hence ariſes that inconceivable velocity with which light (if it conſiſt of real particles) muſt move, to reach from the ſun to our earth in ſeven minutes. For the rays emitted from the body of the ſun by the vibrating motion of its parts are no ſooner got without the ſphere of attraction of the ſun than they come within the action of the repelling power.

The elaſticity or ſpringineſs of bodies, or that property by which, after having their figure altered by an external force, they return to their former figure, follows from the repelling power. See Repulsion.

REPENTANCE, in *Theology*, is a change of ſentiments followed by a change of conduct: or repentance denotes ſuch a conviction of the evil and danger of a ſinful courſe, as is ſufficient to produce ſhame and ſorrow in the review of it, and effectual reſolutions of amendment. This definition expreſſes the ſenſe of the two words μεταμελεια and μετανοια, which are commonly uſed by the evangelical writers to ſignify repentance.

REPENTIGNY, in *Geography*, a town of Canada, on the river St. Laurence. N. lat. 45° 48′. W. long. 73° 15′.

REPERCUSSION, in *Mechanics*. See Reflection.

Repercussion, in *Muſic*, iteration, a repetition of the ſame note or ſound.

This often happens in the modulation, where the eſſential chords of each mode, or of the harmonical triad, are to be ſtruck oftener than the reſt; and of theſe three chords, the two extremes, *i. e.* the final and the predominant one, (which are properly the repercuſſions of each mode) oftener than the middle one.

REPERNDORF, in *Geography*, a town of the duchy of Wurzburg; 7 miles S.E. of Wurzburg.

REPERTORY, Repertorium, a place in which things are orderly diſpoſed, ſo as to be eaſily found when wanted.

The indices of books are repertories, ſhewing where the matters ſought for are treated of. Common-places are a kind of repertories, very uſeful to the learned.

Repertorium *Anatomicum*, denotes a large hall near an amphitheatre of diſſections, where ſkeletons, both human and brutal, are orderly preſerved. Such is the repertory in the French king's garden at Paris.

REPETEND, in *Arithmetic*, is uſed for that part of an indeterminate or infinite decimal fraction, which is continually repeated ad infinitum.

Thus, in the indeterminate decimal fraction 317.45 316 316,316, &c. the figures 316 are called the repetend.

Theſe repetends often ariſe in the reduction of vulgar fractions to decimals, thus $\frac{1}{3} = 0.3333$, &c. $\frac{1}{7} = 0.142857$, 142857, &c. $\frac{1}{11} = 0.09\,09,\,09$, &c.

Decimals of this kind are called repeating or circulating *decimals*, (which ſee,) on account of this continual repetition or circulation of the ſame figures. Infinite decimals are of two kinds, which may be diſtinguiſhed by the general denominations of certain and uncertain. A general infinite decimal is ſuch whoſe numerator runs into infinity by a continual repetition of one or more figures, as 44, &c. 033, &c. Uncertain decimals are ſuch, whoſe numerator goes on for ever without a conſtant circulation of figures. The eſſential difference between theſe two kinds is this; that the certain infinite decimals have a determinate, finite, and certain value, in that there is a certain determinate vulgar fraction, which expreſſes the true and complete value of that infinite decimal, whereas the uncertain have no ſuch finite and aſſignable value: and hence the reaſon of the names.

REPETEND, *Single*, is that where only one figure is repeated, as in 0. 3 3 3, &c.

REPETEND, *Compound*, is that where two or more figures are repeated, as in 0. 09 09, &c. or in 0. 142857 142857, &c.

Decimals with repetends may always be reduced to vulgar fractions; for either the repetend begins with the decimal, or not.

If the repetend begins with the firſt place of decimals, or if the decimal is a pure circulate, make it the numerator of a vulgar fraction, and make the denominator conſiſt of as many 9's as the repetend has figures; or if there be cyphers between the point and repetend, with as many cyphers to the right hand of the denominator, then will this vulgar fraction be equal to the decimal.

Thus, if the repetend be ſingle, as in 0. 3 3 3 3, the vulgar fraction equal to it will be $= \frac{3}{9} = \frac{1}{3}$. So if the repetend be compound, as in 0. 09 09, &c. the equivalent vulgar fraction will $= \frac{09}{99} = \frac{9}{99} = \frac{1}{11}$.

And in like manner 0. 142857 142857, &c. $= \frac{142857}{999999} = \frac{1}{7}$.

The reaſon is obvious from this conſideration, that the decimal 0. 3 3 3, &c. is $= \frac{3}{10} + \frac{3}{100} + \frac{3}{1000}$, &c. the ſum of which will be equal to $\frac{3}{10}$ divided by $1 - \frac{1}{10} = \frac{3}{9} = \frac{1}{3}$; and ſo of the reſt.

If the repetend does not begin with the firſt place of decimals, but at ſome place farther on towards the right, or if it be a mixed circulate, as in the decimal 0. 8 3 3 3, &c. where the repetend does not begin till the ſecond place of decimals, obſerve, that 0. 8 3 3 3 + &c. $= \frac{8}{10} + \frac{3}{100} + \frac{3}{1000} + \&c. = \frac{8}{10} + \frac{1}{10} \times \frac{3}{10} + \frac{3}{10^2} + \&c.$ But $\frac{3}{10} + \frac{3}{10^2} + \&c. = \frac{3}{9} = \frac{1}{3}$, as before: therefore the propoſed decimal is $= \frac{8}{10} + \frac{1}{10} \times \frac{1}{3} = \frac{8}{10} + \frac{1}{30} = \frac{24+1}{30} = \frac{25}{30} = \frac{5}{6}$.

Thus alſo if the decimal 0. 2 27 27, &c. were propoſed, we ſhall find it $= \frac{2}{10} + \frac{1}{10} \times \frac{27}{100} + \frac{27}{100^2} + \&c.$ And $\frac{27}{100} + \frac{27}{100^2} + \&c.$ being $\frac{27}{99} = \frac{3}{11}$, the decimal will be $= \frac{2}{10} + \frac{1}{10} \times \frac{3}{11} = \frac{2}{10} + \frac{3}{110} = \frac{22+3}{110} = \frac{25}{220}$. The reaſon of which is obvious from what has been ſaid.

It may, perhaps, be worth while to obſerve, that if the numerator of a vulgar fraction be unity, and the denominator any prime number, except 2 and 5, the decimal equal to the propoſed fraction will always be a repetend, beginning at the firſt place of decimals; and this repetend muſt neceſſarily be a ſubmultiple, or an aliquot part of a number expreſſed by as many nines as the repetend has figures; that is, if the repetend have ſix figures, it will be a ſubmultiple of 999999; if four figures, it will be a ſubmultiple of 9999, &c. From whence it follows, that if any prime number be called p, the ſeries 9999, &c. produced as far as is neceſſary, will always be diviſible by p, and the quotient will be the repetend of the decimal fraction $= \frac{1}{p}$. For the management of decimals of this kind, ſee Malcolm's Arithmetic, book v. chap. 4.

REPETITION, Repetitio, the reiterating of an action. See REITERATION.

Habits are acquired by the frequent repetition of actions.

School-philoſophers call the repetition of the ſame numerical effect, in another place, the replication of that effect.

REPETITION. The French make uſe of this word for a *rehearſal*, which the Italians call a *prova*. "Rehearſals (ſays Rouſſeau) are neceſſary for compoſitions that are to be performed in public, in order to prove whether the ſeveral parts are correctly copied, and for aſcertaining the entrances and the exits of the ſeveral characters, as well as to ſee that they ſeize the ſpirit of their parts, and of the entire drama. Rehearſals are likewiſe of uſe even to the compoſer himſelf, to enable him to judge of effects, and to make ſuch changes as may ſeem neceſſary."

REPETITION, in *Muſic*, denotes a reiteration or playing over again the ſame part of a compoſition, whether it be a whole ſtrain, or part of a ſtrain, or a double ſtrain. The repetition is denoted by a character called a *repeat*; which is varied ſo as to expreſs the various circumſtances of the repetition.

REPETITION, *Reply*, is alſo uſed when, after a little ſilence, one part repeats or runs over the ſame notes, the ſame intervals, the ſame motions; in a word, the ſame ſong, which a firſt part had already gone over during the ſilence of this.

REPETITION, *Reply*, is alſo a doubling or trebling, &c. of an interval, or reiteration of ſome concord or diſcord.

Thus, a fifteenth is a repetition of the octave, *i. e.* a double octave, or ſecond octave.

REPETITION *of Paſſages*. See ROSALIA.

REPETITION, in *Rhetoric*, is a figure by which the orator rehearſes the ſame words or phraſes over again.

Of this there are two kinds. In the firſt, the word is repeated preciſely in the ſame ſenſe: as, *Oh, Jeruſalem, Jeruſalem, who killeſt the prophets*, &c. *My God, my God, why haſt thou forſaken me?*

Such repetitions have the ſame effect in diſcourſe, with ſecond ſtrokes of the pencil in painting; they render the colours more ſtrong and lively.

Sometimes the orator begins again and again with the ſame word, of which we have an inſtance in the beginning of Cicero's firſt oration againſt Catiline: *Nihilne nocturnum præſidium palatii, nihil urbis vigiliæ, nihil timor populi, nihil conſenſus bonorum omnium, nihil hic munitiſſimus habendi ſenatus locus, nihil horum ora vultuſque moverunt?* Where the word *nihil* ſo often reiterated gives an admirable force and vehemence to the diſcourſe. Again, the ſame author: *Quem ſenatus damnârit, quem populus R. damnârit, quem omnium exiſtimatio damnârit, eum vos ſententiis veſtris abſolvetis?* Again, *Non feram, non patiar, non ſinam.*

The ſecond kind of repetition, called πλοκη, *place*, (which ſee,) is a repetition of the ſame word in the ſame phraſe; but in ſuch a manner, as that ſome new idea or character is added to the word in the ſecond, which it had not in the firſt.

As, *Corydon is always Corydon: Ex illo Corydon Corydon eſt tempore nobis*; by which we ſignify, that Corydon is no ordinary perſon; and that nothing can diſtinguiſh him but the repetition of his own name: as if we ſhould ſay, *he is Corydon, that is enough.* By the ſame figure our Saviour ſpeaks, when he ſays: *Let your language be yea, yea; and nay, nay.* See RECAPITULATION.

REPETITUM, or *Vetitum Namium*, in *Law*. See NAMIUM.

REPHAM, or REEPHAM, in *Geography*, a market-town and pariſh in the hundred of Eynsford, and county of Norfolk, England, is ſituated at the diſtance of 13 miles N.W. by N. from Norwich, and 112 N.E. by N. from London. The charter for its market, which is held on Saturday weekly, was obtained by ſir John de Vaux, in the fifth year of the reign of king Edward V. An annual fair, on the 29th of June, was granted at the ſame time. At one period this pariſh was remarkable for having three churches ſituated within one ſepulchral incloſure; *viz.* Reepham, Whitwell, and Hackford; but only two of theſe are now ſtanding.

The church of Reepham ſerves alſo for the village of Kerdeſton, which belongs to the ſame lords. In this edifice was formerly a "famous image of the Virgin Mary," which, like the ſhrine of Diana at Epheſus, was productive of no ſmall gains to its poſſeſſors; numerous pilgrimages having been made to it by perſons of rank and affluence. Here are ſeveral monuments to the memory of different branches of the Kerdeſton family. One of them, placed againſt the north wall of the chancel, bears the figure of a knight templar in armour, with his hands and legs croſſed. It has no inſcription, but is traditionally ſaid to have been raiſed in honour of ſir Fulk de Kerdeſton, who died in 1270. Blomefield's Hiſtory, &c. of Norfolk. Beauties of England and Wales, vol. xi. by John Britton, F.S.A.

REPIN, a river of Poland, which runs into the Dnieper, near Kiev.

REPITZ, or Ropitz, a town of Saxony, in the margravate of Meiſſen; 2 miles N. of Torgau.

REPLANTING, in *Gardening*, the act of planting a ſecond time.

The gardeners uſed to diſplant their tulips every year, and replant them. Lettuces muſt be diſplanted and replanted yearly, to make them head and knit. If ſtrawberries, &c. be not diſplanted and replanted once in a few years, they degenerate.

REPLEADER, Replacitare, in *Law*, is to plead over again what was once pleaded before.

If, by the miſconduct or inadvertence of the pleaders, the iſſue be joined on a fact totally immaterial, or inſufficient to determine the right, ſo that the court upon the finding cannot know for whom judgment ought to be given, the court will after verdict award a repleader, *quod partes replacitent;* unleſs it appears from the whole record that nothing material can poſſibly be pleaded in any ſhape whatſoever, and then a repleader would be fruitleſs. (4 Bur. 301, 302.) And whenever a repleader is granted, the pleadings muſt begin *de novo* at that ſtage of them, whether it be the plea, replication, or rejoinder, &c. in which there appears to have been the firſt defect, or deviation, from the regular courſe. Raym. 453. Salk. 579.

REPLEGIANDO *Homine, Writ de.* See Homine.

REPLEGIARE *de Averiis*, a writ brought by one whoſe cattle are diſtrained, and put in a pound, by another; upon ſecurity given the ſheriff to purſue, or anſwer the action at law againſt the diſtrainer.

REPLETION, in the *Canon Law*, is where the revenue of a benefice or benefices is ſufficient to fill or occupy the whole right or title of the graduate who holds them.

When there is a repletion, the party can demand no more by virtue of his degrees. In England, where benefices are not appropriated to degrees, repletion, ſtrictly ſpeaking, has no place.

In France, by the old conſtitution, 600 livres, or 45*l.* ſterling *per annum*, made a repletion, when the benefice was obtained otherwiſe than by a degree; and 30*l. per annum*, when it was obtained by virtue of a degree.

Repletion, in *Medicine*, ſometimes ſignifies the general fulneſs of the habit, which is called *plethora;* and ſometimes the temporary overloading of the ſtomach with food and drink, which occaſions particular attacks of diſeaſe, ſuch as a fit of apoplexy, or of the gout, or a diarrhœa.

REPLEVIN, Plevina, in *Law*, a remedy granted on a diſtreſs; being a re-deliverance of the goods diſtrained to the firſt poſſeſſor, on ſecurity or pledges given by him to try the right with the diſtrainer, and anſwer him in the courſe of law.

If a perſon diſtrain another's goods or cattle for rent, or damage feaſant, &c. the owner, upon giving ſecurity to the ſheriff, that he will proſecute his action againſt the party diſtraining, and return the goods or cattle again if the ſeizure ſhall be adjudged good, may have a writ of *replevin*, or *replegiari facias*. See Distress and Replevy, *infra*.

REPLEVISH, is to let one to mainprize upon ſurety. See Mainprise.

REPLEVY, Replevie, (from the Latin *replegiare*, to re-deliver to the owner upon pledges of ſurety,) is the bringing of a writ of *replevin*, or *replegiari facias*, iſſuing out of chancery, by him whoſe cattle or goods are diſtrained by another upon any cauſe; having firſt given ſecurity to the ſheriff, that, on the delivery of the thing diſtrained, he will proſecute the action againſt the perſon who made the diſtreſs.

In the ſtat. 24 Henry VIII. we read of *canes replegiati*, or *hounds replevied*, in a caſe between the abbot of St. Alban's and Geoffery Childwic.

Goods may be replevied two ways; *viz. by writ*, which is that uſed by the common law; and *by plaint*, which is that by ſtatute law, for the more ſpeedy having again the cattle and goods; and is brought in the ſheriff's court.

Accordingly, the ſtatute of Marlbridge (52 Hen. III. cap. 21.) directs, that (without ſuing a writ out of chancery) the ſheriff, immediately upon complaint made to him, ſhall proceed to replevy the goods. And, for the greater eaſe of the parties, it is farther provided by ſtatute 1 P. & M. cap. 12. that the ſheriff ſhall make at leaſt four deputies in each county, for the ſole purpoſe of making replevins. Upon application, therefore, either to the ſheriff, or one of his ſaid deputies, ſecurity is to be given, in purſuance of the ſtatute of Weſtm. 2. 13 Edw. I. cap. 2. 1. That the party replevying will purſue his action againſt the diſtreinor; for which purpoſe he puts in *plegios de proſequendo*, or pledges to proſecute: and, 2. That if the right be determined againſt him, he will return the diſtreſs again; for which purpoſe he is alſo bound to find *plegios de retorno habendo*. Beſides theſe pledges, which are merely diſcretionary in the ſheriff, the ſtatute 11 Geo. II. cap. 19. requires that the officer, granting a replevin on a diſtreſs for rent, ſhall take a bond with two ſureties, in a ſum of double the value of the goods diſtrained; which bond ſhall be aſſigned to the avowant or perſon making cognizance, on requeſt made to the ſheriff; and, if forfeited, may be ſued in the name of the aſſignee. The ſheriff, on receiving ſuch ſecurity, is immediately, by his officers, to cauſe the chattels taken in diſtreſs to be reſtored into the poſſeſſion of the party diſtrained upon; unleſs the diſtreinor claims a property in the goods ſo taken. If this be the caſe, the party replevying muſt ſue out a writ *de proprietate probanda*. But, if no claim of property be put in, or if (upon trial) the ſheriff's inqueſt determines it againſt the diſtreinor, then the ſheriff is to replevy the goods, if they be found within his county. When the goods are delivered back to the party replevying, he is then bound to bring the action of replevin, which may be proſecuted in the county-court; but either party may remove it to the ſuperior courts. Blackſt. Comm. book iii.

REPLICATION, Replicatio, in *Logic*, the aſſuming or uſing the ſame term twice in the ſame propoſition; otherwiſe called *reduplication*.

Some philoſophers uſe the phraſe *replicatio mundi*, replication of the world, for its converſion, or turning round. The human ſoul is ſaid to be in a place *replicatively*, *replicative*, when conceived to be all in the whole, and all in every part of it.

Replication, in *Law*, is an exception of the ſecond de-

gree, made by the plaintiff to the plea or firſt anſwer of the defendant.

The replication is particularly that which the plaintiff replies to the defendant's anſwer in chancery; and which is either *general* or *ſpecial*. The ſpecial is grounded upon matter ariſing out of the defendant's anſwer, &c. The general is ſo called from the general words uſed in it. See REJOINDER, and CONFESS *and avoid*.

REPLIQUE, Fr. in *Muſic*. This term, which implies an octave, has been, not very happily, rendered into Engliſh by *replicate*, in the wretched tranſlation of Rameau's treatiſe; but though it has been generally adopted, it has never ſeemed properly naturalized to our language. Sir Francis Bacon has uſed the word *recurrence* for the ſame purpoſe, which is much more congenial with our idiom. There is neceſſarily a repetition of the ſame ſound, or its octave, in every compoſition of four parts.

REPLOT, in *Geography*, one of the Quarken iſlands, in the gulf of Bothnia. N. lat. 63° 15′. E. long. 21° 7′.

REPOLON, in the *Manege*, is a demivolte, the croupe in, cloſed at five times. The Italians are extremely fond of this ſort of manege. In making a demivolte, they ride their horſes ſhort, ſo as to embrace or take in leſs ground, and do not make way enough every time of the demivolte.

REPOLOVSKOI, in *Geography*, a town of Ruſſia, in the government of Tobolſk, on the Irtiſch; 171 miles N. of Tobolſk.

REPONSE, Fr. in *Muſic*, the anſwer to a ſubject of fugue. The anſwer to a fugue, and the time when it is to be introduced, are difficulties in the art of regular fugue, concerning which young contrapuntiſts are long doubtful. See FUGUE and COUNTER-SUBJECT.

REPORT, the relation made upon oath, by officers or perſons appointed to viſit, examine, ſtate, or eſtimate any thing.

Damages, repairs, &c. are judged from the reports of experienced perſons. Proviſions for perſons wounded are only granted on the reports of ſurgeons, &c.: in caſes of rapes, a report of matrons is to be had.

REPORT, in *Law*, is a public relation, or bringing to memory, of caſes judicially argued, debated, reſolved, or adjudged, in any of the king's courts of juſtice, with the cauſe and reaſon of the ſame delivered by the judges. They are hiſtories of the ſeveral caſes, with a ſhort ſummary of the proceedings, which are preſerved at large in the record, the arguments on both ſides, and the reaſons the court gave for its judgment: taken down in ſhort notes by perſons preſent at the determination: theſe ſerve as indexes to, and alſo to explain, the records.

Theſe reports, which in matters of conſequence and nicety the judges direct to be ſearched, are extant in a regular ſeries from the reign of king Edward II. incluſive; and from his time to that of Henry VIII. were taken by the prothonotaries, or chief ſcribes of the court, at the expence of the crown, and publiſhed annually; whence they are known under the denomination of the "Year-books." And it is much to be wiſhed (ſays judge Blackſtone) that this beneficial cuſtom had, under proper regulations, been continued to this day; for though king James I., at the inſtance of lord Bacon, appointed two reporters, with a handſome ſtipend, for this purpoſe, yet that wiſe inſtitution was ſoon neglected; and from the reign of Henry VIII. to the preſent time, this taſk has been executed by many private and contemporary hands; who ſometimes through haſte and inaccuracy, ſometimes through miſtake and want of ſkill, have publiſhed very crude and imperfect (perhaps contradictory) accounts of one and the ſame determination. Some of the moſt valuable ancient reports are thoſe publiſhed by lord chief juſtice Coke, which are ſo highly eſteemed, that they are generally cited without the author's name; and are ſtiled κατ' εξοχην, *the reports*. The reports of judge Croke are alſo cited in a particular manner, by the name of thoſe princes in whoſe reigns the caſes reported in his three volumes were determined, *viz.* queen Elizabeth, king James, and Charles I., as well as by the number of each volume. Blackſt. Com. book i. &c.

When the chancery, or any other court, refers the ſtating of ſome caſe, or comparing an account, &c. to a maſter in chancery, or other referee, his certificate therein is alſo called a report.

REPORTS, in *Military Matters*, are daily, weekly, and monthly reports of the ſtate of the companies or regiments, relative to their being preſent or abſent, on duty, ſick, confined, &c.

General officers report to the commander-in-chief only. The commander-in-chief's guard reports to himſelf by one of his aid-de-camps. Reports of cavalry are given in to the ſenior generals of cavalry; and reports of infantry to the ſenior general officers of infantry. On a march the field officer of the piquet reports to the general of the day who leads the column; and in camp to the next ſuperior officer to himſelf. A provoſt martial gives in his return of priſoners, and reports to the general of the day.

Deputy judge advocates, acting in diſtricts or garriſons, &c. ſend in the minutes of courts martial, and report to the judge advocate general, without going through any general officers. Regimental ſurgeons report to their commanding officers, and ſurgeons in diſtricts, &c. to the medical board.

The life-guards report, through the Gold Stick, to the king direct, from whom they receive the parole.

The foot-guards report, through the field officer of the day, to the king direct.

All other troops belonging to the Britiſh ſervice, the marines excepted, who report to the admiralty, report through their ſeveral commanding officers, &c. to the adjutant-general and ſecretary at war, and to the commander-in-chief.

A *ſpecial* report is ſaid to be made when the name of an officer is tranſmitted by his commander to the general of a diſtrict, independent of the regular returns; and ſome ſpecific inſtance of miſconduct is laid before him. It muſt be generally remembered, that every officer, on his arrival from abroad with a regiment or detachment of troops, muſt report himſelf to the governor or commanding officer of the ſeaport at which he arrives; and every officer who takes his paſſage for foreign ſervice, muſt do the ſame previous to his departure.

The ſenior officer in each recruiting quarter reports weekly to the field officer of the diſtrict, the number and ſtrength of the parties therein. The field officers commanding recruiting parties in diſtricts, report to the inſpector-general, to whom all returns and reports are to be tranſmitted by them, and not direct from the recruiting officers.

The various ſubordinate reports are thoſe of a rear-guard, of a barrack-guard, of a quarter-guard, of a main-guard and its dependencies, &c. &c.

In the column of remarks which muſt accompany each of theſe reports, it is neceſſary, for the perſon who ſigns, to ſpecify all caſualties and extraordinary occurrences according to the particular nature of each report. The different hours at which the grand rounds, viſiting rounds, and patroles went, muſt likewiſe be put down.

REPORT, *Pinion of*. See PINION.

REPOS, Fr. in *Muſic*, a repoſe, or pauſe. It is the termi-

termination of a phraſe or period. The repoſe here meant reſembles a hyatus in verſification; it is a cadence more or leſs perfect as the baſe falls a third, a fifth, or riſes to the ſixth of the key. It is a kind of reſting place, determined by the ſenſe of the paſſage, and by feeling. See CADENCE and CADENZA.

REPOSE, in *Poetry*, &c. See REST, PAUSE, &c.

REPOSE, in *Painting*, is applied to certain maſſes, or large ſyſtems of aſſemblages of light and ſhade; which, being well conducted, prevent the confuſion of objects and figures; by engaging and taking up the eye ſo as it cannot attend to the other parts of the painting for ſome time; and thus leading it to conſider the ſeveral groupes gradually, and, as it were, to proceed from ſtage to ſtage.

REPOSE, *In*, in *Military Language*, is a phraſe that applies to troops which are allowed to be ſtationary for any given period, during an active campaign, either through ſickneſs, or from ſome other cauſe.

REPOSITION *of the Foreſt* (formed from *re*, and *ponere to lay again*), an act by which certain grounds, before made purlieu, are, upon a ſecond view, laid to the foreſt again.

REPOSITION, in *Surgery*, the reduction of a bone.

REPOSITORY, REPOSITORIUM, a ſtore-houſe or place where things are laid up and kept. In which ſenſe we ſay, the repoſitory of the royal ſociety, the royal repoſitory at Woolwich, containing models of every ſort of warlike ſtores, &c. See MUSEUM.

REPOSITORY *of Farm Manure*, in *Rural Economy*, the place where it is put or laid up. See RECEPTACLE *of Stall Manure*.

REPOSO, in *Geography*, a ſmall iſland near the coaſt of Braſil; S. lat. 19° 36′.

REPPELE, a town of Hinder Pomerania; 7 miles W.S.W. of Zachau.

REPPIN, a town of Brandenburg, in the New Mark, on the Eylang; ſix miles S.S.W. of Droſſen, N. lat. 52° 25′. E. long. 15° 2′.

REPREHENSION, in *Rhetoric*. See PARRHESIA.

REPRESENTATION, REPRÆSENTATIO, in the *Drama*, the exhibition of a theatrical piece; including the ſcenes, machines, recitation, &c.

Sir Richard Steele's principle is, that the deſign of a play is not to be read but repreſented; ſo that it is on the ſtage, not in the preſs, it is to be judged of; and that the pit, not the public, are the proper judges.

REPRESENTATION, in *Law*. See DESCENT, *Right of* CROWN, INTESTATE, ADMINISTRATION, and PARLIAMENT.

REPRESENTATION, in *Inſurance*, is underſtood to mean a collateral ſtatement, either by parol or in writing, of ſuch facts or circumſtances relating to the propoſed adventure, and not inſerted in the policy, as are neceſſary for the information of the inſurer, to enable him to form a juſt eſtimate of the riſk. Such repreſentations are often the principal inducement to the contract, and afford the beſt ground upon which the premium can be calculated. A repreſentation may be untrue, either wilfully and fraudulently; or inadvertently and innocently.

A wilful miſrepreſentation, or *allegatio falſi*, in any fact or circumſtance *material to the riſk*, is a fraud that will always avoid the contract. As if an agent, knowing that a ſhip had ſailed from Jamaica for London on the 24th of November, effect an inſurance on the voyage, and tell the underwriter that the ſhip ſailed in December: this is a fraud, and the policy is void.

And ſuch miſrepreſentation ſo completely vitiates the policy, that the inſured cannot recover upon it, even for a loſs ariſing from a cauſe unconnected with the fact or circumſtance miſrepreſented. As if the inſured repreſent that the ſhip or goods inſured are neutral property, when in fact they are enemy's property; he ſhall not recover even for a loſs occaſioned by ſhipwreck.

So it would be if the broker or agent were to aſſert that a ſhip or goods were neutral property, without knowing whether this were true or falſe, and they are, in fact, enemy's property: for, though it may not, perhaps, be equally criminal *in foro conſcientiæ* for a man to aver that to be true which he knows nothing of, as to aver that to be true which he knows to be falſe; ſtill it is unqueſtionably a fraud, and in the caſe of an inſurance, equally injurious to the underwriter; becauſe he is induced by the deception, however occaſioned, to compute the riſk upon falſe principles. The ſame reaſoning holds even in the caſe where the perſon himſelf making the repreſentation *believes* it to be true.

But if he were only to ſay that he *believes* the ſhip to be neutral property, knowing nothing on the ſubject, and having no reaſon to believe the contrary; there, though the ſhip be not neutral, the repreſentation will not avoid the policy; becauſe the under-writer may inform himſelf of the grounds of this belief, before he enters into the contract; and if he neglect to do ſo, he takes upon himſelf the riſk of its being unfounded.

For the ſame reaſon, if the word *expected* be uſed, this will not amount to a repreſentation: as when a broker in getting inſurances effected on ſeveral ſhips, belonging to the ſame owner, and ſpeaking of them all, ſaid, — 'Which veſſels are *expected* to leave the coaſt of Africa in November or December,' when, in fact, they had all ſailed in the May preceding: this does not amount to a repreſentation, being only an *expectation*, the ground of which the under-writer might have enquired into.

There is a material difference between a repreſentation and a warranty. A warranty, being a condition upon which the contract is to take effect, is always a part of the written policy, and muſt appear on the face of it: whereas a repreſentation is only matter of collateral information or intelligence on the ſubject of the voyage inſured, and makes no part of the policy. A warranty, being in nature of a condition precedent, muſt be *ſtrictly and literally* complied with; but it is ſufficient if a repreſentation be true in *ſubſtance*. By a warranty, whether material to the riſk or not, the inſured ſtakes his claim of indemnity upon the preciſe truth of it, if it be affirmative, or upon the exact performance of it, if executory; but it is ſufficient if a repreſentation be made without fraud, and be not falſe in any material point; or if it be *ſubſtantially*, though not *literally*, fulfilled. A falſe warranty avoids the policy, as being a breach of a condition upon which the contract is to take effect, and the inſurer is not liable for any loſs though it do not happen in conſequence of the breach of the warranty. A falſe repreſentation is no breach of the contract, but if material, avoids the policy on the ground of *fraud*, or at leaſt becauſe the inſurer has been miſled by it.

It has already been ſhewn that a warranty muſt appear upon the face of the policy, and make a part of the written contract; and therefore a written paper, wrapped up in the policy, or even wafered to it, is only a repreſentation. For the ſame reaſon, the written inſtructions for effecting the policy, unleſs inſerted in it, cannot be deemed a warranty, but only a repreſentation; for the under-writer, by not inſiſting on having theſe inſtructions inſerted in the policy, ſhews that he is content to take them as a repreſentation.

But

But it behoves all agents and brokers concerned in the effecting of policies, to keep correct entries of theſe inſtructions, and indeed of all repreſentations made to the under-writers: for the whole queſtion between the inſured and the under-writers often turns upon theſe inſtructions. Beſides, they are anſwerable to the inſured for the conſequences of any repreſentation made by them without authority, as well as for thoſe of omitting to make ſuch repreſentations as they have been inſtructed to make.

By an extenſion of equitable relief in caſes of fraud, it ſeems to be now ſettled that if a falſe repreſentation be made to the firſt under-writer on the policy, in a material point, this ſhall be conſidered as a miſrepreſentation made to every under-writer, ſo as to infect the whole policy, otherwiſe it might be a contrivance to deceive many; for when a reſpectable under-writer ſtands firſt on the policy, the reſt ſubſcribe the policy without aſking a queſtion; and if the firſt under-writer be impoſed upon, the reſt are entrapped by the ſame fraud.

But the inſurer muſt avail himſelf of this ſort of objection in the firſt inſtance; for after a verdict has been obtained, the court will not ſet it aſide upon an affidavit of the firſt under-writer, that a material miſrepreſentation had been made to him. The defendant, in ſuch caſe, knows what has been repreſented to himſelf, and might have known what had been repreſented to the firſt under-writer; and he ſhall not lie by till after a trial, in order to make the objection, if the verdict ſhould be againſt him.

If the inſured ſtate his computation as *fact*, inſtead of the information on which he founds his computation, and it prove untrue, it is a miſrepreſentation; and if material, it will avoid the policy.

A miſrepreſentation in a material point equally vitiates the contract, whether it be the miſrepreſentation of the inſured himſelf or of his agent, and whether it proceed from fraud, miſtake or negligence; for the inſurer is thereby led into an error, and computes the riſk upon falſe grounds.

As a repreſentation is only matter of collateral information, it is ſufficient if it be true in *ſubſtance;* and its not being inſerted in the policy in the form of a warranty, is looked upon as a proof that the inſurer does not require it to be ſtrictly and literally true. Although the voyage be repreſented as being leſs than the voyage deſcribed in the policy, yet, if there be no fraud, and the voyage actually performed be within the policy, it will be protected by the policy. Even if a repreſentation as to the courſe of the voyage be literally untrue, yet if it be made in conformity to an eſtabliſhed uſage of trade, and no perſon be deceived by it, and the voyage meant to be performed be within the policy, it will not avoid the contract.

Every repreſentation reſpecting the ſtate of the ſhip, and the time of her ſailing, is material; and therefore if it be ſtated that a ſhip was *ready to ſail* on a certain day, when, in fact, ſhe had ſailed the day before, this is both a miſrepreſentation and a concealment, and will avoid the policy.

Concealment, or "ſuppreſſio veri," is nearly allied to miſrepreſentation, or "allegatio falſi," and conſiſts in the fraudulent ſuppreſſion of any fact or circumſtance material to the riſk; and this, like every other fraud, avoids the contract *ab initio*, upon principles of natural juſtice. But it is not merely on the ground of *fraud* that a concealment avoids the contract; for even a concealment which is only the effect of accident, negligence, inadvertence, or miſtake, will be equally fatal to the contract, as if it were intentional and fraudulent. Whatever reſpects the ſtate of the ſhip, the time of her ſailing, the nature of the employ in which ſhe is to be engaged, &c. ought to be fully diſcloſed; and the keeping back of any part of this fact will be fatal to the contract. In ſuch caſe, the concealment ſo vitiates the policy that it will afford the inſured no remedy, even for a loſs ariſing from a cauſe unconnected with the fact or circumſtance concealed; for a concealment is to be conſidered, not with reference to the event but to its effect, at the time of making the contract. A well-founded ſuſpicion of concealment will amount in the courts to proof of fraud. As it is in ſome caſes neceſſary to ſtate to the under-writers the nature of the ſervice in which the ſhip is to be employed; if this be attended with any extraordinary danger, the concealment of it will avoid the policy. A material concealment is fatal, though the fact concealed was not diſcloſed, becauſe the broker thought it immaterial. Doubtful rumours reſpecting the ſafety of a ſhip which it is intended to inſure "loſt or not loſt," ought to be faithfully diſcloſed to every under-writer; and the withholding of ſuch information will avoid the contract. The obligation of a ſtrict obſervance of good faith is equally binding on both parties in all contracts; and in that of inſurance, the under-writer, as well as the inſured, is bound to diſcloſe all circumſtances within his knowledge affecting the riſk. If, therefore, it ſhould appear, that at the time when he underwrote the policy, he knew that the ſhip was arrived ſafe, the contract will be void as to him, and an action will lie againſt him to recover back the premium.

There are, however, many matters, which are open to both parties, and upon which they may both exerciſe their judgments, with regard to which they may be innocently ſilent. The inſured need not diſcloſe what the under-writer knows, or what he ought to know. The under-writer needs not be told what leſſens the riſk agreed upon, and is underſtood to be compriſed within the terms of the policy. He is bound to know every cauſe which may occaſion natural perils, as the difficulty of the voyage, the variation of ſeaſons, the probability of lightning, hurricanes, &c. He is alſo bound to know every cauſe which may occaſion political perils, from the rupture of ſtates, from war, and its various operations; and he is bound to know the probability of ſafety from the continuance and return of peace, from the imbecility of the enemy, the weakneſs of their counſels, or their want of ſtrength. There are other circumſtances which the under-writer ought to know; and, particularly, it is not neceſſary to communicate to him, that the ſhip is foreign built, though this enabled her to ſail without convoy, and without a licence to do ſo, being within the exception in the ſtat. 38 Geo. III. c. 76. § 6; it being the buſineſs of the under-writer to obtain this information for himſelf. In caſes of concealment, the queſtion muſt always be, whether there was, under all the circumſtances, at the time when the policy was underwritten, a full and fair ſtatement, or a concealment: fraudulent, if deſigned; or, though not deſigned, varying materially the object of the policy, and changing the riſk underſtood to be run; and in both caſes avoiding the contract. It is not neceſſary that there ſhould be any previous repreſentation as to the ſtate of the ſhip, that being covered by the implied warranty that ſhe is ſea-worthy. For a variety of other particular facts and documents, relating to the ſubjects of repreſentation and concealment, we refer to Marſhall's Treatiſe on the Law of Inſurance, vol. i. b. 1. ch. 9 and 10. See WARRANTY.

REPRESENTATIVE, one that perſonates, or ſupplies the place of another; and is inveſted with his right and authority.

The word repreſentative is equivalent to procurator or proxy.

The

The commons are the people's repreſentatives in *parliament*; which ſee.

There is this defect in the conſtitution of our parliament; that whereas all Engliſhmen who have conſiderable eſtates ought not to be taxed without their own conſent in parliament, by themſelves, or their repreſentatives; copyholders, of whom ſome have a thouſand pounds a-year, have no voice in the election of knights of the ſhire. See PARLIAMENT.

REPRESENTATIVE *Character*, in *Political Economy*, thus denominated by way of excellence, or in contradiſtinction to other kinds of repreſentation, conſtitutes the ambaſſador, or miniſter of the firſt rank, who repreſents his maſter in his very perſon and dignity. It places him above all other miniſters, who are not inveſted with the ſame character, and precludes their entering into competition with the ambaſſador. (See EMBASSADOR.) Envoys are miniſters of the ſecond rank, and are not inveſted with the repreſentative character, properly ſo called, or in the firſt degree. See ENVOY.

REPRESENTATIVE *Power*, in *Metaphyſics*, a term introduced by Leibnitz, to ſignify that power of the human ſoul, by which it repreſents to itſelf the univerſe, according to the ſituation of the body in the univerſe.

Wolfius calls this power *vis repreſentativa*, to denote its being an active power, or rather a force actually exerting itſelf. For he expreſsly ſays, *quod vis conſiſtat in continuo agendi conatu*. And he thinks that from this principle of a *vis repreſentativa*, every phenomenon of the human mind may be accounted for. See his Pſycholog. Ration. art. 529.

But it may be preſumed, that many will find this principle too obſcure to be admitted.

When it is ſaid, that our ideas are repreſentative of things without us, or of the univerſe; it may be aſked in what ſenſe this is to be underſtood? Do they repreſent it, 1. As a picture does its original? Or, 2. As an effect of a cauſe? Or, 3. As a ſign repreſents the thing ſignified? The firſt opinion is exploded in part by Locke and the Carteſians, and totally by Dr. Berkeley, late biſhop of Cloyne. The ſecond is admitted by Hobbes, but denied by Leibnitz himſelf and the idealiſts. The third ſhould ſeem to be the opinion of Leibnitz, but he is not ſufficiently explicit.

Dr. Berkeley admits ideas to be ſigns; but according to him they are arbitrary ſigns, depending on the immediate will of the Deity: hence the viſual language; and ideas only ſignify or ſuggeſt each other, and ſpirits; but not bodies, the exiſtence of which is totally unknown.

REPRIEVE, or REPRIVE, from *reprendre, to take back*, in *Law*, a ſuſpending or deferring the execution of the law upon the priſoner for the preſent time.

A reprieve is properly a warrant from the king, for ſuſpending the execution of a perſon condemned.

This may be, firſt, *ex arbitrio judicis*, either before or after judgment; as, where the judge is not ſatisfied with the verdict, or the evidence is ſuſpicious, or the indictment inſufficient, or he is doubtful, whether the offence be within clergy; or ſometimes, if it be a ſmall felony, or any favourable circumſtances appear in the criminal's character, in order to give room to apply to the crown for either an abſolute or conditional pardon. Theſe arbitrary reprieves may be granted or taken off by the juſtices of gaol-delivery, although their ſeſſion be finiſhed, and their commiſſion expired; but this rather by common uſage than by ſtrict right. (2 Hal. P. C. 412.) Reprieves may alſo be *ex neceſſitate legis*, as where a woman is capitally convicted, and pleads her pregnancy; which is referred to a *jury of matrons*. Another cauſe of regular reprieve is, if the offender become *non compos* between the judgment and the award of execution. See LUNATIC.

REPRIMAND, a ſharp authoritative reproof. Such a perſon was reprimanded in court by the bench, &c.

REPRIMAND, a military puniſhment at the head of a regiment, is ſometimes ordered by a court-martial, and ſometimes only in the preſence of the officers of the corps: it is generally given by one of the field-officers, and uſually in ſuch terms as theſe: "Captain, or lieutenant A. B., you have been tried for ——, and are, by the ſentence of a general court-martial, found guilty thereof, and ſentenced to be reprimanded at the head of the regiment: the diſagreeable taſk of doing it is aſſigned to me: I therefore do hereby reprimand you, and hope, that it may prevent your falling again into the like error." Non-commiſſion officers are ſometimes, though not frequently, ordered to be reprimanded.

REPRISALS, or REPRIZALS, *Repriſalia*, in the *Civil Law*, a right which princes have to retake from their enemies ſuch things as they unjuſtly detain from them; or other things equivalent to them.

The word is formed from the Italian *repreſaglia*, which ſignifies the ſame thing.

When a place is taken or held from a prince, he ſeizes another by way of repriſal. Sometimes he takes men of the oppoſite party, by right of repriſals.

The Romans called this *clarigatio*; and the Greeks had ſomething like it under the name of *androlepſia*.

Repriſals are uſed between nation and nation, to do juſtice to themſelves, when they cannot otherwiſe obtain it. If a nation has taken poſſeſſion of what belongs to another; if it refuſes to pay a debt, to repair an injury, or to make a juſt ſatisfaction; the other may ſeize what belongs to it, and apply it to its own advantage, till it has obtained what is due for intereſt and damage, or keep it as a pledge till full ſatisfaction has been made. The law of nations permits repriſals only upon a cauſe that is evidently juſt, as for a debt that is extremely clear. For he who forms a doubtful pretenſion, can at firſt demand only an equitable examination of his right. In the ſecond place, he ſhould, before he proceeds ſo far, have in vain demanded juſtice, or, at leaſt, have the utmoſt reaſon to believe that it would be in vain for him to demand it. Then alone he may right himſelf. It would be too contrary to the peace, to the repoſe, and ſafety of nations, to their mutual commerce, and to the duties which bind them to each other, for any prince ſuddenly to apply to force, without knowing whether the other is diſpoſed to do him juſtice, or to refuſe it. It muſt be obſerved, in order perfectly to underſtand this article, that if, in a litigious affair, our adverſary refuſes the means of bringing the right to proof, or artfully eludes it; if he does not, with good faith, apply to pacific meaſures for terminating the difference; and, above all, if he is the firſt who begins acts of hoſtility, he renders the cauſe juſt, which was before doubtful: we may then make uſe of repriſals, or ſeize his effects, to oblige him to embrace the methods of reconciliation, which the law of nature preſcribes. This is the laſt attempt before coming to an open war. As the wealth of the citizens forms a part of the total wealth of a nation, and between ſtate and ſtate, whatever is the property of the members is conſidered as belonging to the body, and is anſwerable for the debts of the body; it follows, that in repriſals they ſeize the goods of the ſubject, in the ſame manner as thoſe of the ſtate, or ſovereign. Every thing that belongs to the nation is ſubject to repriſals, as ſoon as it can be ſeized, provided it be not a depoſit truſted to the public faith. This depoſit is found in our hands,

only

only in conſequence of that confidence which the proprietor has put in our good faith; and it ought to be reſpected, even in caſes of open war. Thus it has been uſual to behave in France, England, and elſewhere, with reſpect to the money which foreigners have placed in the public funds. He, however, who makes uſe of repriſals againſt a nation, on the goods of its members indiſcriminately, cannot be taxed with ſeizing the wealth of an innocent perſon for the debt of another; for, in this caſe, the ſovereign is to recompenſe thoſe of his ſubjects on whom the repriſals fall: this is a debt of the ſtate or nation, of which each citizen ought only to ſupport his quota. It belongs only to ſovereigns to uſe and order repriſals, in the manner now ſtated. This is a meaſure of too great conſequence to be abandoned to private perſons. In all civilized ſtates, a ſubject who thinks himſelf injured by a foreign nation has recourſe to his ſovereign, in order to obtain the permiſſion of making repriſals. This is what is called deſiring "letters of marque." See the next article.

We may uſe repriſals againſt a nation, not only for the actions of the ſovereign, but alſo for thoſe of his ſubjects. Accordingly the ſovereign demands juſtice, or makes repriſals, not only for his own affairs, but alſo for thoſe of his ſubjects, whom he ought to protect, and whoſe cauſe is that of the nation. But to grant repriſals againſt a nation, in favour of foreigners, is to ſet himſelf up as a judge between that nation and theſe foreigners, which no ſovereign has a right to do.

As we may ſeize the things which belong to a nation, to oblige it to do juſtice, we may, for the ſame reaſon, arreſt ſome of the citizens, and not releaſe them till we have received entire ſatisfaction; the ſubjects thus detained being only regarded as a ſecurity to oblige a nation to do juſtice, if their ſovereign is obſtinate in refuſing it. We cannot take away their lives, nor inflict any corporal pain upon them, for a refuſal of which they are not guilty. But the ſovereign may make uſe of force againſt thoſe who reſiſt the execution of this right, and uſe as much as is neceſſary to ſurmount their unjuſt reſiſtance. In this caſe, the true and juſt welfare of the ſtate is the grand rule: moderation is always laudable in itſelf; but the conductors of nations ought to exerciſe it only ſo far as it is conſiſtent with the happineſs and ſafety of their people. A ſovereign, however, has no right to oppoſe force, or to make war againſt him, who, in ſuch a caſe, by ordering the making of repriſals, only exerciſes his juſt right. Whenever a ſovereign can, by the way of repriſals, procure a juſt recompence, or a proper ſatisfaction, he ought to make uſe of this method, which is leſs violent and leſs fatal than war. Thoſe who run to arms, ſays the excellent Vattel, without neceſſity, are the ſcourges of the human race, barbarians, enemies to ſociety, and rebels to the law of nature, or rather to the common father of mankind. There are caſes, however, in which repriſals would be juſtly condemned, even when a declaration of war would not be ſo; and theſe are preciſely thoſe in which nations may with juſtice take up arms. When it relates to differences, not on an act of violence, or of an injury received, but of a conteſted right; after having in vain attempted ways of reconciliation, or pacific meaſures of obtaining juſtice, it is a declaration of war which ought to follow, and not pretended repriſals, which, in ſuch a caſe, would only be real acts of hoſtility, without a declaration of war, and would be contrary to the public faith as well as to the mutual duties of nations.

There is one kind of retortion ſometimes practiſed in war, under the name of repriſals, which we muſt here mention. If a general of the enemy has, without any juſt reaſon, cauſed ſome priſoners to be hanged, a like number of his men, and of the ſame rank, will be hung up; ſignifying to him, that this retaliation will be continued for obliging him to obſerve the laws of war. It is a ſad extremity thus to put a priſoner to death for his general's fault; and if this priſoner was before promiſed his life, repriſals cannot be made on him with any colour of juſtice. Yet as a prince, or his general, has a right of ſacrificing the life of his enemies to his ſafety, and that of his men, if he is engaged with an inhuman enemy, who frequently commits ſuch enormities, he appears to have a right of refuſing life to ſome of the priſoners he may take, and of treating them as his were treated. But Scipio's generoſity is rather to be imitated. That great man, having reduced ſome Spaniſh princes, who had revolted againſt the Romans, declared to them, that on a breach of their faith, he would not call the innocent hoſtages to an account, but themſelves; and that he would not revenge it on a diſarmed enemy, but on thoſe who ſhould be found in arms. (Liv. l. 28.) Alexander the Great, having cauſe of complaint againſt Darius for ſome malpractices, ſent him word, that if he continued to make war in ſuch a manner, he would purſue him to the utmoſt, and give no quarter. (Quint. Curt. l. iv. c. 1, and 11.) It is thus an enemy, violating the laws of war, is to be puniſhed, and not by cauſing the penalty due to his crimes to fall on innocent victims. Vattel's Law of Nations, b. ii. ch. 18. b. iii. ch. 8.

Repriſals is alſo uſed for a letter or permiſſion, which a prince ſometimes gives a ſubject, upon a full cognizance of the cauſe; authorizing him to retake from the firſt perſons he meets of the oppoſite party, as many effects as make an equivalent to what have been violently forced from him, and for which the oppoſite prince has refuſed to do him juſtice.

Theſe permiſſions are alſo called *letters of marque*, or *mart*; and in the ſtat. 27 Edw. III. *law of marque*; in regard a perſon denied juſtice in another man's territory, redreſſes himſelf by goods belonging to men of that territory. See *Letters of* Marque.

Repriſals is alſo uſed in the ſame ſenſe with recaption.

REPRISE, or Reprize, in the *Commerce by Sea*, a merchant-ſhip, which, having been taken by a corſair, privateer, or other enemy, is retaken or recovered by a veſſel of the contrary party.

The word is French, and ſignifies a *reſumption* or *retaking*.

When a veſſel, thus retaken, has been twenty-four hours in the hands of the enemy, it is deemed a lawful prize. If the reprize has been made within twenty-four hours, the veſſel is to be reſtored to the proprietor, with every thing in it, upon his allowing one-third to the veſſel who made the reprize.

If the reprize has been abandoned by the enemy, either in a tempeſt, or from any other cauſe, before it have been led into any port, it is to be reſtored to the proprietor. See Recapture.

Reprise, in the *Manege*, is a leſſon repeated, or a manege recommenced. Thus we ſay, to give breath to a horſe upon the four corners of the volte with only one repriſe, that is, all with one breath.

Reprise, Fr., in *Muſic*. Every part of an air or ſtrain that is to be repeated, without being written or printed twice over, is called by the French a repriſe. There are various ways of marking repetitions in muſic: firſt by a double bar dotted; if on both ſides, both parts or ſtrains

are to be repeated; if only one ſide of the double bar is dotted, that ſide only is to be repeated. This ſign 𝄋, and ſometimes *da capo al ſegno* 𝄋, imply a repetition of particular portions of a melody; as do, likewiſe, dots in the ſpaces of the ſtaff. (See RENVOI and REFERENCE.) Gretry, in his Memoires, ſays that the repeating of the firſt and ſecond parts or ſtrains of a movement is a barbarous cuſtom.

REPRISES, in *Law*, are deductions, drawbacks, or duties, paid yearly out of a manor, or lands. Such are rent-charges, penſions, fees of ſtewards or bailiffs, &c. The manor of Doll yields 40*l. per annum, ultra reprizas*, beſides all reprizes.

REPROBATION, REPROBATIO, in *Theology*, a decree or reſolve, which God has taken from all eternity to puniſh ſinners, who ſhall die in impenitence.

Reprobation ſtands in direct oppoſition to *election*.

Divines hold it a ſymptom of reprobation, when a ſinner is hardened ſo as not to feel any farther remorſe or miſgivings of conſcience.

The caſuiſts diſtinguiſh two kinds of reprobation, *poſitive* and *negative*. *Poſitive* is that by which God is ſuppoſed to create men with a poſitive and abſolute reſolution to damn them eternally. This opinion of reprobation is countenanced by St. Auguſtine, and others of the fathers; and is ſtrongly maintained by Calvin, and moſt of his followers. Something like it is alſo found in the thirty-nine articles of the church of England; but it is now generally exploded, as injurious to the juſtice of God. *Negative* or *conditional* reprobation is that by which God, though he creates all men with a ſincere deſire to ſave them, and furniſhes them with the neceſſary means thereto, ſo that all may be ſaved, if they will; yet ſees there are ſeveral who will not do it, with the aids he ſhall afford them, how powerful ſoever; and ſees, at the ſame time, they would do it with certain other aids, which he ſees, but will not give them. *O altitudo!* &c.

By comparing one part of ſcripture with the other, ſays Dr. Doddridge in his "Lectures," (Prop. 142, ſchol. 1.) there ſeems to be this remarkable difference between the predeſtination to life and that to death (here called reprobation), that, in the former caſe, God determines by the influence of his grace to work ſuch a change in the hearts of his elect, as that their ſalvation ſhould on the whole be aſcribed to him, and not unto themſelves; whereas he determines to bring others into ſuch circumſtances, that though their ruin ſhould in fact happen, yet they themſelves ſhould be the authors of it, and the blame lie as entirely upon themſelves, as if it had not been ſo much as foreknown. (See Rom. ix. 22, 23. Matth. xxv. 34, 41.) But the oppoſers of this doctrine allege, that this kind of reaſoning is an evaſion and not a ſolution of the difficulty. This learned divine, adverting to the objection, that the above-ſtated doctrine tends to make the perſons whom it concerns deſperate, obſerves, that if it be granted, that *ſufficient* aſſiſtances are given to *all*, none will have reaſon to deſpair, nor will any have an excuſe to plead before God, in conſequence of his ſecret purpoſes, which will not be made a rule of his final judgment. If it be ſaid, that nevertheleſs thoſe who are not predeſtinated to life are left under a neceſſity of periſhing, and an impoſſibility of ſalvation; it muſt be owned, that it is difficult to ſay, how the doctrine, as explained by ſome, can be freed from this objection; but that this conſequence does not neceſſarily follow from it, according to his ſtatement. See ELECTION and PREDESTINATION. See alſo SUBLAPSARIAN and SUPRALAPSARIAN.

REPRODUCTION, in *Phyſiology*. In ſpeaking of the growth of organic bodies, we muſt notice their power of reproduction; that wonderful property of reſtoring or renewing parts that have been mutilated or entirely loſt. This is one of the moſt important proviſions of nature, inaſmuch as it guards animals and plants againſt the multiplied dangers to which their bodies are expoſed. Hence, when viewed in connection with the ſyſtem of nutrition altogether, it forms one of thoſe deciſive and grand characters, which diſtinguiſh at once the machines that proceed from the hand of the Creator, from all, even the moſt ingenious and boaſted, productions of human ſkill. The difference is recogniſed at the firſt glance; the diſtance is immeaſurable. The ſprings and wheels of mechanical inſtruments have no power of repairing themſelves, when they are bent, broken, worn, or ſpoiled; but ſuch a faculty is enjoyed in various degrees by every animal and by every plant.

At different periods of the year, ſeveral organiſed beings loſe, by a ſpontaneous and natural proceſs, certain parts of their body, which are ſubſequently renewed. Examples of this occur in the fall of the ſtag's horns; in the moulting of birds; in the renewal of the cuticle of ſerpents, and other amphibia, of the larvæ of inſects, and of the ſhell of the cruſtacea; the fall of the leaves of trees, &c. This may be called ordinary or natural reproduction. The ſtag's horn, or antler, as it ſhould be more properly called, is a maſs of true bone, poſſeſſing the ſtructure and characters of oſſeous ſubſtances. In its early ſtate it is ſoft, and traverſed by large veſſels, which muſt be reproduced every time the new horn is formed. This annual reproduction conſtitutes, in many points of view, one of the moſt remarkable phenomena of animal phyſiology. It affords a moſt ſtriking proof, 1ſt, of the power of the nutritive proceſs, and of the rapid growth, which is dependant on this in warm-blooded animals. For the horn of a ſtag, which may weigh a quarter of a hundred, is completely formed in ten weeks. 2dly. Of a limited duration of life in a part of an animal, entirely independent on the life of the whole animal, which in the ſtag extends to about thirty years. 3dly. Of change of calibre in particular veſſels. For the branches of the external carotid, which ſupply the horn, are ſurpriſingly dilated during its growth; and recover their former area, when that proceſs has ceaſed. 4thly. Of a peculiar ſympathy, which is manifeſted between the growth of the horns, and the generative functions. For caſtration, or any eſſential injury of the organs of generation, impedes the growth, alters the form, or interrupts the renewal of the horns. See the articles CERVUS, and HORN, in *Comparative Anatomy*.

The cuticle of the ſnake is ſeparated every year, and comes off as a complete ſheath, excepting the aperture, through which the animal eſcapes: the covering of the cornea is ſhed with the reſt of the external integument.

Cruſtaceous animals (the crab, lobſter, &c.) have a ſkeleton, which ſurrounds and contains their ſoft parts, and which ſerves, at the ſame time, the purpoſes of a ſkin. When it has attained its perfect conſiſtence, it grows no more; but, as the ſoft parts ſtill increaſe, the ſhell ſeparates, and is detached, being ſucceeded by a larger one. The calcareous bodies in the ſtomachs of theſe animals, performing the office of teeth, are ſhed with the ſhell. See the article CANCER, in the account of the ſpecies *ruricola*, and *gammarus*.

The larvæ of inſects caſt their cuticular covering ſeveral times before their transformation. An intereſting account of

the particulars may be ſeen in the article ENTOMOLOGY, in the diviſion "*of the larva ſtate*," under the ſubdiviſion "*lepidoptera*."

The ſecond, or *extraordinary* kind of reproductive power, is that by which wounds, fractures, or any accidental mutilation or loſs of parts of an organiſed body, are remedied or reſtored. This exiſts in very different degrees in different departments of the animal kingdom. In man, and ſuch animals as are nearly allied to him, the property is very limited, although ſufficiently active to be capable of remedying the effects of great injuries. If a bone be broken, a muſcle or tendon divided, or a piece of ſkin deſtroyed, proceſſes are ſet up in the parts by which reſtoration is accompliſhed. The ends of the bone are joined by an oſſeous ſubſtance, which gives to the part its original ſolidity; the tendon regains its firmneſs and power of reſiſtance; the muſcle can contract again and move the points of its attachment; and the ſurface of the body is covered by a new piece of integument. The functions of the parts are reſtored; but the newly formed matter can be always diſtinguiſhed from the original compoſition of the body, and poſſeſſes a weaker vitality. For, in ſome caſes, old ulcers have broken out afreſh, and even fractures have been diſunited in ſtates of great general debility. A divided nerve is reunited, even if a ſmall portion be removed: and the function of the part, ſuſpended for a time, is thus reſtored. The caſe is different in the blood-veſſels: the proceſſes conſequent on wounds of theſe tend to ſtop the hemorrhage, which in general can be effected only by the obliteration of the tube.

The power of repairing the effects of injury is modified by various circumſtances. The health and ſtrength of the individual, the age, the air, and other circumſtances, which the ſurgeon muſt attend to, have great influence.

In the caſes which have been juſt mentioned, the reſtorative power repairs injuries; but it goes no further. Neither in man, nor in any warm-blooded animals, are entire organs ever reproduced. If a limb be cut off, or a piece of fleſh taken away, the wound is healed, the chaſm is filled up; but the loſt parts are never formed again.

In the lower orders of the animal kingdom, on the contrary, ſuch are the ſtrength and perfection of the reproductive energy, that conſiderable members are formed again, and we can hardly aſſign a limit to the power in ſome inſtances. The lower we deſcend in the ſcale of beings, the more ſurpriſing are the manifeſtations of this reproductive faculty. It is familiarly known, that the claws of the crab and lobſter, and the entire limbs or tail of the newt, can be reſtored: the ſame holds good of the rays of the ſtar-fiſh (aſterias), and the arms or tentacula of the cuttle-fiſh. It was aſſerted by Bonnet and Spallanzani, that the entire head of the ſnail can be reproduced; but the aſſertion was ſuſpected, becauſe other experimentaliſts did not ſucceed in repeating the trials. Hence Blumenbach was led to obſerve, "that ſome experiments on this reproductive power require a hand exerciſed in ſuch employments, together with various precautions, and a favourable combination of circumſtances, for their ſucceſs. Hence perſons muſt be cautious in concluding againſt the truth of any ſtatement, becauſe their own experiments do not ſucceed. After ſeveral fruitleſs attempts on this ſubject, I have lately ſucceeded in obſerving the reproduction of the whole head of the ſnail (helix pomatia) with its four horns, which occupied about ſix months." Comparative Anatomy, tranſlated by Lawrence, p. 219.

The ſame phyſiologiſt has given us a remarkable inſtance of reproduction in an animal of more complicated ſtructure. "I preſerve," ſays he, "in ſpirits a large water newt (lacerta paluſtris), from which I extirpated nearly the whole eye ſeveral years ago: all the humours were diſcharged, and then four-fifths of the emptied coats were cut away. In the courſe of ten months an entirely new eye-ball was formed, with cornea, iris, cryſtalline lens, &c.; and this is only diſtinguiſhed from the ſame organ on the oppoſite ſide by being ſmaller." Ibid.

Not only are amputated tentacula ſpeedily replaced in the actiniæ (ſea anemones), but, if the animal be divided by a vertical or horizontal ſection into two halves, each of theſe becomes an entire actinia. See the article ANEMONE.

The freſh water polype exhibits very ſurpriſing powers in this way. If it be cut into two or more pieces, theſe become perfect animals. If it be ſlit half way down, the two halves are rendered perfect, remaining united below: theſe may be ſlit again with the ſame reſults. The oppoſite ends of two polypes may be made to grow together, &c. See POLYPE.

See the memoirs on animal re-productions in Spallanzani's tracts: alſo the works of Bonnet.

REPROOF, OBJURGATIO, in *Rhetoric*, is diſtinguiſhed from *invective*; which ſee.

REPS, in *Geography*, a town of Tranſilvania; 16 miles N. of Fogaras.

REP-SILVER, money anciently paid by ſervile tenants to their lord, to be quit of the duty of reaping his corn.

REPTILES, in *Comparative Anatomy* and *Phyſiology*. Although the animals, whoſe ſtructure we are about to explain, are perfectly ſimilar to each other in their principal characters, and ought therefore to be united in one claſs, naturaliſts have experienced a real difficulty in diſcovering an appropriate name for the claſs. That of *amphibia*, employed by Linnæus and his diſciples, although deduced from a ſtriking circumſtance in the economy of the more generally known reptiles, namely, the power of exiſting for a long time in water, as well as in air, is vague and uncertain in its ſignification. If we regard as amphibia thoſe aquatic animals, which are able to live for ſome time on land, or thoſe land animals, which can remain for a certain time under water, all animals are amphibious; for even the human ſubject and the mammalia can dive. If, on the other hand, the word amphibious be taken etymologically, and underſtood to denote an equal power of ſubſiſting in air and water, it is applicable to no animals. Although reptiles can remain much longer under water than the mammalia, or birds, they are obliged, as their reſpiratory organs are only calculated for breathing air, to come ſooner or later to the ſurface for this purpoſe; and they are drowned, like any warm-blooded animal, if detained in the water beyond that time. To enable an animal to exiſt equally in air and water, it ſhould have lungs and gills; that is, it ſhould have the power of breathing air, like the mammalia and birds, and of breathing water, like fiſhes; and it ſhould be able to uſe either of theſe methods, to the excluſion of the other. But we know of no ſuch animals. The larvæ of frogs and ſalamanders, the proteus anguinus, and the ſiren lacertina (ſee the latter part of this article), have indeed branchiæ and lungs; but as far as our knowledge hitherto goes, none of theſe could live out of the water. The lungs of the tadpole, and of the larvæ of ſalamanders, are deſigned for the ſervice of thoſe animals in their ſubſequent ſtage of exiſtence; but do not give them the power of living in air: and the lungs, either of the proteus or ſiren, do not ſeem ſufficient to enable them to diſpenſe with the office of the branchial appendages. In its etymological ſenſe, then, the term amphibious is not applicable to any animals we know of.

Linnæus places among his amphibia reptiles who never go into the water, and ſome fiſhes which never quit it. He could not fail to experience great difficulties in naming a claſs ſo ill conceived as that of his amphibia; conſequently, this appellation is objectionable, as being vague and obſcure; the genera comprehended in the Linnæan claſs amphibia, are too ill aſſorted to admit of their having a common name ſuitable to all. Daubenton divided them into two claſſes, naming one oviparous quadrupeds, and the other ſerpents. Lacépéde adopted theſe two claſſes, and placed between them a third, that of oviparous bipeds. Hermann of Straſbourg, in his "Tabulæ affinitatum Animalium," propoſed to ſubſtitute, for the term amphibia, that of cryerozoa. "Si in novorum nominum impoſitione gloriam more multorum quæreremus, et ea re ſcientia promoveretur, cryerozoa apte vocari poſſe putaremus, quia omnem fere naturam eorum animalium vox iſta exhaurire videatur. Κρυερος enim non modo frigidum, ſed et horridum luridumque ſignificat." Hermann, Tab. affin. Anim. p. 218.

Without entering further into the objections againſt the appellations juſt enumerated, we adopt that of reptiles, already employed by many modern naturaliſts, and particularly by Cuvier, in his "Tableau Elémentaire d'Hiſtoire Naturelle." In fact, in the progreſſion of the oviparous quadrupeds, as well as in that of ſerpents, the belly moves againſt the ſurface of bodies, over which they paſs.

General Obſervations.—Referring to the article CLASSIFICATION for a view of the genera comprehended under theſe diviſions, we prefix to the more detailed ſurvey of the anatomy of reptiles, a ſhort ſummary of the principal anatomical characters of the four orders into which the claſs is divided.

1. The CHELONIAN order; Teſtudines. Body incloſed in a bony ſhell. They reſemble birds in having the maſticating ſurfaces of their maxillary bones covered by ſtrong cutting horny plates. Body ſupported on four limbs, terminated by a tail, and covered in almoſt all by ſcales. They copulate; fecundation takes place internally: the female lays eggs, covered by a firm calcareous ſhell: the young animals come out without incubation, merely by the heat of the atmoſphere; and they undergo no metamorphoſis. Stomach larger than in the other reptiles, and inteſtinal canal furniſhed with a cæcum. The heart has two auricles.

2. SAURIAN order, or Lizard kind. They reſemble the former very nearly in the ſtructure of their principal internal organs. They have firm bones, like thoſe of the mammalia: curved and long ribs, and a ſternum. Teeth ſet in the jaw. The two branches of the lower jaw conſolidated. A trachea compoſed of cartilaginous rings, an os hyoides and larynx, capable of producing ſounds, at leaſt in ſome individuals. Heart with two auricles. A ſimple penis in the male. There is a real internal copulation; the female lays ſeparate eggs, generally covered with a firm ſhell, depoſiting them on dry ground, or in holes. The young ones come out of them, and undergo no metamorphoſis. The ſkin is furniſhed with numerous plates or ſcales. Body elongated, and ending with a tail. Feet, often high, and ſtrong enough to ſuſtain the body above the ground in progreſſion. Some are quadruped; others biped, having either fore or hind feet. Toes furniſhed with nails: generally five in number; but there may be four, three, two, and even one.

3. OPHIDIAN order; Serpents. They agree with the two former orders, in having firm bones, curved and long ribs, a larynx and trachea, capable of producing a ſlight hiſſing in moſt. An external organ of generation in the male. A real internal copulation: the female lays eggs covered with a calcareous ſhell, which ſhe depoſits in holes filled with leaves, under the roots of trees, in warm and rather moiſt ſituations. The young ones, when they quit the egg, are like their parents. They differ from the preceding orders, in having a long, eel-ſhaped, flexible body, covered with a ſkin, either furniſhed with ſcales or plates, or naked, unprovided with feet, and terminated by a tail, often very long. Numerous long curved ribs, not united together, as there is no ſternum. The branches of the lower jaw not united in front. Upper jaw conſiſting of four branches. Simple, ſharp, and numerous teeth; and long, curved, tubulated fangs, in addition to theſe, in the venomous kinds. They creep along the ground by undulations of their body. Excepting the ophiſauri, they have no external auditory openings. Heart with a ſingle auricle. Double penis. Eggs covered with ſoft calcareous ſhells.

4. BATRACIAN order; Frog kind. They reſemble the preceding orders in having a tail; excepting the frogs and toads in their perfect ſtate: a trachea and larynx, capable of producing ſound. Like the chelonian and ſaurian reptiles, they have feet, and ſimple jaws, *i. e.* not formed of two branches, moveable on each other. In common with the ſaurian and ophidian orders, they poſſeſs teeth fixed in the jaws; and with the ophidian, a heart with a ſingle auricle.

Many characters diſtinguiſh them from theſe three orders. Their naked ſkin, which is warty or tubercular, more or leſs moiſt, and nearly ſimilar to that of the ceciliæ, the laſt genus of the ophidian order. Softneſs of the bones; a ſternum without ribs in the frogs and toads: rudiments of ribs and no proper ſternum in the ſalamanders: true curved ribs ſurrounding the body in the proteus and ſiren. Four feet, or two only. They all ſwim; thoſe with long hind legs and no tail leap; the tree-frogs attach themſelves to leaves by the round tubercles of their toes: thoſe with four equal limbs, or two only, crawl and ſwim, but do not leap. An external tympanum in the tree-frogs, frogs, and moſt toads; no external ears in the others. No external organ of generation in the males, nor any internal real copulation. The female lays eggs in the water, or humid earth, and the male fecundates them as they paſs out; or in the ovo-viviparous ſpecies, as the land ſalamander, the ſeminal liquor of the male is abſorbed by the ſexual organ of the female. The ova are without ſhells; from them proceed ſmall animals, called tadpoles, which undergo various changes, before reaching their perfect ſtate. They have branchiæ in their tadpole condition, and thus approach to fiſhes.

Notwithſtanding the obvious differences of organization in the different reptiles, as the turtle, lizard, ſerpent, frog, and ſalamander, we may remark that their ſtructure does not deviate eſſentially in its general plan from that of the human ſubject. They have a bony vertebral column, and all the principal organs found in man, but with more or leſs ſtriking modifications.

Reptiles have ſome relations, in their organization and habits, with other vertebral animals, particularly with fiſhes. This is ſeen in the true branchiæ of the batracian larvæ and ſiren; in the ſcales of the ſkin in lizards and ſerpents; in the polygonal horny plates of the teſtudines, correſponding to thoſe of ſome cartilaginous fiſhes; in the elongated form and habits of the ſiren, like thoſe of the eel-ſhaped fiſhes.

The form of the body preſents great differences in the reptiles; nearly all the chelonians, ſaurians, and batracians have four feet; and there are only two ſaurians with two feet. In the chelonians, the body is orbicular, more or leſs convex, incloſed in a bony caſe, and terminated by a ſmall tail; the toes are ſeparate and diſtinct in ſome, palmated and fin-like in others. All the ſaurians have an elongated body, covered with various kinds of ſcales, and terminated

by a very flexible tail, often compoſed of articulated rings. In the very elongated form of their body, the chalcides reſemble ſerpents, though, in other reſpects, they are true ſaurians. The ſkin is quite naked in all the batracians; they have four feet; ſome have no tail, a ſtout, thick body, and the hind legs longer than the front; others have the ſhape of a lizard, being furniſhed with a tail, and having feet of equal length. Laſtly, ſerpents have a very long, cylindrical body, covered with ſcales, and without limbs. Theſe variations of figure muſt neceſſarily be attended with modifications in the form and poſition of organs; the internal arrangements will correſpond with theſe outward ſigns.

Although the animals of this claſs differ very conſiderably in outward form, as well as in the general bulk of their bodies, they agree very nearly in the eſſential points of their organization, and more particularly in the functions of their animal economy. We may inſtance the mode of taking their food; the long abſtinence of which they are capable; their oviparous generation; the length of time, for which they can bear an interruption of reſpiration; their tenacity of life and extraordinary power of reproduction; and the low temperature of their bodies. The laſt points, of animal heat and reproduction, two exceedingly intereſting ſubjects of inquiry, which have been inveſtigated of late years with great induſtry, form the moſt ſtriking differences between cold and warm-blooded animals; the latter alone poſſeſſing that remarkable property of maintaining in themſelves a temperature conſiderably exceeding that of the medium in which they live, while the former are diſtinguiſhed by the wonderful extent of their power of extending or reproducing injured or loſt parts.

An accurate knowledge of the ſtructure of reptiles is not only important from its ſubſerviency to the claſſific arrangements of natural hiſtory, and highly intereſting from expoſing to us new and rich ſcenes in the vaſt domains of nature, new forms of life, and freſh modifications of organization, accompanied with ſingular changes of functions already familiar to us in other ſhapes; but it acquires additional intereſt from the great uſe which phyſiologiſts have made of different reptiles in their experimental elucidations of the human economy. We muſt ſurvey in a general view the ſtructure and economy of theſe animals, and compare them with thoſe of ths warm-blooded claſſes, before we can determine how far the concluſions, drawn from experiments on reptiles, concerning the heart's motion, irritability, the action of the nerves, the effects of opium, &c. &c. can be transferred to the human body.

Organs concerned in the Vital Functions.—The *mouth* is ſituated at the extremity of the ſnout, and directed tranſverſely. If we fancy the head to be divided by a horizontal cut, extending from before backwards, to its very poſterior part, we ſhall have a juſt idea of the mouth of a reptile. The cranium is very ſmall in this claſs, and the head conſiſts almoſt entirely of the two jaws. The lower is articulated towards the back of the head, and thus allows the opening between the two mandibles, conſtituting the mouth, to be very conſiderable. Almoſt all reptiles ſwallow entire animals, and thus require this extenſive opening. The margins of the aperture conſiſt ſimply of the maxillary arches, which are not covered or encloſed by any thing deſerving the name of lips. In no caſe is there any maſtication; and the food or prey is taken by the teeth or tongue, ſo that a moveable covering of the jaws, ſimilar to the lips and cheeks of the mammalia, is not neceſſary either for confining ſubſtances ſubjected to the action of teeth as organs of maſtication, or for the purpoſe of reaching or ſeizing food.

The horny coverings of the mandibles, completely naked, and not concealed even by the ſmalleſt fold of ſkin, form the ſides of the entrance into the mouth in the chelonian reptiles. Their food conſiſts of marine vegetable productions, teſtacea, inſects, &c. and does not require ſo large an opening for its introduction, as when conſiderable animals are ſwallowed whole. The mouth is conſequently ſmaller in this than in either of the other orders; and does not extend completely to the back of the head.

The family of tortoiſes, which Geoffroy has called trionyx, offers a remarkable exception to what we have ſtated about the abſence of lips: they have theſe folds, and a moveable probоſcis at the end of the ſnout. "The exiſtence of lips in theſe tortoiſes is an anomaly, the more likely to ſurpriſe us, inaſmuch as the affinity of theſe reptiles to birds ſeems to aſſign a motive for the abſence of lips, and alſo for the exiſtence of the horny coverings of the mandibles." Geoffroy St. Hilaire, Mem. ſur les Tortues molles; Annales du Muſeum, v. 14. pl. 1. p. 9.

In the ſaurians, the ſlit of the mouth goes to the very back of the head, far behind the ear. Its appearance is very formidable in the crocodile, where the hard ſtrong jaws project into a large ſnout, and are armed with ſharp powerful teeth, deſtitute even of gums: theſe jaws open to the very back of the head, and diſcloſe a tremendous throat. The mouth is as large proportionally in the other ſaurians; but their ſize is too inſignificant and their habits too harmleſs to allow of their inſpiring that terror, which the formidable weapons of the crocodile ſo juſtly cauſe. The ophidians have not only a mouth equal in its tranſverſe meaſurement to the diameter of their body; but they poſſeſs alſo the means of enlarging this aperture, ſo that they can ſwallow creatures whoſe diameter exceeds their own. The batracians have an opening as large as the ſize of the head will allow. In the latter, as well as in the ophidian, and moſt of the ſaurian reptiles, the integuments make a ſmall fold at the edge of each jaw; theſe folds meet when the mouth is cloſed, ſo as to hide the edge of the jaws, but they poſſeſs no power of motion.

In the tadpole, in the proteus and ſiren, the mouth is much ſmaller than in the other reptiles; and they poſſeſs folds more deſerving the name of lips. In the former there is a kind of horny apparatus within theſe lips, forming ſomething like a beak. In the ſmallneſs of its mouth, and in theſe horny jaws, the tadpole is remarkably diſſimilar to the perfect animal.

The Jaws.—In conſidering the jaws and their muſcles, the teeth, and the tongue, we muſt bear in mind that theſe organs are calculated merely for ſeizing their food, and conveying it to the throat; in no caſe does the food undergo any maſtication, as in the mammalia.

No reptiles have an upper jaw moveable on the head, like that of birds: the ſuperior maxillary bones are in truth articulated moveably with the head in ſerpents, and may be extended and retracted, or moved laterally, as we ſhall deſcribe preſently; but, in general, the cranium and upper jaw are united into one piece, ſo far as their motions are concerned.

The moſt oppoſite opinions have prevailed reſpecting the crocodile, even down to the preſent time. Herodotus firſt obſerved, that it is the only animal poſſeſſing an upper jaw moveable on the lower, which remains fixed. The ſame opinion was generally held by the ancients, as Ariſtotle, Pliny, &c.; and ſeveral moderns ſpeak in the ſame way, as Marcgrave, Marmol, Jacobæus, Veſalius, and the Jeſuit Miſſionaries at Siam, who had opportunities of obſerving the living animal. But the anatomiſts of the Academy of Sciences

Sciences (Perrault and Duverney) undertook to demonſtrate the falſehood of the opinion of Herodotus. Geoffroy, one of the French ſavans, who attended the Egyptian army, has given us an account of the matter, which ſettles all theſe diſputes, by proving that the ſtatement of Herodotus is almoſt rigorouſly true; and that the crocodile is the only known animal, whoſe upper jaw, including within its branches the cranium, is moveable on the lower jaw, which poſſeſſes only an almoſt inſenſible degree of motion. "Nothing can be more paradoxical than the head of the crocodile: every thing which is placed laterally in other animals, as the moving powers of the jaw, &c. is thrown behind. The temporal bone itſelf extends backwards far behind the cranium, is elongated, and transformed into a double condyle. We have in fact nearly deſcribed the crocodile's head, when we ſay that it conſiſts of two mandibles; for the cranium is ſo ſmall, and out of place, that it eſcapes notice at firſt. We find it below, and a little in front of the occipital criſta. The brain is ſo far forwards, that the eye and ear are above and a little behind it.

"The lower jaw is one-ſixth longer than the upper, with the cranium: it preſents a cavity with a double ſurface, in which the condyle of the temporal bone is articulated by ginglymus. The occipital condyle is in the ſame line as the temporal condyles: thus the head is really held at its articulations, like the lid of a box by the hinge, and is confined entirely to motions upwards and downwards. When a living or ſtuffed animal is examined, it is difficult to believe that the head ends at the extremities of the jaws. There is a regular fullneſs of the front of the neck, which might be regarded as the frontal part of the head: this ariſes from the enormous temporal muſcles, which lie between the recti and obliqui. The latter, ariſing from the cervical vertebræ, and inſerted in the occipital criſta, elevate the head upon the neck, making it deſcribe an arc of 45°. The ſkin behind the occiput being thin, yields to the motions of the head; while the lower jaw, on the contrary, is incloſed in a kind of ſheath of hard, rugous ſkin. If there were a muſcular force capable of drawing it down, this covering would impede its deſcent, while it is ſtill further confined behind: the long proceſs ſituated beyond its articular ſurface, deſcribing a curve, approaches the ſkin exactly at the point where it is armed with a long ſcale, which offers an almoſt invincible reſiſtance to the elevation of the condyle, and conſequently to the depreſſion of the jaw. Yet it is not entirely fixed, as Marmol imagined, who ſtated that it forms a ſingle bone with the ſternum. Two ſmall muſcles have the power of moving it ſlightly." (Annales du Muſeum, tom. ii. p. 38, et ſeq.) This deſcription is accompanied with an excellent figure of the ſkull, in the elevated ſtate of the upper mandible. An analogous figure of the whole head is given by Humboldt, Recueil d'Obſ. de Zool. & d'Anat. comparée, tom. i. pl. 4. From the figures of the Nilotic crocodile, in Blumenbach's Abbildungen Natur Hiſtoriſcher gegenſtände, N° 26; and of the St. Domingo crocodile, in the Annales du Muſ. tom. ii. it appears, that the animal moſt frequently exhibits this elevation of the upper jaw. It cannot be neceſſary to point out how the raiſing of the entire cranium and ſuperior mandible, juſt deſcribed, differs from the motion of the upper jaw upon the cranium: this has been already done by Blumenbach. See Syſtem of Comparative Anatomy, p. 111, note 8.

The length of the lower jaw is much more conſiderable in compariſon to that of the upper in reptiles, where it is articulated far back, and is even prolonged beyond its articulation, than in mammalia and fiſhes, where this articulation is placed more forwards. Its compoſition is more complicated in the reptiles, than in any other order. In the green turtle (teſtudo mydas) it conſiſts of ſeven diſtinct pieces, a middle one forming the arch, and three others on each ſide, forming a continuation of its branches. The fartheſt of the three penetrates like a wedge between the two others, and forms a great part of the articular cavity. In many of the ſaurians the number is ſtill greater: the lower jaw of the Nilotic crocodile, and of the caïman (croc. americanus), has no fewer than twelve pieces, arranged as follows. As the two branches are diſtinct, and united by a ſuture, each of them muſt be compoſed of ſix pieces; 1, one, in which all the teeth are implanted; 2, another, lying along the internal ſurface of the former, without reaching to its anterior extremity; 3 and 4, two others articulated with the preceding; *viz.* an inferior one prolonged to the poſterior extremity of each branch, a ſuperior extending as far back as the other in the Nilotic crocodile, but not ſo far in the caïman. 5. The greateſt part of the articular cavity is excavated in a fifth piece within the two former, and conſtituting the inner and ſuperior part of the portion beyond that cavity. 6. Laſtly, a ſixth piece forms the front and inner part of the orifice of the dental canal. The lower jaw of the tupinambis (lacerta monitor) is alſo compoſed of twelve pieces, two of which form the coronoid proceſſes, while the other ten are analogous to thoſe deſcribed as entering into the formation of the lower jaw of crocodiles, excepting the laſt. There are eight or ten in moſt of the other ſaurians. We find four in each branch in the genus anguis; an anterior one united to its correſponding piece in front, and three poſterior ones joined to the former. There are only four altogether in the amphiſbæna. The two laſt mentioned genera are the only ophidian reptiles, in which the jaws are not ſeparated in front. In all the others there is a ſeparation, and each branch has only two diſtinct pieces; an anterior, in which the teeth are implanted, and a poſterior: they are united by ſuture, and vary in relative length, according to the number of teeth. The very open arch, compoſing the lower jaw of the batracian order, is made up of ſix pieces; the middle of which are the moſt ſlender.

The anterior angle, formed by the union of the two branches, depends on the form of the ſnout in general, on the figure of the two branches, the preſence or abſence, number and ſize of the teeth, &c. It is rounded and very open in the chelonian reptiles, and more ſo in the batracian. In the ophidian order, which have the branches of the jaws moveable, it is ſuſceptible of change, according as their extremities are approximated or drawn aſunder; indeed in the former caſe only can it be properly ſaid to exiſt at all. It is rounded in the amphiſbæna; more angular in the anguis; ſtill very obtuſe in the geckos (lacerta gecko), which have wide jaws, with the branches of the lower curved only in the horizontal direction; it is leſs ſo in the cameleon and ſtellio (lacerta ſtellio), the ſcinks (lacerta ſcincus), and the lizards, although in all theſe the two branches are only joined by their extremities. It is acute in the tupinambis and iguana, in which the branches, ſomewhat curved in the vertical direction, are approximated for a longer ſpace. The Nilotic and Gangetic crocodiles differ very much in this reſpect. The two branches are united in the latter in the greateſt part of their extent, as in the cachalot, and conſequently form a long bill, in the edges of which the two rows of teeth are implanted. In the former, on the contrary, the branches remain ſeparate, and only approximate towards their extremity, increaſing a little in thickneſs at the ſymphyſis.

The portion of the bone, which is incurvated towards the cranium in moſt of the mammalia, and conſtitutes

the aſcending branch of the jaw, does not exiſt in reptiles.

Motions of the Jaws.—Reptiles may be divided into two orders, according to the conformation of their maxillary bones, and the kind of motion of which they are ſuſceptible. In the firſt would be placed thoſe which have the lower jaw only moveable, as the lizards, the teſtudines (tortoiſe and turtle), the frogs, the ſalamanders, and the genera anguis and amphiſbæna among the ſerpents. The ſecond would include the colubres, and the venomous ſerpents, which can move both jaws.

The general diſpoſition of the articulation is nearly the ſame in reptiles as in birds (ſee BIRDS, in *Comparative Anatomy*). Inſtead of a condyle at the poſterior extremity of the jaw, an articular ſurface is excavated to receive an eminence bearing conſiderable analogy to the os quadratum of birds, and differing from it only in not being ſo moveable; often, indeed, it is only a ſimple prolongation of the temporal bone. To this moſt inferior point of the cranium, and to an articular ſurface nearly tranſverſe in its direction, and ſhaped like a condyle, the lower jaw is articulated by a glenoid cavity, of which the middle part ſometimes preſents a riſing line, converting it into a kind of pulley. Behind this articular cavity there is often a more or leſs conſiderable bony proceſs, affording attachment to a muſcle analogous to the digaſtric.

The moſt remarkable differences requiring our notice here are, the form of this prominence or condyle of the temporal bone; the greater or leſs prolongation of the proceſs behind the articulation; the ſituation and extent of the temporal foſſa; and, laſtly, the exiſtence or abſence of the eminence occupying the ſituation of the coronoid proceſs.

In proportion as the temporal eminence is carried backwards, the jaws approach more nearly to each other in their longitudinal direction. We ſee this in the crocodile, ſalamander, frog, turtle, and tortoiſe. When, on the contrary, it deſcends vertically, or very obliquely, and is very elongated, as in the cameleon and iguana, it forms a kind of pedicle to the lower jaw, which, by ſeparating it from the cranium, produces a much more conſiderable interval between the jaws. Several kinds of lizards, as the lacerta agilis, draco, &c. occupy the intermediate ſpace between theſe two extremes.

The crocodile has the largeſt proceſs for the attachment of the digaſtricus. It is ſenſibly diminiſhed in the cameleon, the gecko, the tupinambis, and the teſtudines; and we ſee nothing of it in the pipa, the toad, frog, and ſalamander.

All four-footed reptiles have very deep temporal foſſæ; they are united to the cavity of the orbit. In ſome ſpecies, the two cavities are ſeparated in front by a bony circle, as in the teſtudines, the crocodile, the dragon, and the other lizards; but in the pipa, the frogs, and ſalamanders, there is no orbital circle.

There is, in the crocodile, a conſiderable excavation on each ſide of the cranium, behind the orbit, terminating below in the temporal foſſa, and wanting in the crocodile with bony eyelid (Crocod. palpebroſus, Cuvier). It is bounded externally by a bone correſponding to the ſquamous portion of the temporal, which joins the lateral frontal bone, and thus forms a ſecond kind of zygomatic arch. The ſize of this excavation differs much in the different ſpecies. No doubt it contains muſcles. But we find no expreſs and ſatisfactory deſcription of it and its muſcles, nor of the muſcles of the jaw in the writings of the French naturaliſts already quoted, on the ſubject of the crocodiles.

The coronoid proceſs of the lower jaw is not prominent in reptiles. There is a mere rudiment of it in the teſtudines, the cameleon, and ſome lizards, as the iguana, but there is no trace of it in the crocodile, the frogs, and ſalamanders.

The muſcles of the jaw, in the oviparous quadrupeds, are analogous to thoſe of the mammalia, and reſemble them in number.

The maſſeter is large and diſtinct in the tupinambis, occupying all the ſpace compriſed between the poſterior edge of the orbit and the meatus auditorius. It is directed obliquely from behind forwards, ſo that it raiſes and carries the jaw backwards. This muſcle is ſmall in the agame marbré (lacerta marmorata), and the turtle. It is ſo ſlender, that it can ſcarcely be diſtinguiſhed from the lower part of the temporal.

The temporal muſcle is very large in the turtle, occupying all the temporal foſſa, and forming the back of the orbit. It is much ſmaller in the tupinambis and common lizard, in which it is almoſt entirely concealed by the maſſeter.

The pterygoidei are, in general, but imperfectly diſtinguiſhed from each other. They envelope the whole branch of the jaw towards its extremity in the tupinambis; their fibres are in a manner twiſted. They elevate the jaw and carry it forwards; thus they act in an oppoſite direction to the two preceding muſcles. The ſame muſcles are flat and thin in the turtle; their fibres are nearly tranſverſe, ſo that they can move the lower jaw more directly from ſide to ſide.

In all theſe reptiles the muſcle analogous to the digaſtric is flat and triangular; the broad portion is fixed to the cervical ligament behind the occiput, and the point terminates at the extremity of the jaw, behind its articulation, and near the pterygoid muſcles.

After deſcribing the muſcles employed in moving the jaws of the turtle, Perrault aſſerts, in his "Mémoires ſur les Animaux," that it has more power in its jaws than moſt other animals, that it can cut very hard and ſtrong ſubſtances, and that the head of a ſmall turtle has been ſeen, half an hour after it was cut off, to ſtrike its jaws together with a noiſe like that of caſtagnettes. Daudin relates the following circumſtance, communicated to him by a Dutch naturaliſt, who reſided ſeveral years in India. "When we landed in Table bay, we took ſeveral hawk's-bill turtles (teſtudo imbricata), whoſe ſtomachs were filled with marine plants, and thick ſhells, which they eaſily break down with their horny gums. Three, which could not be brought on board, were tied to the trunk of a tree, with a thick cable, but when the ſailors returned on the following morning, they found that theſe turtles had contrived to turn over on their bellies, and had then cut, with their gums, the cables with which they had been faſtened." Hiſt. Nat. des Réptiles, in the edition of Buffon, by Sonnini, t. i. introduction, p. 38.

The two jaws are not moveable in all the ſerpents. They may be divided into three orders. 1. Thoſe with the branches of the lower jaw conſolidated, and conſequently not poſſeſſing any power of thruſting forward the upper jaw, or moving it laterally. 2. Thoſe with the branches diſtinct, and united in the recent ſtate by an elaſtic ligament. There are two modifications of the latter; they may either have merely the power of ſeparating the two jaws; or they may, at the ſame time, ſeparate the jaws, and carry forwards a part, or the whole of the upper. We ſhall ſpeak of the motions of the jaws according to this diviſion, firſt deſcribing the bones, and then the muſcles.

The Bones.—In the ſerpents, with the lower jaw conſolidated, the head is ſhaped nearly as in the lizards. This is the caſe in the anguis and amphiſbæna, the cæcilia, acrochordus, and hydrophis. In the genus anguis the head very cloſely reſembles that of the iguana. The arch of the upper

jaw

jaw is uninterrupted, and correſponds to the curve of the lower; the concavity of the palate is nearly complete in front. The palatine arches are directed backwards, and united to the condyloid pedicle of the temporal bone. This pedicle is ſhort, and nearly vertical, and excavated behind for the attachment of the digaſtric muſcle. The lower jaw has a ſmall proceſs behind its articulation for the attachment of the muſcles, which depreſs it; and another towards its poſterior third portion, analogous to the coronoid, for the elevating muſcles.

In the amphiſbæna, although the general configuration is a little changed, nearly the ſame arrangement is met with. The whole upper jaw is leſs ſeparated from the cranium; the concavity of the palate is nearly complete. The palatine arches are much larger. The condyloid pedicle of the temporal bone, inſtead of being vertical, is continued nearly horizontally forwards. In proportion to the cranium, the lower jaw is much ſhorter; and it is articulated to the condyle by its poſterior extremity. It is very wide behind, to produce the coronoid proceſs. The orbit and temporal foſſa are completely confounded; they are bounded by prominent bony criſtæ, as in the carnivorous mammalia; hence, on firſt view, the head of an amphiſbæna might be ſuppoſed to belong to one of the cheiroptera.

The ſerpents of the ſecond kind, whoſe lower jaw is formed of two diſtinct branches, and in which the upper is capable of being ſeparated, but not carried forwards, are all the non-venomous colubres, and the boas. The conformation of the upper jaw, in the latter, is very different from that of the lizards, although the bones are nearly the ſame, as we ſhall explain in the oſteology of the head. The oſſa inciſiva are not always furniſhed with teeth; ſometimes even, as in the boas, they do not unite the ſuperior maxillary bones. All the other bones of the jaw are moveable on the cranium, which ſerves merely as a point of ſupport.

The ſuperior maxillary bones are two long branches, in which the teeth are implanted; they form the outer edge of the palate. They are articulated by two points; firſt towards their middle, as a lever of the firſt kind, on a ſmall bone analogous to the os malæ, and forming the anterior edge of the orbit: nearly at the ſame point, but towards the inner ſide, the ſuperior maxillary bone has a proceſs, which ſlides in a groove, and reſts on the palatine arch. It moves on theſe two ſurfaces, playing backwards and forwards. The anterior extremity of this upper maxillary bone is free: the poſterior receives the end of a particular bone, ſerving to unite it to the palatine arches.

The palatine arches are the two internal bony branches themſelves, formed of two parts. An anterior, which is free in front, and articulated by three points; behind, with a bony branch, which proceeds towards the extremity of the lower jaw within its articulation, and appears to form a continuation of it; on the outſide, with a particular bone, uniting it to the maxillary arch; and above, with the baſis of the cranium, in front of the orbits. The poſterior portion of the palatine arch is analogous to the pterygoid alæ or laminæ. It is articulated by three points; 1ſt, in front, with the poſterior extremity of the firſt portion; 2d, behind, with the lower jaw towards the inſide; 3d, on the outſide, and towards its anterior part, with the bone uniting it to the maxillary arch. Laſtly, the third palato-maxillary is a piece nearly cylindrical in its middle, flattened and widened at its two extremities, by which it is ſupported, being articulated, on the outſide, to the poſterior extremity of the maxillary arch, on the inſide, towards the middle and outſide of the pterygoid portion of the palatine arch.

In conſequence of this ſingular formation, the whole upper jaw is, as it were, ſuſpended and diſtinct from the cranium, and influenced by the motions of the lower jaw. When the poſterior extremities of the latter are ſeparated, the pterygoid arches are moved apart. They carry with them the poſterior extremities of the palatine and maxillary arches, while at the ſame time the anterior extremity is moved inwards. On the contrary, when the two internal edges of the pterygoid laminæ are brought together, or, what is the ſame, when the articular extremities of the lower jaw tend to approximate, the anterior ends of the palatine and maxillary arches are carried outwards, and ſeparate from each other.

The ſerpents of the third order, which have jaws ſuſceptible of ſeparation, and which at the ſame time can carry forwards the ſuperior maxillary bones, properly ſo called, exhibit but a ſlight modification of the ſtructure deſcribed as belonging to the preceding diviſion. Their pterygoid arches are articulated with the lower jaw, towards its extremity, on the guttural aſpect. They alſo receive the bone which is to join them to the palatine arches; but the latter are very ſhort, directed forwards, and only containing venomous teeth. This intermediate bone, therefore, goes above the ſuperior maxillary, which is itſelf articulated in the front of the orbit, or the ſhort and moveable cheek-bone. When the lower jaw is moved forwards, the palatine arch, carried in the ſame direction, drives before it the bone which joins it to the maxillary. The latter, extremely moveable, is immediately turned up, or carried forwards, by moving on the cheek-bone, which cauſes a complicated ſeries of motions.

The articulation of the lower jaw is the ſame in the whole family. The temporal proceſſes are prolonged poſteriorly: they receive an intermediate bone; analogous to that deſignated by the name quadratum in birds. This bone is very ſhort, and poſſeſſes little motion, in the ſpecies which have the upper jaw fixed, and the inferior conſolidated.

It is directed forwards in the amphiſbæna towards the lower jaw, which is ſhorter than the cranium by nearly one-third;—a circumſtance which belongs only to this ſpecies. In the anguis, the os quadratum deſcends much more obliquely forwards.

In all the other ſpecies the bone laſt-mentioned is much longer. It ſometimes deſcends perpendicularly, as in the boas; but it is commonly directed backwards, as in moſt of the colubres. The temporal extremity is generally widened and excavated by a ſmall depreſſion. The inferior extremity is rounded like a condyle, and received into an excavation of the poſterior extremity of the correſponding branch of the inferior maxillary bone.

From the nature of its articulation, the lower jaw of either ſide is not only ſuſceptible of elevation and depreſſion, ſo as to open and ſhut the mouth, by playing on the os quadratum, as is the caſe only in the genera amphiſbæna and anguis; but it may alſo be carried outwards, and take with it the os quadratum, as is the caſe in the colubres and venomous ſerpents, whenever the pterygoid arch is moved outwards. That is to ſay, whenever the upper jaw is widened, the inferior muſt follow its dilatation, becauſe the poſterior extremities of the pterygoid arches, being articulated with the internal part of the lower jaw, it muſt move together with them. The arrangement of the muſcles accords very well with this formation, as we ſhall proceed to deſcribe.

Muſcles of the Jaws.—The maxillary muſcles of the genera anguis and amphiſbæna, and probably of all the ſerpents with a conſolidated under jaw, reſemble thoſe of the common

common lizard: but they are very different in thoſe whoſe lower jaw conſiſts of two diſtinct pieces: we ſhall deſcribe them in the rattleſnake.

Here the muſcles of the lower jaw are concealed in the lips, and go round the mouth on each ſide. That which forms the anterior edge of the commiſſure of the lips is the ſtrongeſt, and ſeems to hold the place of the maſſeter. It ariſes by firm aponeuroſes from the tendinous ſheath, which contains the venomous gland. Its fibres form a conſiderable cord, which conſtitutes the whole thickneſs of the lower lip, and are inſerted in the upper edge of the inferior maxillary branch for almoſt two-thirds of its length.

The muſcle immediately behind is analogous to the temporal, and is much ſlenderer than the preceding. It is a muſcular faſciculus, of which the ſuperior extremity is fixed to the temporal excavation behind the orbit, and the inferior, after going backwards behind the commiſſure, is confounded with the inſertion of the laſt muſcle. It is obvious that the contraction of theſe two muſcles muſt approximate the jaws, and thus cloſe the mouth.

In the commiſſure of the lips, and behind the two laſt muſcles, we ſee another reſembling them in form, but much ſhorter. It occupies the inferior part of the os quadratum, and about the poſterior third of the jaw, at the outer edge of the dental canal. It is an acceſſory muſcle to the temporal and maſſeter.

The muſcle correſponding to the digaſtricus occupies the whole length of the back of the os quadratum, and terminates at the poſterior apophyſis of the maxillary branch beyond and behind its articulation.

The muſcles moving the upper jaw are more numerous. One ariſes, by aponeurotic fibres, from the capſule of the joint, between the maxillary branch and the os quadratum, and paſſes forwards and upwards towards the ſheath of the venomous teeth, being partly expended on that ſheath, and on the poſterior apophyſis of the ſuperior maxillary bone. Its uſe is evidently to draw down the venomous teeth, when they have been elevated.

Two other muſcles act on the pterygoid and palatine branches. Both are ſituated between the middle line of the baſis cranii and the palatine arches. The lower, ſituated immediately under the ſkin in the palatine foſſa, is a plane of elongated fibres, occupying the whole middle line of the cranium, and going backwards to the internal ſurface of the bony pterygoid plate, which it will carry inwards and forwards, ſo as to protrude the ſuperior maxillary bone, and elevate the venomous fangs, at the ſame time contracting the mouth by the approximation of the two internal arches.

The other muſcle, ſlenderer, and placed above the preceding, towards the baſis of the ſkull, extends from the anterior portion of the palatine arch, and the whole length of this arch, to the middle of the baſis cranii, croſſing the direction of the laſt muſcle, on which it is placed. When it contracts, it carries backwards the whole maſs of the upper jaw, at the ſame time approximating its two branches.

By means of this mechaniſm, ſerpents can twiſt their mouths in ſeizing objects, and dilate them extraordinarily, ſo as to ſwallow animals larger than themſelves. Their teeth ſerve merely for holding their prey; and the muſcles moving the bones, in which theſe teeth are implanted, cannot move them in ſuch a way as would be neceſſary for maſtication, but merely depreſs, elevate, approximate, ſeparate, protract, and retract them.

Lacépéde thus deſcribes the motions of the jaws in ſerpents. "While the teeth of one ſide are fixed in the prey which the animal has ſeized, and are therefore motionleſs, thoſe of the other ſide are carried forwards, penetrate the animal, drag it towards the throat, and there fix it in their turn; when the oppoſite ones are again advanced to repeat the ſame proceſs on their ſide. By theſe repeated alternate motions of the two ſides of the jaws, combined with their lateral expanſion, ſerpents are enabled gradually to ſwallow animals of a diameter exceeding their own." Hiſt. Nat. des Serpens.

The Teeth.—Their ſtructure has nothing peculiar in reptiles. The bone is compact and hard; the enamel thin; and, as they are always thin, there is none of the third ſubſtance called by Cuvier the cement. We are not acquainted with any facts concerning the ſucceſſion of the teeth in reptiles;—whether they have two ſets, or that the firſt grow conſtantly, or that the jaws are elongated anteriorly, &c. The crocodile forms an exception to this remark: we are indebted to Cuvier for a very intereſting account of the ſucceſſion of their teeth, which we ſhall ſtate preſently.

The chelonian reptiles, like birds, have no teeth, properly ſo called: the horny ſubſtance encaſing their jaws, and ſupplying the place of teeth, will be deſcribed at the end of this account of the teeth of reptiles.

The ſaurian, ophidian, and batracian reptiles may be compared to the cetacea; as they do not maſticate their prey, the teeth are calculated merely to hold, and not to divide it: hence they have much leſs influence on their economy than thoſe of viviparous quadrupeds. They accord, however, tolerably with the natural genera and ſubgenera.

They are almoſt always the ſame in all parts of the jaw, ſo that they admit of diviſion into different claſſes, according to their configuration, only in very few ſpecies.

Sometimes they are attached to the two jaws only, as in the mammalia: this is the caſe with the ſaurians (excepting only the iguana, which has palatine as well as maxillary teeth); ſometimes they are implanted alſo in the palate, as in the ophidians, with the ſingle exception of the amphiſbæna. Their number is of leſs importance; firſt, becauſe it is conſiderable, and not accurately determined; ſecondly, becauſe they fall out without any hitherto aſcertained regularity, either in ſituation or time.

Teeth of the Saurians.—In the crocodile the enamel is more or leſs ſtriated longitudinally. The upper and lower teeth croſs when the jaws are ſhut. They are all conical, hollow, generally a little curved, and marked with two longitudinal projecting lines; an anterior and a poſterior one. The five or ſix poſterior teeth on each ſide are more obtuſe and compreſſed than the others.

In a living crocodile, which Perrault obſerved at Verſailles in 1681, he found that all the teeth were ſlightly bent towards the throat, and that this curvature was the moſt conſpicuous in thoſe near the end of the ſnout. When the jaws were drawn together, the teeth of each jaw paſſed into the intervals between thoſe of the other, ſo that an uninterrupted ſeries was viſible, as there are no lips to hide them. He ſays further, that the points of the upper teeth entered into excavations of the lower jaw.

The following account is derived from Cuvier's Obſ. ſur l'Oſteologie des Crocodiles vivans, in the 10th volume of the Ann. du Muſ. "The number of the teeth does not change with the age of the animal: a crocodile quitting the egg has the ſame number as one twenty feet long. I have aſcertained this fact in a ſeries of heads from an inch to two feet long. The back teeth may be a little concealed by the ſkin of the gums. The interior is always hollow, although

although the teeth, as in all other cafes, are formed by fucceffive ftrata.

" The capfule containing the new tooth is not enclofed in a feparate cell of the maxillary bone, as in the mammalia, but it lies in the bottom of the focket of the tooth which it is deftigned to fucceed. This little fhell is firft on the internal furface of the root of the tooth in place; it occafions a groove in this part, by which, as it increafes in length, it penetrates into the hollow of the latter, and then deftroys by its preffure the pulp that filled its cavity, and furnifhed the materials of its increafe. Hence, at whatever age we may remove a crocodile's teeth, we fhall find, either in the alveolus, or in the cavity of the tooth itfelf, a fmall tooth, either in the form of a thin and fhort fhell, or more advanced and ready to occupy its place, when the old and enveloping tooth fhall have been difcharged. This fucceffion feems to be repeated as long as the animal lives: hence the teeth always appear fharp and frefh, and although larger, they are not much more worn in old than in young crocodiles. I have afcertained all thefe facts in a recent head, and in others preferved in fpirits of wine: and I could diftinguifh very clearly pulps and capfules fimilar to thofe of quadrupeds.

" This procefs was tolerably well underftood by Perrault and Duverney; Mem. pour fervir à l'Hiftoire des Animaux, v. iii. p. 167.

" As the teeth of the crocodiles are generally nearly perfect cones, and enlarge to their very bafis, how can they come out of the alveoli, of which the entrance is much narrower than their bafe? The new tooth, as it is developed and fills the cavity of the old, compreffes its fubftance againft the focket, deftroys its conftitence, makes it crack, and thus difpofes it to be feparated on the flighteft fhock at the level of the gum. The fragments are eafily thruft out of the fockets. We often find in the fockets of crocodiles, when changing their teeth, rings formed by the relics of the old teeth left behind, through which the new are making their way: and fuch are alfo found in the foffil jaws of true crocodiles.

" The bafe of the cone is generally not entire, but exhibits a more or lefs deep fiffure on its internal fide: it has been already mentioned that this is caufed by the preffure of the germ of the new tooth. While the germ is very fmall, this fiffure does not exift, and the germ itfelf never exhibits it.

" Although the teeth may be faid to be all alike, and arranged in an uniform feries, fome are rather larger than the reft; and the greater this inequality, the more irregular is the line of the jaws.

" Thefe larger teeth are either received into grooves of the oppofite jaw, or into holes, or they perforate it completely.

" In the caimans or alligators, the firft of Cuvier's fubgenera, (containing the American fpecies,) there are from nineteen to twenty-two teeth on each fide below, and nineteen or twenty above. The two firft of the lower jaw penetrate at a certain age the front of the upper jaw, and go completely through it. The fourth of the fame jaw are the longeft, and go into the holes of the upper jaw, in which they are entirely concealed when the mouth is fhut. The five front in the upper jaw are intermaxillary teeth.

" The firft and fourth of the lower jaw are long in all the three fubgenera; next to thefe come the eighth and ninth of the upper, the eleventh of the lower jaw in the true crocodiles and caimans. The caiman with bony eye-lids (crocodilus palpebrofus) has the twelfth below and the tenth above the longeft. After the fourth in the gavials (longiroftres) they are all nearly equal, fo that the jaws in thefe have not fo waving a line as in the other fubgenera.

" The fourth tooth below might be called canine, from its fuperior length, and becaufe it correfponds to the future between the maxillary and intermaxillary portion of the upper jaw.

" In the fecond fub-genus, or proper crocodiles, there are fifteen teeth on each fide below, and nineteen above. The firft of the lower jaw penetrate the upper; the fourth pafs into grooves, and are not lodged in cavities of the upper jaw.

" The gavials (longiroftres) have 25—27 on each fide below, and 27—28 above. The two firft and the two fourth of the lower pafs into grooves, not into perforations or cavities of the upper."

In the tupinambis of the Nile we find fixteen above, of which five are intermaxillary, thirteen below; all conical, and flightly bent backwards: the pofterior are the largeft and moft obtufe. In a tupinambis from the Moluccas there were fix above, and feven below, all compreffed and pointed.

The teeth of the common lizard, the iguana, and agame, are cutting, and more or lefs ferrated on the edges; they are all fo in the iguana, where feveral have fix or eight denticulations, and there are twenty or twenty-one teeth on each fide. The common lizard has twenty-one or twenty-two, but the anterior are not fenfibly denticulated, and the others have merely a groove. The agame has nineteen or twenty, all with three denticulations. In thefe three genera they increafe in fize from before backwards.

They are triangular, with a little groove before and behind, in the ftellio: there are fixteen or feventeen fuch on each fide, and two large conical canine teeth. There are, moreover, two fmall conical intermaxillary teeth above, to which nothing correfponds below.

The dragon correfponds to the ftellio in its teeth, except that the canine are proportionally longer than the incifors: the number is the fame. There is a good repreſentation of them in Blumenbach, Abbildungen Natur-Hiftorifcher gegenftände, No. 98.

The gecko has thirty-five or thirty-fix teeth on each fide, all of equal fize, clofe, fimple, flender, and pointed. The flat-headed gecko has feventy or feventy-four on each fide. There are twenty-two on each fide, above and below, in the fcink, all conical, fhort, clofely fet, and of equal fize.

The cameleon has, on each fide, eighteen above and nineteen below; of which the anterior are very fine, the pofterior much larger, and furnifhed with three points.

Teeth of the Batracians.—All thefe have teeth in the palate; as to the jaws, the falamanders have them in both, the frogs in the fuperior only, and the toads in neither.

The palatine teeth form, in the toads and frogs, a tranfverfe line, interrupted in the middle. They are implanted in the palate bones. They form two long parallel lines in the falamander.

The maxillary teeth are fmall, pointed, and clofely fet. The frog has about forty on each fide above, eight of which are intermaxillary; the falamander fixty, both above and below, and thirty on each fide of the palate.

Teeth of the Ophidians.—The ferpents are divided firft into two families, thofe which can, and thofe which cannot, feparate the two halves of the upper jaw. The former have no incifor teeth; but they have palatine, maxillary, and

mandibular, or teeth of the lower jaw. The latter, having all the edge of the upper jaw furniſhed with teeth, poſſeſs, conſequently, a kind of inciſors.

The ſecond family includes only the angues and amphiſbænæ. The former, beſides the conical ſlightly curved teeth of uniform ſize, which they have in both jaws (eighteen or twenty above, and fifteen or ſixteen below on each ſide), poſſeſs others, very ſmall and ſhort, arranged in two rows, on the poſterior half of each palatine arch.

The other family is ſubdivided into two tribes, the venomous and the non-venomous. In the latter there are conical, curved, and very pointed teeth, directed backwards along each maxillary, palatine, and mandibular arch; conſequently there are four rows in the upper, and two in the lower jaw, all nearly longitudinal.

On the maxillary branch of the venomous ſerpents there are only the hollow fangs, attached to the anterior extremity only; conſequently, with the exception of theſe fangs, there are only the two palatine rows above, and the two rows of the lower jaw below.

The following is a table of the numbers of teeth on each ſide in ſome ſpecies.

Names.	Inciſor Teeth.	Maxillary.	Palatine.	Mandibular.
Boa conſtrictor.	2	18	14	
Coluber molurus.	0	18	24	20
Coluber naſica.	0	16 of which the anterior are the largeſt.	25 of uniform ſize; very ſmall.	18 the anterior largeſt.
Coluber natrix (common ſnake).	0	18 the poſterior largeſt.	28	24
Rattleſnake (crotalus horridus).	0	1 and ſeveral rudiments not fixed.	14	5 or 6
Coluber haje.	0	the ſame.	25 and a parallel row of ſmall ones.	12—14
Coluber naja.	0	the ſame.	the ſame.	
Anguis fragilis (blindworm).				
Amphiſbæna fuliginoſa.	3 on each ſide, and a middle one.	5	0	8

To this table, which is derived from the Leçons d'Anat. comp. of Cuvier, we add a ſecond, drawn up by Paliſot Beauvois, a French naturaliſt, who ſpent many years in America, and whoſe obſervations on ſerpents are inſerted by Daudin in the fifth volume of his Natural Hiſtory of Reptiles.

Comparative

Comparative Table of the Teeth of feveral Serpents of North America, by Palifot Beauvois.

Names of the Species.	Upper Jaw.			Lower Jaw on each Side.	Total Number of Teeth.	Food.
	External Branch.		Internal Branch on each Side.			
	Fangs on each Side.	Common Teeth on each Side.				
Crotalus duriſſus.	1	0	6	5	24	Squirrels, various birds, rats, mice.
Cr. rhombifer.	1	0				Hares, fquirrels, birds, rats, mice.
Cr. miliaris.	1	0				Graſshoppers and other infects, worms.
Vipera berus.	1	0	10	10—12	44—48	
Coluber hetorodon (hognoſe-ſnake).	0	13 the two lower ones three times larger.	14	12—15	80—86	Inſects, worms, field-mice, ſhrews.
Col. erytrogrammus.	0	10	15—16	10—12	70—76	Birds, young turtles, frogs, ſalamanders, the amphibious rat.
Col. conſtrictor.	0	12	28—30	16—18	112—120	As the laſt; alſo ſquirrels, lizards, tree-frogs.
Col. getulus (chain ſnake).	0	8	18—20	10—12	72—80	Lizards, a ſerpent with red and black bands, col. fulvius?
Col. faſciatus.	0	8	20—24	12—15	80—94	Small fiſhes, frogs, inſects, worms.
Col. fulvius.		the teeth not aſcertained.				Graſshoppers and other inſects.
Col. faurita.		the ſame.				Tree-frogs, inſects, worms.

Venomous Teeth and Gland.—We have ſtated that the innocent ſerpents have teeth along the maxillary edge of the upper jaw, and in the palate; that is, four parallel rows, two external or maxillary, two internal or palatine. The venomous kinds, inſtead of the maxillary rows, have the venomous fangs at the anterior end of each ſuperior maxillary branch; and they poſſeſs the palatine rows, as well as the innocent ſerpents. There is no difference in the teeth of the lower jaw. The venomous fangs are much longer and thicker than the other teeth: they are conical, ſharp-pointed, and perforated by a fine tube. They are moveable at the will of the animal, and can be drawn up from the jaw, or laid down at pleaſure. They are contained in a kind of cavity formed in the gums, from which their point projects.

At the end of his account of Indian ſerpents, Ruſſel has given two finely engraved plates, repreſenting the appearances of the teeth in the venomous and innocent ſpecies. In the coluber catenularis (tar-tuttah), an innocent ſerpent, there are two marginal or maxillary rows of ſimple teeth, and two palatine rows. The vipera elegans (katukah-rekula-podah) has alſo two palatine, but no marginal or maxillary rows. The teeth are ſurrounded by a fringed membranous covering, which almoſt conceals them. The points alone appear, when the membrane is not entirely depreſſed. At the anterior end of the maxillary bone, on each ſide, is a large membranous ſac, wrinkled, and containing the fangs. The vipera naja, or ſpectacle ſnake, has the palatine teeth, and two venomous fangs, like the laſt; but the teeth are ſmaller, the fangs ſhorter, and the membranous ſac leſs apparent. The bungarum-pamah, a ſpecies of bungarus, has the palatine teeth, two fangs ſtill ſmaller than in the ſpectacle ſnake, and at the edge of the mouth, behind the orifice of the bag incloſing the fangs, three ſmall teeth on each ſide, which may be conſidered as an imperfect maxillary row.

In the vipera elegans, the fang is fixed to a bony baſis, which is attached to the ſuperior maxillary bone: this baſis is much longer in the ſpectacle ſnake, and has attached to it the three ſmall ſimple teeth already mentioned.

Behind the venomous fangs in the vipers and other ſerpents, are other ſmaller fangs, ſaid to be deſigned to replace the former when they are loſt.

Blumenbach has given an excellent delineation of the

mouths of the boa conſtrictor and the crotalus horridus, in his Abbildungen Natur-Hiſtoriſcher gegenſtände, No. 37, to ſhew the difference between the venomous and innocent kinds; an object of the greateſt importance, both with regard to the fewer ſpecies of the former, and the much more numerous of the latter kind, in order to warn mankind againſt real danger, and preſerve them from groundleſs terrors. "All ſerpents (ſays Blumenbach), whether venomous or not, have the double internal row of palatine teeth, and the inferior maxillary teeth, in common. But the innocent ſpecies have moreover the whole outer edge of the upper jaw furniſhed with teeth: in the venomous kinds, this is toothleſs. But the latter have, at each anterior corner of the mouth, attached to the upper jaw, the long hollow fangs with a ſlit at their point. Theſe are connected with the venomous glands, of which they may be regarded as bony excretory ducts, to convey venom into the wound made by the bite.

"When, therefore, we ſee in any ſnake four rows of teeth in the upper jaw, *viz.* beſides the two internal palatine rows, an external row on each ſide running to the corner of the mouth; we may be ſure that the ſpecies is poiſonleſs, and ſo far innocent."

The *poiſonous gland*, peculiar to the ſerpents with fangs, and ſaid to be of the conglomerate kind, like the ſalivary glands of the mammalia, is ſituated on each ſide, behind the orbit, cloſe to the branch of the ſuperior maxilla, and almoſt immediately under the ſkin. It is covered by a membranous or aponeurotic ſemitranſparent ſheath, fixed to the bones of the head in front of the gland. The excretory duct extends from the anterior part of the gland, immediately under the orbit, to the bony baſis of the fang, and opens into a canal excavated in the fang, running through it from above downwards, and terminating by an oblique aperture on its anterior ſurface. Two muſcles deſtined to elevate the fangs, to depreſs the ſuperior maxillary bones, and conſequently to cloſe the mouth, paſs along theſe bones from before backwards; one on the outer, and the other on the inferior ſide of the gland. Theſe cannot act without compreſſing the gland, and expelling its ſecretion into the excretory duct. See a repreſentation of the gland and the ſurrounding muſcles in the coluber naja, Phil. Tranſ. 1804, pt. 2. pl. 8.

In the article Poison of this work, there is an account of the appearance and ſenſible properties of the fluid ſecreted by the venomous gland of the viper, and of its effects on animals. We have a few additional points to mention on this ſubject, as well as concerning the poiſonous properties of ſome other ſerpents.

Fontana aſſerts, that the noxious qualities of the ſecretion are retained for a long time, even in a dry ſtate; and that perſons have ſuffered from wounds inflicted by the fangs of vipers, and other venomous ſerpents, preſerved in ſpirits or dried, even years after the death of the animal. The venom retains its colour and tranſparency in the dead tooth, and is ſtill active enough to kill animals, if it be rendered fluid by immerſion in warm water. He alſo found it active after many months, when dried and powdered.

Leeches, ſnails, and ſlugs, were not injured by the venom of the viper. The blindworm and common ſnake were not affected. Of tortoiſes, ſome were inſenſible to the bite, others died at the end of ſome hours, when bitten by ſeveral vipers.

The bites of the vipers of theſe climates produce more or leſs alarming ſymptoms in the human ſubject, but are not attended with danger. A peaſant, bitten by a viper in the little toe, had the foot, leg, and thigh ſwoln in ſix hours; the pulſe ſmall and intermittent; there was head-ache, pain in the abdomen, laſſitude, and oppreſſion; he cried frequently and had no appetite. He gradually recovered in two days, under the uſe of vegetable decoctions and poultices, which probably did not contribute much to his reſtoration. Daudin, Hiſt. Nat. des Reptiles, 8vo. introd. p. 138.

Lepechin mentions the circumſtance of a young Baſchkir, ten years old, being bitten by a black viper (coluber preſter, L.) in the foot. "Son pied enfla extremement en moins d'une demi-heure, et il eprouvoit tant de douleur dans la partie bleſſée, qu'il ne pouvoit pas remuer le pied ſans être forcé de crier: la páleur extrême de ſon viſage, ſes yeux troublés, et ſa reſpiration gênée, annonçoient très-fortement le danger que couroit ce jeune homme, ſi l'on n'y apportoit un prompt remède." Olive oil externally, and volatile alkali by the mouth, were the ſucceſsful remedies. Daudin, v. 6. p. 168; (quoted from Lepéchin, Tagebuch einer Reiſe, &c. t. 2. p. 105).

While Charas was engaged in reſearches for his work on the viper, he was bitten in the fore-finger. He immediately ſucked the wound, made a ligature on the root of the finger, and another on the wriſt. The bite gave him but little pain. He took ſome ſudoriſics, which operated in a few hours, and he was cured.

Boyle ſays that he cured a man bitten by a viper, by holding a red-hot iron near the wound for a quarter of an hour. The truth ſeems to be, that the effects of the bite are not conſiderable in the human ſubject; and this accounts better for the recovery of perſons bitten, than any virtues in the remedies employed.

The wounds inflicted by theſe animals are not, however, always ſo free from danger. The viper cherſea (coluber cherſea, L.), ſays Daudin, is very venomous, and its bite is often mortal. Linnæus employed olive oil in the caſe of a woman who had been bitten; but ſhe died, although the remedy had been ſucceſsfully employed in the bite of the black viper (vipera preſter). Daudin. v. 6. p. 148.

The wounds of many Indian, African, and American ſerpents, are, however, fatal to the human ſubject. The vipera cornuta of ſouthern Africa, is deſcribed by Paterſon as very virulent, inſomuch, that the Bosjeſmen and Namaquaws employ its venom for poiſoning their arrows. Daudin, ibid. p. 189.

A captain Hall made ſome experiments on the poiſonous powers of the rattleſnake, of which he has recorded the reſults in the Philoſophical Tranſactions. The firſt dog bitten by this animal died in fifteen ſeconds; the ſecond at the end of two hours; and the third of three hours. He recommenced his experiments with the ſame ſerpent on the following day: the firſt dog died in thirty ſeconds; another in four minutes. Three days after, a frog died in two minutes, a chicken in three minutes. A little time after, an amphiſbæna was bitten, and died in eight minutes; and the ſerpent, having ſubſequently bitten himſelf, died in twelve minutes.

Sir Everard Hume has deſcribed at full length the caſe of a man, who was bitten on the thumb and fore-finger by a rattle-ſnake between four and five feet long in this country. He died eighteen days after the accident. Great ſwelling of the whole limb up to the axilla enſued; the tumefaction did not extend to the neck, but there was a fullneſs down the ſide, and blood was extravaſated as low as the loins, producing a mottled appearance. A full trial was given to the volatile alkali, both externally and internally, and to other medicines of the like nature, as ether, brandy, &c. alſo to opium. The cellular ſubſtance had ſloughed over the whole ſwelled part of the limb, ſo that the ſkin was ſeparated univerſally from the muſcles. For a further account of this caſe,

and

and of ſome other caſes of bites of Eaſt and Weſt Indian ſerpents, ſee the Phil. Tranſ. for 1810, p. 75.

Ruſſel, in his account of Indian ſerpents, has furniſhed us with the moſt ample and intereſting details concerning the Indian poiſonous ſerpents. Of theſe the cobra de capello, or ſpectacle ſnake (coluber naja), and the katuka-rekula-poda (vipera elegans), are the moſt dangerous. It appears, from a compariſon of the effects of the venom of the Indian ſerpents, the rattleſnakes, and the viper in the mammalia, that the ſymptoms are nearly the ſame in all, but that the term of their duration differs. The bite of a rattleſnake deſtroyed a dog in England in two minutes; while that of the moſt venomous Indian ſnake has never been fatal to this animal in leſs than thirty-ſeven minutes. A chicken bitten by the gedi paragoodoo (bungarus cæruleus) was immediately affected with ſtupor; in ten minutes, it was incapable of remaining upright; a quarter of an hour after it was ſtretched on the ground, as if aſleep; it made ſome efforts to riſe, turning the head to one ſide and the other, became convulſed, and periſhed in half an hour.

A ſtout dog was bitten in the thigh by a ſerpent of the ſame ſpecies: he howled much from the bite, but walked about freely. He lay down in a quarter of an hour, and howled: when an attempt was made to make him ſtand by raiſing him up, it was found that the hind limbs were paralyſed. He grew worſe, ceaſed to howl, and vomited abundantly: he became benumbed, and remained lying on the ſide. He died in two hours, having had very bad convulſions.

A lean bitch, having been bitten near the groin, remained fifteen minutes without exhibiting any ſymptoms of ſuffering. In fifty minutes ſhe lay down, and appeared much affected: on attempting to make her ſtand, it was diſcovered that the limbs were paralyſed. She vomited a little, and was convulſed till death, which occurred ſeventy minutes after the bite.

Wounds inflicted by the ſpectacle ſnake, or coluber naja, had the ſame effects; alſo thoſe of the katuka rekula poda. Death did not always follow in the latter caſe, particularly in a dog, who was bitten ſix times, and once inoculated with the poiſon. A horſe was bitten by the laſt-mentioned ſnake on each ſide of the noſe. Prodigious ſwelling enſued, and extended to the throat; the animal refuſed his food, vomited, and appeared greatly affected. He had an emollient fomentation, and recovered on the third day.

Experiments with the bodrou pam had the ſame reſults: ſwelling, numbneſs, paralyſis, convulſions, and death.

Ruſſel tried inoculation of the venom with needles, thread, &c. Of ſix trials on dogs, none proved mortal. Eight out of twenty-four were fatal in chickens and pigeons.

Several venomous and innocent ſerpents were expoſed to the ſpectacle-ſnake: it would not bite them until inſtigated to do it, and they died without attempting to retaliate. But Ruſſel found, in repeated trials, that two of theſe animals did not hurt each other; they would fight, and wound each other, but theſe wounds were not mortal.

Many circumſtances modify the reſults of wounds inflicted by venomous ſerpents: *viz.* the quantity of venom, the condition of the ſerpent as to vigour or weakneſs, the number of bites he has inflicted, the ſituation and nature of the part bitten, the ſize of the animal, &c.

There are many facts to prove, that the ſecretion of the venomous gland, which is ſo active a poiſon, when introduced into a freſh wound, is quite innocent, and probably inoperative, if taken into the ſtomach. The pſylli, or ſerpent charmers, ſo celebrated among the ancients for curing perſons who had been bitten by vipers, ſucked the wound ſtrongly and repeatedly. Recent wounds made by the fer de lance (vipera lanceolata) of Martinique, the venom of which is very active, are alſo ſucked with impunity. Fontana ſwallowed the poiſon of the viper, both mixed with water, and pure; it had even a mild taſte, inſtead of producing a cauſtic and burning ſenſation, as ſome have ſtated. The heads of vipers, with their fangs and glands entire, have been eaten by dogs without any ill effects; and even the head of the terrible rattleſnake, with all its venomous apparatus, has been employed, with the reſt of the body, in making ſoup, which has been drunk with perfect impunity.

Having thus deſcribed the inſtruments with which nature has furniſhed the venomous ſerpents, for the purpoſe of attacking, killing, ſeizing, and ſwallowing their prey, we cannot be at much loſs to underſtand how theſe objects are effected; yet the prevailing notions on the ſubject are calculated, inſtead of elucidating, to involve a plain matter in obſcurity and myſtery. Theſe will be moſt effectually diſpelled by the following ſtatement of Paliſot Beauvois, who had conſiderable opportunities of obſerving the habits of ſerpents in America. "Much has been written on the manner in which ſerpents ſeize their prey: ſome aſcribe to them a kind of magical power, the effect of which is to charm and enchant the animals on whom they fix their looks; others, leſs fond of the marvellous, pretend that they inſpire them with exceſſive alarm, that, not knowing what they do, they run from one ſide to the other, fly, return, and at laſt precipitate themſelves into the jaws of the monſter; a third opinion is, that ſerpents diffuſe around a fetid odour, by the aid of which they ſuffocate birds, ſquirrels, rabbits, and the different animals on which they feed. It muſt be difficult to determine the means employed by theſe animals in a ſtate of nature, for the purpoſe of ſeizing their prey; and it would probably be wrong if we were to ſuppoſe that the ſame means are adopted in all inſtances. Can we believe, for example, that the black ſerpent (coluber conſtrictor), which creeps with aſtoniſhing quickneſs, climbing ſhrubs, and not at all venomous, ſhould employ the ſame means as the boiquira (crotalus duriſſus), a ſlow moving animal, never aſcending the ſmalleſt plant, and furniſhed, like all the venomous ſerpents, with two fangs, the wound of which is ſo quickly fatal? Yet, if we may judge of theſe reptiles in a ſtate of liberty, by what goes on when they are priſoners, they certainly create only a common alarm, ſuch as any creature will feel, when endeavouring to eſcape from its enemy. The animals experience no enchantment, nor any attack of madneſs, when a ſerpent fixes his eyes on them. Serpents produce no bad ſmell, ſtill leſs a fetid vapour, capable of ſuffocating animals. The boiquira eats indiſcriminately all the dead birds brought to it. It will not eat frogs, which the black ſerpent, on the contrary, ſeems to prize highly. Faſcination and charms are repugnant to reaſon: ſorcerers and magicians exiſt no more among animals than men: cunning, addreſs, and force, are in both caſes a ſufficient, as well as the only charm and power, to render the weak tributary and victim to the ſtrong.

"I made, in conjunction with Peale, the following obſervations on a boiquira, which he had preſerved alive for five years, and on a black ſerpent.

"A living bird (icterus pheniceus) was put into the cage with the rattleſnake, and remained there two days, without any offenſive proceeding on the part of the ſerpent. The bird did not ſeem at all uneaſy. As far as we could judge from the countenance, the air which it breathed was the ſame as it would be in an ordinary cloſed cage. During the two days, the reptile ate a dead bird of the ſame ſpecies

as

as that in the cage, which he never offered to touch. Another living bird, the loxia cardinalis, inſtead of being frightened by finding himſelf in company with the boiquira, amuſed himſelf with pecking at the cage, and eating millet-ſeed thrown into him; he changed his ſituation frequently, and would even perch on the reptile's back; but he moved off at the ſound of the rattle. Several kinds of frogs, living and dead, were preſented to the ſame ſerpent; but he touched none. The black ſerpent, on the contrary (coluber conſtrictor), attacked the frogs immediately, and ſeemed to prefer the tree-frogs. He alſo ſwallowed flies and other inſects.

"A common rat was put into the cage with the boiquira, who immediately appeared animated; the rat, frightened, ran towards the ſide oppoſite to the reptile. The chaſe laſted a few ſeconds, the animal uſing every effort to eſcape, when the reptile, perceiving a favourable moment, flew at his prey, and bit it. The rat continued to run round the cage, but the ſerpent remained quiet: the former, in about a minute, ſwelled, became convulſed, died, and was ſwallowed by his enemy. Theſe convulſions were probably conſidered by old obſervers as the effect of the charming power of the ſerpent, or of extraordinary fear; but they are a regular ſymptom of the action of the poiſon.

"Perhaps theſe experiments do not determine exactly the means which ſerpents employ for ſeizing their prey, ſo likely to eſcape them by running or flying: but they ſeem ſufficient to authoriſe us in rejecting all ideas of faſcination, or charm, of extraordinary terror or ſuffocating vapour. On the latter point, I can ſtate, that nine boiquiras were kept for three weeks in the ſame box; when it was opened, at the end of this time, no particular odour was obſerved." Daudin's Hiſt. Nat. des Reptiles, in the edition of Buffon, by Sonnini, v. 5. p. 55. et ſeq.

Thoſe ſerpents which have not this quick and effectual means of deſtroying their prey by the poiſonous apparatus, accompliſh their object in another manner. They throw themſelves on the animal which they attack, twine round his body and limbs, and exert, in this manner, a compreſſive force capable of breaking the bones. When he is thus diſabled from reſiſtance, they ſmear him over with a mucous ſaliva, and ſwallow him gradually in the way already deſcribed. The enormous ſerpents of Africa and America, thirty or forty feet long, are ſtrong enough to attack and overcome the larger animals, and can then ſwallow them entire. See the account of the boa aboma by Stedman, in his voyage to Surinam and Guiana; and of the boa conſtrictor, in Adanſon's Voyage au Senegal, p. 152. et ſeq.

Proportion of the venomous to the harmleſs Serpents.—The number of ſerpents poſſeſſing venomous fangs is more conſiderable than has been generally ſuppoſed. "Ne telis horrentibus," ſays Linnæus, "execrabili veneno nimium fæverent, decimam quamque tantum ſpeciem armavit imperans, et verſipelles eos voluit, ut dubii omnes metuerentur ab omnibus." Yet Dr. Ruſſel found ſeven venomous ſpecies among forty-three, which he obſerved; and the proportion of the venomous to the non-venomous kinds, among the ſerpents deſcribed by Daudin, in his Hiſtory of Reptiles, is as 80 to 233. There are not more than 14 or 16 genera of ſerpents indigenous in Europe, yet among theſe are five vipers. Of the ſpecies deſcribed by Daudin, 201 belonged to the ancient, and 112 to the new continent: the venomous kinds formed a fourth in the former, and a fifth in the latter.

Daudin gives the following liſts of the poiſonous and harmleſs kinds.

Genera with poiſonous fangs.	Genera without poiſonous fangs.
1. Bungarus.	1. Boa.
2. Acanthurus?	2. Python.
3. Crotalus.	3. Corallus.
4. Scytale.	4. Hurriah.
5. Lacheſis.	5. Coluber.
6. Cenchris.	6. Enhydrus.
7. Vipera.	7. Erpeton.
8. Platurus.	8. Eryx.
9. Langaha.	9. Anguis.
10. Clothonia.	10. Ophiſaurus.
11. Hydrophis.	11. Pelamides.
	12. Acrochordus.
	13. Amphiſbæna.
	14. Cæcilia.

See his Hiſt. Nat. des Reptiles, v. 5. p. 22.

The following is given by Humboldt as a comparative enumeration of the venomous ſpecies in the old world, and in America.

In the old continent.	Species.	In the new continent.	Species.
Bungari	2	Bungarus	0
Crotalus	0	Crotali	7
Scytalæ	3	Scytalæ	2
Lacheſis	0	Lacheſes	2
Cenchris	0	Cenchris	1
Viperæ	44	Viperæ	10
Platuri	2	Platurus	0
Clothonia	1	Clothonia	0
Langaha	1	Langaha	0
Hydrophes	5	Hydrophis	0
	58		22

See the Recueil d'Obſervations de Zoologie et d'Anatomie comparée, v. 2. p. 5.

Horny Covering of the Jaws in the Chelonian Order.—This ſubſtance is ſimilar in its nature to that which compoſes the hollow horns of animals (ſee HORN); and there is no eſſential difference between it and that of the bill in birds. (See BIRDS, in *Comparative Anatomy.*) As in birds, this horny covering is ſpread over the oppoſed ſurfaces of the two mandibles; but the organ ſo covered is much leſs ſuſceptible of motion in the teſtudines, as the upper mandible is always fixed in them. In general it is ſenſibly fibrous in its texture, but ſometimes it appears homogeneous. It is very hard, ſo as to enable theſe animals to break ſhells with facility. In this reſpect, it is analogous to the horny bills of the birds of prey, and the reſemblance is ſo ſtriking in one ſpecies of turtle, that it has received the name of hawk's-bill. It is formed on a vaſcular ſubſtance covering the bone, as is the caſe with the hollow horns and the bill of birds. The edges are ſometimes ſimple, ſometimes ſerrated, ſometimes divided into large unequal teeth; the extremity is either entire and rounded, or grooved, or brought to a ſharp point. The edge of the upper jaw is terminated by a thin ſharp plate of horn, within which the lower paſſes to ſome height, being rather narrower in its tranſverſe meaſurement: hence any ſubſtance may be cut by them as with ſciſſars, for the outer margin of the lower jaw is alſo brought to a ſharp edge. Beſides this ſharp edge, there is a covering of ſome breadth in the upper jaw, forming a ridge

a ridge towards the anterior part, received into a correſponding concavity of the lower jaw.

Salivary Glands.—We have already obſerved, that nothing deſerving the name of maſtication takes place in any reptile. They live on other animals, and almoſt univerſally ſwallow them whole. Some teſtudines feed on ſhell-fiſh, and break the teſtaceous coverings with their horny mandibles, but they do not *chew* the contained animals. The ſalivary apparatus muſt, therefore, be very different from that of the mammalia.

Several reptiles, however, require the aſſiſtance of fluids poured into the mouth for ſeizing and ſwallowing their prey. Some, as the frog and cameleon, dart out the tongue, covered with a viſcid matter, upon inſects, which are entangled in the ſlime, and thus captured. Serpents ſpread a frothy ſlaver over the animals which they ſwallow, to facilitate their paſſage.

In ſome reptiles the tongue is compoſed, in great part, of a thick glandular maſs, formed of numerous ſmall tubes united at their baſes, and ſeparating towards the ſurface of the tongue. They are ſo many papillæ, giving a briſtly appearance to the organ, or rendering it villous, when they are very ſmall. The ſides of the maſs are perforated by numerous pores, through which the ſecreted fluid eſcapes. This gland reſts on the muſcles of the tongue, and follows the motions, which they communicate to the organ. The gland in queſtion exiſts in the chelonians; in the teſtudo græca the ſtructure juſt deſcribed is very evident. It exiſts alſo in ſeveral ſaurians, as the flat-headed gecko (G. fimbriatus), the common iguana, and the Schneiderian ſcink.

In the agame umbra (iguana umbra, Linn.) the gland is ſurmounted in front, inſtead of papillæ, with tranſverſe plates cloſely arranged. Theſe laminæ cover the whole ſurface in the cameleon.

The tongue ſeems to be covered by an analogous glandular ſubſtance in the batracians.

Where the tongue is ſcaly, or ſmooth, and covered with a ſimple membrane, the place of this gland is ſupplied by two others, elongated and glandular, ſituated under the ſkin, along the external ſurface of the branches of the lower jaw-bone, and pouring out their fluid at the outſide of the teeth of the ſame jaw. In this direction they are in contact with the palatine membrane. Theſe glands are ſtrongly marked in the tupinambes, the colubres, and the boas. In the amphiſbænæ the glands are not ſituated in the ſame place, although they have the ſame apparent ſtructure. They lie immediately under the tongue, between the genio-gloſſi and genio-hyoidei.

The conglomerate gland ſecreting the poiſonous fluid of the venomous ſerpents is ſpoken of in the deſcription of the teeth.

The *os hyoides* varies in the different orders of reptiles, but it approximates in general very nearly to that of birds, from which it does not differ eſſentially in the ſaurian and ophidian orders. As in birds, its connections with the larynx are very inconſiderable: there is no muſcle paſſing between them: a ſimple membrane is the medium of union. They are, in fact, completely ſeparated in ſome genera of ſaurians; as, for example, the cameleon: and the ſame obſervation may be extended to all the ophidians which have a tongue included in a ſheath. This circumſtance completes the proof of what is rendered very probable by many other reaſons, that the eſſential function of the os hyoides is to ſupport the tongue, and aſſiſt its motions.

The form of the os hyoides varies much in the chelonians: ſometimes the body is nearly ſquare, thin, and flattened, then the poſterior cornua are ſtraight, articulated to the poſterior angles of the body, ſeparating from each other as they paſs backwards, and having the larynx placed in their interval. The anterior cornua are conſolidated to the body, a little behind the anterior angles, directed backwards, and curved upwards behind the occiput. In front the body is prolonged into a point, under the tongue, which it ſupports. Such an os hyoides is ſeen in the teſtudo græca. But in the matamata (teſtudo fimbriata, Gmel.) the body is very ſolid, bony, and pyramidal, with the baſis turned forwards. The anterior cornua, forming angles towards the front, are articulated behind each angle terminating the baſis; while the poſterior, more ſlender, and bent like an arc, are fixed near each other to the apex of the pyramid.

Uſually the os hyoides conſiſts merely of cartilage in the ſaurians, as in moſt other reptiles; its parts are generally ſlender, elongated, and conſolidated with each other. Yet it preſerves in the crocodile that flattened ſhield-like figure, which we have deſcribed it to poſſeſs in the chelonian order, and which we ſhall diſcover alſo in the batracians. There are only two cornua, articulated nearly in the middle of the ſides of the cartilaginous plate. They ſeem formed of two portions united together, but diſtinguiſhed by a kind of angle projecting poſteriorly.

In the common iguana (I. delicatiſſima, lacerta iguana, Linn.) the body may be conſidered merely as the point of union of the ſeven cornua compoſing the os hyoides An anterior one is continued under the tongue, without being fixed to it. The ſix others are behind. The two loweſt are the longeſt; they are contiguous, ſlightly curved, and enter the goître, without affording attachment to any muſcles or ligaments. The four others are true cornua of the hyoid cartilage. Two paſs firſt forwards, but quickly bend backwards, and then upwards, to reach the occiput. The others are bent backwards and upwards, ſo as to remain nearly parallel to theſe. They are analogous, in their form and uſe, to the correſponding parts in birds. The cornua belonging to the goître are found alſo in the ſcinks, agames, and dragons. In the dragon rayè (draco lineatus) their extremity is attached to the large bag forming the goître, and will draw it inwards, when the tongue paſſes out of the mouth. Theſe cornua are not found in the other ſaurians. Sometimes there are only two hyoideal cornua, as in the gecko fimbriatus. They are always perfectly analogous to thoſe of birds.

The os hyoides of the cameleon has four; of which two are ſtraight and directed obliquely forwards. The two poſterior go behind the head. The body is prolonged to nearly the anterior third of the tongue, when that organ is in the ſtate of repoſe: it is cylindrical and ſlender in the whole of this part, which is between one and two inches long.

In the lizards and tupinambes, the number of cornua is alſo four. The anterior are formed of two pieces, conſolidated, or moveable on each other, of which the firſt is directed forwards, while the ſecond turns backwards, and is curved towards the occiput.

In the ophidians, with a tongue incloſed in a ſheath, the hyoid cartilage is compoſed of two parallel threads, directed from before backwards, approximated to each other, ſeparated in their anterior half by the ſheath of the tongue, and in the reſt of their extent by the two hyogloſſi. The two threads are united in front, nearly between the poſterior extremities of the branches of the jaw, being bent into a ſemicircle under the ſheath of the tongue; from the convexity of their union a ſhort point is continued under the ſheath. In the other ophidians, as the amphiſbænæ, &c.

the

the hyoideal cartilage has a triangular figure: the two posterior angles are elongated to form the cornua.

The os hyoides forms a broad nearly square plate, immediately applied to the inferior parietes of the palate and back of the mouth, in all the batracians, except the salamanders. The anterior cornua go off towards the front from the anterior angles, separate more widely before they turn backwards, then are continued towards the angle of the jaw, and curved from below upwards, in front of this angle, to be fixed to the posterior part of the cranium. The posterior horns are straight, strong, bony, not consolidated with the square plate, but articulated to its posterior angles, and directed obliquely backwards and outwards. The larynx is placed between them. The hyoid cartilage of the salamanders has a triangular form: the cornua go off from the posterior angles, and ascend at the sides of the neck. Their posterior edge is consolidated to a thread of the same nature, bent in the form of a handle, and having its anterior extremity united to that of the opposite thread in the middle of the posterior concavity of the hyoid cartilage. On each side of the branches of this cartilage, towards the front, there is a broad cartilaginous plate, nearly parallel to them, and only joined by muscles which go from one to the other. It seems to hold the place of an anterior horn.

In the thirty-fourth plate of the fifth volume of the Leçons d'Anat. comparée, there are figures of the os hyoides of the iguana, the Nilotic crocodile, the Nilotic tupinambis, the lacerta agilis, the gecko fimbriatus, amphisbæna, another serpent, the testudo græca, the salamander and frog.

Muscles of the Os Hyoides.—In those saurians, which have a more or less protractile tongue, these muscles contribute greatly to its elongation, by carrying the bone forwards.

We find in reptiles; 1st, a muscle analogous to the mylo-hyoideus. It is composed, in the two first orders, of several portions; *viz.* an intermaxillary, fixed to the lower edge and internal surface of the branches of the lower jaw; a second very thick, ascending behind each angle of the jaw, upon the digastricus, and attached to the occiput; a third passing to different distances in the neck, fixed to the skin above, and embracing the neck like a girth. It is analogous to the cutaneus colli; and embraces the whole extent of the neck in the chelonians. In the common iguana the intermaxillary portion does not extend to the arch of the chin; and in the gecko there is only a thin aponeurosis reaching so far. But, in general, the mylo-hyoideus is fixed to the os hyoides in these two orders, which is not the case in the batracians; in which the muscle seems to exist merely for the purpose of filling the wide interval between the maxillary branches, and supporting and elevating the parts above it. Its fibres are directed transversely from one branch to the other; they are divided in several species by a median line, and attached to the internal surface of the maxillary branches, which enables them to elevate more advantageously the subjacent parts. In the rana ocellata the posterior edge is separated on each side, to ascend within the angle of the lower jaw as high as the palatine membrane.

2. The muscle analogous to the sterno-hyoideus is attached in the chelonians, between the two cornua of the same side, and to the posterior cornu; it descends along the neck, passes within the first bone of the shoulder, and is inserted on the inside of the neck of the second bone. It rests, in this course, against the sides of the œsophagus, and is strongly attached to the pharynx towards its anterior extremity.

The same muscle, in the saurians, is attached on the outside of the sternum, between the sterno-mastoidei, and is fixed to the posterior cornu of the hyoid cartilage. In the iguana, it is fixed to nearly the whole posterior edge of the first part of these cornua; in the gecko fimbriatus, to the middle of this edge. In the caïman, after touching the os hyoides, it is continued to the lower jaw, and inserted far back in its lower edge.

It is much elongated in the cameleon, and carried far backwards on the outside of the sternum, forming a point in the same direction. This muscle covers another, thinner and broader, but of the same length, equally contiguous to its fellow of the opposite side in the two posterior thirds, and inserted in the extremity of the posterior cornua of the os hyoides. It might be named sterno-ceratoïdeus. In the agame umbra (iguana umbra, Linn.), the same muscle extends equally backwards on the outside of the sternum. The sterno-hyoideus has two portions in the crocodiles, which are only separated beyond the sternum: the lower one is thinnest, and inserted in the edge of the hyoid plate; the outer, broader and thicker, reaches the posterior edge of the cornu, and after a slight tendinous intersection, which serves to attach it to this cornu, is continued in the same direction to the jaw, and forms the first layer of the cerato-maxillary muscle.

In the serpents, the place of the sterno-hyoideus is supplied by a costo-maxillary muscle, extending from the anterior ribs to the lower jaw. Its internal fibres go from the jaw and the ribs to the hyoid cartilage.

It is prolonged, in the batracians, except the salamanders, within the sternum, to the farthest end of this bone, where it is fixed; or it only reaches the middle of the sternum. Many of its fibres are expanded on the pleura. In front it is divided into several portions, inserted successively in the external edge of the hyoid plate. One of these goes as far as the anterior cornua, and is fixed to it by a slender tendon. In the salamanders, the sterno-hyoideus is continuous with the rectus abdominis, and partakes in its motions.

3. The omo-hyoideus does not exist in the ophidians.

In the chelonians it ends in the sheath of the mylo-hoideus, which incloses the extremities of the anterior cornua of the os hyoides. This muscle is very considerable in some saurians. In the gecko, for example, it is widened, to be inserted in the greatest part of the posterior cornua: it covers the greatest part of the sterno-hyoideus in front.

In the iguana it is contiguous to a muscle, which has the same direction: it is attached to the clavicle behind, and above the body of the hyoid cartilage in front. In the caïman it is also composed of two portions. The external, which is soon detached from the following, is fixed to the palatine membrane near the lower jaw. The internal is attached to the angle of the hyoideal cornu.

It is long and slender in the cameleon; it passes on the outside of the sterno-ceratoïdeus, and is fixed to the body of the os hyoides, on the outside of the sterno-hyoideus.

The omo-hyoideus of the frog is mentioned in the account of the muscles of the shoulder.

4. Muscle analogous to the stylo-hyoideus. This has only been noticed in the frogs and toads. It comes from the back of the head, behind the ear, where it is attached at the side of a muscle analogous to the sterno-mastoideus. It is divided into two portions in the rana ocellata, and into three in the common frog: they are all attached to the posterior cornu.

5. The genio-hyoideus. The chelonians have only one, the tendon of which is fixed to the arch of the chin: the two fleshy portions separate as they go backwards, and are fixed to the basis of the posterior hyoideal cornua. In several saurians the structure is nearly the same; as in the common iguana, and the caïman, for example. It consists of two portions

portions in the cameleon; an internal long and ſlender one, inſerted in the body of the os hyoides; an external broader and ſtronger, contiguous to the former, and attached to the poſterior cornua in their whole length: it has an attachment alſo to the anterior cornua.

In the ophidians the genio-hyoidei are continuous behind with the coſto-hyoidei. They are only obſerved in thoſe whoſe tongue is not incloſed in a ſheath.

The genio-hyoidei are divided behind into two portions, in the batracians. The external and ſhorteſt is inſerted on the ſide of the hyoideal plate above its edge; the internal is prolonged on the poſterior cornua, and furniſhes a ſheath to the hyogloſſus. The ſterno-hyoideus penetrates between theſe two portions, to be fixed to the plate.

6. The cerato-maxillary muſcles. Theſe are analogous in their attachments and uſe to the conical muſcles of the os hyoides in birds: they only differ from them in not being turned round the cornua. They are found in the three firſt orders, but do not exiſt in the batracians. They ariſe from the poſterior third of the internal ſurface of the branches of the lower jaw, and proceed backwards and inwards to the poſterior cornua of the os hyoides. There are two on each ſide, attached to the four cornua, in the iguana. This animal has, moreover, a tranſverſe muſcle of the cornua, the fibres of which go obliquely outwards from the anterior to the poſterior cornu of the ſame ſide.

In the agame umbra the laſt muſcle is long and ſlender, continued from the extremity of the poſterior cornu to the angle of the anterior.

In the chelonians, the cerato-maxillary are inſerted into the extremities of the anterior cornua.

The *tongue* varies conſiderably in this claſs of animals: it is employed, in many inſtances, as the means of procuring their food, by thoſe reptiles which feed on inſects. But as none of this claſs maſticate their aliment, or ſwallow it like the mammalia, the form of the organ is very different from that which it exhibits in the mammiferous animals.

The chelonians have a ſmall pyramidal tongue, with the baſis turned backwards, the apex forwards.

A large part of the ſaurians and ophidians have a tongue capable of conſiderable elongation. The moſt remarkable example occurs in the cameleon, where it is not larger than a quill, but five or ſix inches long: it is expanded at its extremity, which is covered with a viſcous ſecretion. This weapon lies commonly in a ſheath at the bottom of the mouth, contracted to the length of about an inch, or leſs. The animal can dart it out at pleaſure, when the viſcous fluid at its end entangles the prey, which is taken into the mouth with great celerity. "Quand les caméléons veulent manger," ſays Belon, "ils tirent leur langue, quaſi d'un demipied, ronde comme la langue d'un oiſeau nommé picvérd, ſemblable a un verre de terre; et a l'extremité d'icelle ont un gros nœud ſpongieux, tenant comme glu, duquel ils attachent les inſectes, ſavoir eſt ſauterelles, chenilles & mouches, et les attirent en la gueule. Ils pouſſent hors leur langue, la dardant de roideur auſſi vîtement qu'un arbalête ou un arc fait le traict." Pierre Belon, Obſervations, &c. liv. ii. ch. 34.

In the common lizards, the tupinambes, &c. the tongue is ſmooth, extenſile, and terminated by two long flexible points, although ſemi-cartilaginous and nearly horny: it reſembles perfectly that of the ophidians, excepting the anguis and amphiſbæna, and perhaps alſo the cæcilia, which have it flat, and merely forked at the end, without the power of elongating it.

In moſt of the ſerpents, the tongue, when contracted, is contained almoſt entirely in a membranous ſheath. The mechaniſm belonging to theſe projectile tongues partakes both of that which is found in ſome mammalia, as the echidna and the ant-eaters, and of that of birds. (See MAMMALIA and BIRDS, in *Comparative Anatomy*.) It depends on muſcles acting on the os hyoides, and alſo on the muſcles of the tongue.

The ſtellios and iguanas have a fleſhy tongue, villous on its ſurface, and poſſeſſing about the ſame mobility as that of the mammalia. In the ſcinks and geckos it differs from the former only in being biffured at the end; and it reſembles, in this reſpect, that of the angues, between which and the ſcinks there is in all points much analogy.

The tongue of the batracians is not only different from that of other reptiles, but alſo from that of other animals. It is fleſhy, of a flattened figure, ſmooth, and covered, in all of the frog and toad kind, with a tenacious mucus. It is villous in the ſalamanders, and covered with very long papillæ in the horned frog (bufo cornutus, rana cornuta, Linn.). The great peculiarity of the tongue is its being attached by the baſis to the front of the mouth, to the ſymphyſis of the lower jaw. This is its thickeſt part: it is continued backwards in a thinner form, ſo as to end in two looſe and flat portions, repreſenting the apex, and lying in the back of the mouth. This looſe part, ordinarily turned back towards the throat, is projected from the mouth, covered by its viſcous ſecretion, upon the ſmall inſects which the animal feeds on, and which are thus entangled and ſwallowed.

Muſcles of the Tongue.—They poſſeſs nothing peculiar in the chelonian reptiles, which have not an extenſile tongue: they conſiſt merely of two pairs. The hyogloſſi come from the anterior half of the poſterior cornua, and penetrate into the tongue at the ſides of the baſis.

The genio-gloſſi are very ſtrong and broad in the vertical direction: they come from the front of the lower jaw, and enter the tongue more outwards and forwards than the preceding, with which their fibres are interwoven. The apex of the hyoid cartilage penetrates between them: they are alſo ſeparated by a ſmall cylindrical cartilage, to which each muſcle is fixed; which is prolonged behind under the body of the hyoid cartilage, extending in front to the apex of the tongue.

The ſaurians have in general three pairs of muſcles going to the tongue from the os hyoides or the arch of the chin, and a proper muſcle attached to the organ only.

1. The hyogloſſus comes from the cornua of the hyoid cartilage. In the common iguana it is attached to the poſterior cornua, oppoſite the omohyoideus. In the gecko fimbriatus it is fixed to the middle of the cornua, at the ſide and within the cerato-maxillaris: it forms, with the ſtraight genio-gloſſus, the baſis of the tongue, and mixes its fibres with thoſe of the proper muſcle. The hyogloſſus is long and cylindrical in the lizards and tupinambis: it comes from the extremity of the poſterior cornua, approaches the oppoſite muſcle as it advances forwards, becomes contiguous to it at the baſis of the organ, towards the extremity of which it terminates in forming the two portions of cylinders, of which this tongue conſiſts. In the cameleon it is fixed to the whole anterior edge of the poſterior cornua, and is very thick at that part. Beyond the angle formed by the two cornua of the ſame ſide, it is curved and continued directly forwards. The faſciculi of fibres, of which it conſiſts, are inſerted in the poſterior half of the ſheath of the tongue, which it ſerves to draw backwards.

2. The ſtraight genio-gloſſi come from the inferior edge of the arch of the chin, and are continued to the baſis of

of the tongue; where they meet the hyogloſſi, with which their fibres are interwoven.

3. The tranſverſe genio-gloſſi are attached to the arch of the chin, and to the anterior part of the inferior maxillary branches, on the outſide of the preceding. Inſtead of being narrow and elongated, they are broad and ſhort. Their fibres paſs obliquely from without, inwards and backwards upon the membrane of the mouth, as far as the ſides of the tongue; which they will draw outwards and forwards. The two laſt pairs of muſcles do not exiſt in the cameleon.

4. The proper muſcle is found in thoſe ſaurians only, whoſe tongue admits of elongation. It is compoſed, in general, of annular fibres. In the gecko fimbriatus, which has a broad tongue, this muſcle is divided in front into ſix or eight ſmall portions, which are united into two towards the middle third of the tongue, and then into one on each ſide, which form the two pieces of the baſis of the tongue.

In the cameleon the annular muſcle is very thick, and forms a fleſhy cylinder ſurrounding the anterior three-fourths of that part of the os hyoides which penetrates into the tongue. Towards the front it is divided on the ſides into two portions, a ſuperior and an inferior; the latter is folded back towards the ſheath of the tongue, to which it adheres. There is, moreover, a muſcle proper to this ſheath, which may be called the retractor muſcle. It comes from below the glandular part, and is continued, on each ſide, as far as the part that is puckered up. When the hyogloſſus throws this latter part into wrinkles, and ſhortens it, and the os hyoides is carried backwards by the ſterno-hyoidei and ceratoidei, the retractor muſcle cauſes the end of the ſheath to remain applied to the extremity of the annular muſcle which recedes, becauſe then its poſterior attachments are the moſt fixed: on the contrary, when the extremity of the os hyoides and the annular muſcle puſh the ſheath forwards, the anterior attachments have a point d'appui; the poſterior portions of the retractor draw forwards the ſheath, and unfold it.

By putting together what we have ſaid concerning the os hyoides and its muſcles in the cameleon, in a former part of this article, and what we have juſt ſaid of the muſcles of its tongue, it will be eaſy to underſtand how this organ can be elongated, and withdrawn into the mouth. The firſt office is performed by the annular muſcle, with the cerato-maxillary, and the genio-hyoidei. The ſterno-ceratoidei and hyoidei carry backwards the os hyoides, at the ſame time that the hyogloſſus ſhortens the ſheath and puckers it up.

In moſt of the ophidians the tongue is incloſed in a membranous ſheath, which opens behind the interval of the branches of the lower jaw, and is continued backwards between thoſe of the hyoid cartilage, under the trachea. It is lined internally by the membrane of the mouth. This ſheath is carried forwards by a pair of muſcles analogous to the genio-gloſſi. They derive their origin by two portions, one of which comes from between the two branches of the lower jaw, the other from their extremity; they come together and are fixed to the ſides of the ſheath to its moſt diſtant extremity. The hyogloſſi are two elongated muſcles, contiguous, and even united together by fine cellular laminæ. They exactly fill the interval of the cornua of the hyoid cartilage, and are even doubled backwards round their extremity. Theſe muſcles go to the baſis of the ſheath, and draw it backwards, when it has been carried forwards by the two firſt pairs.

The proper muſcle is formed of two cylinders, firſt lying together, and ſeparated towards the anterior third of the tongue, for the two portions of which its apex conſiſts; here they become conſiderably diminiſhed, and are reduced to a mere thread at the end.

This ſimple apparatus, combined with that of the os hyoides and its muſcles, gives to the tongue of the ſerpent that wonderfully quick power of extenſion and retraction. Carried forwards by the genio-vaginal muſcles, brandiſhed by its proper muſcles, it re-enters the ſheath in conſequence of the elaſticity of the hyoideal cornua, which tend to reſtore themſelves, and of the action of the hyogloſſi. One or other of theſe actions is aſſiſted by the coſto-maxillary muſcles, according as the portion analogous to the ſterno-hyoideus, or that which correſponds to the cerato-maxillary, contracts. The extenſion of the tongue out of the mouth is ſo much the greater, becauſe it is effected through an orifice near the extremity of the ſnout, and becauſe its baſis may be brought near to this part.

In the amphiſbænæ, which have a flattened tongue, not incloſed in a ſheath, nor ſuſceptible of extenſive motion, there are, 1ſt, two genio-gloſſi attached to the arch of the lower jaw, more internally than the genio-hyoidei; 2dly, two hyogloſſi; and 3dly, two cerato-gloſſi, which preſent nothing worthy of particular notice.

The tongue of the batracians, as we have already deſcribed, is fixed in front to the arch of the lower jaw, and free behind. In paſſing out of the mouth, and going back again, it turns upon the fixed point of its attachment to the jaw. Two pairs of muſcles, the genio-gloſſi, and the hyogloſſi, execute theſe motions. 1. The hyogloſſi form, in the rana ocellata, two cylindrical maſſes, lying on, and attached to, the poſterior cornua. They ſoon unite into a ſingle maſs, which reſts on the hyoideal plate, and penetrates the tongue in front of this plate, expanding into ſmall faſciculi, which reach to the looſe edge of the organ. 2. The genio-gloſſi form at firſt two ſmall ſpherical maſſes, placed at the arch of the chin on the ſmall tranſverſe muſcle; they are ſubſequently elongated into two contiguous cylinders, of which the fibrous faſciculi ſeparate from each other, decuſſate with thoſe of the preceding muſcle, and go to the looſe edge of the tongue. While the tongue is in the mouth, the hyogloſſus is folded on itſelf, and the genio-gloſſus is ſtraight. The latter muſcle is folded, and the former ſtraight, when the tongue has been projected. In the common frog, theſe two pairs of muſcles are not ſo minutely divided in the tongue, and the genio-gloſſi do not form ſpherical maſſes towards the arch of the chin: in other reſpects they are ſimilar.

Tongue of the Crocodile.—Humboldt has obſerved a peculiar mechaniſm in the tongue of this animal, bearing an evident relation to its wants and habits, of which the following is a deſcription in his own words.

"From the moſt ancient times diſputes have exiſted concerning the tongue of the crocodile; ſome naturaliſts pretended that it was entirely wanting, others affirmed that it was very ſhort, and placed at the entrance of the œſophagus. According as one or the other of theſe opinions prevailed, the ſculptors and antiquaries of Rome amuſed themſelves with deſtroying or reſtoring the tongues of their crocodiles. When we examine attentively the os hyoides of this animal, we find that it is in conſequence of its form and ſmall ſize that a part or rather a fold of the tongue has been confounded with the whole organ. There is in this animal a peculiar mechaniſm, by which a valve is formed, interrupting the communication between the mouth and throat. When the crocodile appears motionleſs on the bank of the river, with the jaws opened at an angle of

95°, the whole mouth appears yellow: the valve is elevated, and the opening of the fauces is not ſeen. If we ſurpriſe him, the valve is generally depreſſed; and if a perſon runs the riſk of approaching ſufficiently, a round body of a beautiful red colour, which is the opening of the glottis, may be perceived. This valve enables the crocodile to ſeize his prey under water without running the riſk of being inundated by the great quantity of fluid that would paſs into the œſophagus. When he ſwallows, the valve muſt be depreſſed, and the animal on dry ground. The os hyoides of the crocodile of the Orinoco is a membranous ſpatula, broad, concave, and terminated by two ſhort horns. The os hyoides of the Egyptian crocodile, as delineated by Mr. Duverney, is altogether different from that of the South American animal; another proof of the diſtinction between the crocodiles of the old and new continent. In an animal of eighteen feet, the tongue is twenty-five inches: it is yellow, fleſhy, and covers the whole jaw; but it is attached on all ſides, ſo that the os hyoides cannot elevate it to the end. The anterior or ſpatula-ſhaped portion of this bone enters the membranous ſubſtance of the tongue, which it can elevate at a right angle. As the ſides and extremity of the organ are fixed, this motion of the bone can only carry with it the membranous part of the tongue, which forms the fold preſenting itſelf like an elevated valve. The os hyoides is depreſſed, and the valve immediately diſappears. Three conditions are neceſſary to the execution of this mechaniſm, a tongue attached to the lower jaw; a ductile and flexible membrane covering it; and an os hyoides broad in front. The yellow ſubſtance in the anterior part of the mouth belongs to the tongue as well as the fold covering the entrance of the œſophagus. Humboldt found that the tongue ſwelled very much, when ſubjected to Galvanic influence, by means of zinc and ſilver. See Recueil d'Obſervations d'Anatomie comparée et Zoologie, faites dans le Voyage de Humboldt et Bonpland, t. 1. pag. 9. pl. 4.

Geoffroy gives a ſimilar deſcription of the tongue, os hyoides, and their mechaniſm, in the Nilotic crocodile. He deſcribes it as a yellowiſh, ſhagreened ſkin, exactly like the ſubſtance of the palate, pierced by numerous ſmall holes, the excretory ducts of the glands ſituated on its upper ſurface, and adhering on all ſides to the branches of the lower jaw. He ſpeaks of the broad anterior part of the os hyoides forming, by its elevation, a veil, which covers all the back of the mouth. Thus, the animal can remain under water with the jaws open, and receive air through the noſtrils, the only part above the ſurface, without the water entering the throat or trachea. Annales du Muſeum, vol. ii. p. 42, et ſeq.

Epiglottis.—In moſt reptiles the opening of the glottis is neither covered by a valve, as in the mammalia, nor armed with papillæ, as in birds. Yet a kind of epiglottis may be obſerved in the common iguana, and in the Schneiderian ſcink. There is a rudiment in the crocodiles; it does not appear in ſeveral other animals of the ſame order, nor in the chelonian, ophidian, and batracian reptiles. The cylindrical larynx of the dragon, and its ſimple opening behind the root of the tongue, are very well repreſented in Blumenbach's Abbildungen Natur-Hiſtoriſcher gegenſtände, N° 98. Is the abſence of the epiglottis connected with the peculiar modification which reſpiration undergoes in this claſs? or with their deglutition? On the former point we may obſerve, that, as they breathe only at conſiderable intervals, there is no danger of the glottis being opened during ſwallowing, and its edges may conſequently be kept cloſely approximated. Again, as they ſwallow their food whole, it is not likely to paſs into the larynx.

Fauces.—The openings of the noſtrils are ſituated very forwards in reptiles, and are not cloſed by any moveable curtain, as in the mammalia. A kind of immoveable valve, attached to the anterior edge of the opening, and leaving the orifice free behind, may be ſeen in the gecko fimbriatus.

There is ſomething analogous to the velum palati in the crocodile. The noſtrils open far back, contrary to what we have mentioned concerning other reptiles. They form a round aperture in the moſt diſtant part of the arch of the palate. The membrane lining this concavity forms a looſe production a little in front of the opening in queſtion, which deſcends on the ſides, growing a little broader, until it meets another elevation behind the baſis of the tongue. Theſe form together, by their looſe edge, the iſthmus faucium, or entrance of the throat. The firſt affords ſome protection to the opening of the noſtrils, but cannot entirely cloſe it; the latter contributes, with the rudiment of the epiglottis already mentioned, to cover the glottis.

The entrance of the throat is large in all reptiles, and capable, in many, of ſtill greater ſize, by the expanſion of the lower jaws. There is nothing deſerving the name of iſthmus. They ſwallow entire animals, which cannot paſs into the noſtrils, and hence do not require a velum palati.

Pharynx.—As the noſtrils open forwards in reptiles, the pharynx has not the ſame relation to the naſal cavity, as in the mammalia and birds. The mouth and larynx communicate with it, and there is uſually a large aperture correſponding to the Euſtachian tube.

The pharynx can hardly be diſtinguiſhed from the commencement of the œſophagus in reptiles. Their diameter is uſually the ſame; and there is abſolutely no difference in the aſpect of the membrane forming their internal parietes. It preſents a great number of longitudinal folds, which are effaced when a prey of large ſize is ſwallowed. There is no exterior muſcle enveloping the entrance of the canal.

Deglutition may be aſſiſted, in the chelonians, by the action of the ſterno-thyroidei, which reſt on the œſophagus in the whole length of the neck; and even adhere in front to its parietes, and to the part which may be regarded as belonging to the pharynx. The os hyoides may alſo contribute to deglutition, by means of the muſcles which elevate it.

This office is particularly evident in the batracians, and eſpecially in the frogs and toads. The hyoideal plate, which ſupports in theſe animals the extenſive parietes of the back of the mouth and palate, is put in motion by the mylo-hyoideus and the muſcles analogous to the ſtylo-hyoidei, only for the purpoſe of elevating theſe parietes, and applying them to the concavity of the palate. There is alſo another muſcle coming from the upper and back part of the head, in front of that which correſponds to the ſtylo-hyoideus; it is narrow at its origin, but expands as it paſſes forwards and downwards, and as it covers that part of the throat which is prominent behind. It is continued to the edge of the hyoideal plate, in which it is inſerted, its fibres adhering alſo to the membrane of the throat, on which they lie. Their action will elevate the hyoideal plate, and apply the membrane which they cover to the oppoſite ſurface of the cavity.

The longitudinal fibres, belonging both to the pharynx and œſophagus, are more or leſs ſtrongly marked.

Œſophagus and Stomach.—The former tube does not preſent thoſe dilatations which we notice in birds: it retains nearly an uniform diameter throughout, or the change, if any, is gradual. But this diameter is, in moſt caſes, much more conſiderable, in compariſon with that of the ſtomach, than in the two preceding claſſes. Under certain circumſtances, indeed, the œſophagus is larger than the ſtomach

in the ophidians; for example, when the latter is not diſtended with food, becauſe its parietes contract ſooner after enlargement than thoſe of the œſophagus. The membranes are the ſame in both, and, when the tube increaſes in ſize inſenſibly to the ſtomach, it is often very difficult to aſſign the limits of the two parts, and conſequently the ſituation of the cardia. The ſtomach is generally without any cul-de-ſac, oval and elongated: its parietes uſually thin. The muſcular coat is then hardly perceptible, at leaſt in ſome part of its extent, and the cellular is confounded with the mucous or internal. The pylorus is uſually without any valve; it is marked by a ſimple contraction, by the greater thickneſs of the parietes of the ſtomach, and by the different ſtructure of the inteſtinal membranes.

In the turtle, the internal ſurface of the œſophagus is beſet with long, hard, conical papillæ, of which the points are directed backwards, with the effect, apparently, of preventing the return towards the mouth of the matters ſwallowed by the animal. Such, at leaſt, is the notion generally entertained of the end or purpoſe of this ſtructure. But the abſence of ſuch proviſion in all other animals, where the neceſſity ſeems equally to exiſt, cannot but render us ſceptical on the ſubject, more particularly as we know no facts concerning the nature of the food, the mode of its deglutition, nor any peculiar modification of ſurrounding or connected organs, to which this ſingular ſtructure might be ſuppoſed to bear ſome relation. The ſtomach is gradually diminiſhed in ſize from the cardia to the pylorus: it is bent on itſelf, and the portion beyond the curvature is thicker than the reſt, in conſequence of the muſcular fibres being more copious. The internal coat has longitudinal folds in this part, but hardly any in the other. The ſituation of the cardia is well marked, and the œſophagus is diſtinguiſhed from the ſtomach by the ſudden dilatation of the latter. The pylorus has no valve.

Among the ſaurians, the crocodile has a peculiarly ſhaped ſtomach; it is very diſtinct from the œſophagus by its globular figure. Near the inſertion of this canal there is ſeparated from it below a ſmall cul-de-ſac, opening into the inteſtine by a very ſmall orifice, and having its cavity ſeparated from the great ſac of the ſtomach by a kind of ſtrait. Conſequently the general cavity of the ſtomach is a large cul-de-ſac, of which the parietes are very thick. The internal membrane forms conſiderable plaits arranged in a ſerpentine form, like the convolutions of the brain. The cellular coat, which is not very diſtinct from the mucous in the œſophagus, becomes more ſo in the ſtomach. The muſcular nearly equals the two others in thickneſs; the coats are altogether much thinner in the ſmall cul-de-ſac.

In the other ſaurians there is no cul-de-ſac. The ſtomach is oval and very elongated in the iguana, without curvature; the œſophagus dilates gradually to form it. The only mark that can guide us in determining the ſituation of the cardia is, the ceſſation of the longitudinal folds of the internal œſophageal membrane. The ſtomach is ſuddenly contracted, and bent a little before its termination at the pylorus. Its parietes become thick and opaque at ſome lines from this aperture, from an increaſe of the muſcular fibres, of which the tranſverſe are ſtrongly marked. The internal coat forms no fold; there is no valve at the pylorus, which is very ſmall.

In the tupinambis monitor the ſtomach forms a long tube, bent into almoſt a complete circle.

In the Schneiderian ſcink we again meet with the ſame elongated form, tranſparent parietes, and difficulty of diſtinguiſhing the ſtomach from the œſophagus, except by the longitudinal folds of its inner membrane, and the thickneſs of its muſcular coat. But the poſterior part of the ſtomach contracts ſuddenly, is bent towards the right, and a little elongated in this direction before it terminates. The parietes of the latter portion are more thick and opaque, and its internal membrane is folded longitudinally.

The ſtomach begins by a ſmall dilatation in the cameleon, then it aſſumes a cylindrical and elongated form, and is bent on itſelf; it is conſiderably contracted before it terminates, and forms a ſmall cylindrical canal, of which the internal membrane is folded longitudinally. The muſcular coat is thicker in this contracted part than elſewhere. It forms a prominent ring at the pylorus.

In the dragon the ſtomach is ſhaped like a pear, of which the large end correſponds to the cardia; it has no curvature; its parietes are tranſparent; they become thicker and opaque near the pylorus; and theſe characters are the only circumſtance, by which we can diſtinguiſh it from the beginning of the inteſtinal canal, which has thin and tranſparent coats.

The ſtomach is alſo pear-ſhaped in the gecko; the œſophagus makes a curve before it ends, and is inſerted at one ſide of the baſis. It is narrow, with thick coats, a ſtrong muſcular covering, and broad longitudinal folds of the internal or mucous coat. The ſides of the organ are thicker at its extremities; and the pyloric end is a little bent. The internal membrane is ſmooth.

In the ophidian order the ſtomach is ſhaped like an inteſtine, hardly larger than the œſophagus, and without curvature. The internal membrane is folded longitudinally. When the ſtomach is empty, theſe folds are thicker than thoſe of the œſophagus, which are not always obſerved.

The œſophagus of a ſnake, examined by Spallanzani, formed a cylindrical tube like an inteſtine, for about nine inches: it then became gradually narrower, ſo as to conſtitute a funnel of the length of four inches and a half. This funnel was the true ſtomach. The ſides of the ſtomach were thicker than thoſe of the œſophagus: no glands or follicles could be ſeen in the latter; but the ſtomach was abundantly ſupplied with them throughout its whole length; they diſcharge part of their liquor on being preſſed, and the internal coat is moiſtened with it. Diſſertations relative to the Natural Hiſtory of Animals and Vegetables, v. i. p. 112 and 113.

In frogs and toads the ſtomach is ſhaped nearly as in the chelonian reptiles. At firſt conſiderably dilated in compariſon with the œſophagus, it is gradually contracted, then curved ſo as to form an inteſtine-like canal, with thick coats, ending at the pylorus.

It is ſlightly curved only near its poſterior extremity in the ſalamanders. Its figure is elongated and not much ſwoln; the parietes thick; and the internal membrane exhibits ſmall rugæ. There is a fold near the pylorus, in the ſituation of the curvature. Figures of the ſtomach and inteſtines of various reptiles are given in Cuvier's Leçons, pl. 41.

Inteſtinal Canal.—Its length, in proportion to that of the body, is greateſt in the mammalia, and diminiſhes ſucceſſively in birds, reptiles, and fiſhes. In reptiles it is often hardly twice the length of the body, taken from the extremity of the ſnout to the anus. But tadpoles exhibit in this reſpect a remarkable peculiarity. Their inteſtinal canal is nearly ten times as long as the ſpace between the ſnout and anus, while in the frog it is not more than twice the length of the correſponding ſpace. Other important differences, which will be noticed ſubſequently, exiſt in the two caſes. This ſhortneſs of the alimentary canal correſponds to the nature of the food in reptiles, which is derived from the animal kingdom.

The

The following table of the length of the inteſtinal canal in various reptiles, is taken from the third volume of Cuvier's Leçons d'Anatomie comparée, p. 457.

Names.	Length of the body.	Length of the ſmall inteſtine.	Length of the large inteſtine.	Length of the whole canal.	Proportion to the length of the body.
Teſtudo græca	0.210	0.680	0.014	0.694	:: 1 : 3.3
Nilotic crocodile (adult)	1.690	5.384	0.406	5.790	:: 1 : 3.4
Nilotic crocodile (young)	0.240	0.710	0.036	0.986	:: 1 : 4.1
Gangetic crocodile (gavial)	0.360	1.350	0.040	1.390	:: 1 : 1.1
Cameleon	0.130	0.180	0.040	0.220	:: 1 : 1.7
Gecko à goutelettes (gecko guttatus)	0.125	0.120	0.053	0.173	:: 1 : 1.3
Schneiderian ſcink	0.150	0.230	0.171	0.401	:: 1 : 2.8
Iguane ardoiſé (iguana cærulea)	0.180	0.175	0.062	0.237	:: 1 : 1.3
Common iguana	0.220	0.400	0.230	0.630	:: 1 : 3
Lacerta agilis	0.088	0.050	0.017	0.067	:: 1.3 : 1
Common ſnake (coluber natrix)*	0.500	0.530	0.050	0.580	:: 1 : 1.2
Toad	0.065	0.110	0.028	0.138	:: 1 : 2
Frog	0.070	0.100	0.034	0.134	:: 1 : 2
Tadpole of the frog	0.035	0.300	0.030	0.330	:: 1 : 9.7
Salamander	0.040	0.080	0.022	0.102	:: 1 : 2.5

* In a common ſnake of four feet in length, Blumenbach found the inteſtinal canal about three feet, nearly ſtraight, or at leaſt very ſlightly undulated: its proportional length was therefore different from that expreſſed in the table. Specimen Phyſiol. Comp. p. 30.

The inteſtinal canal of reptiles has in general no appendix to mark its diviſion into large and ſmall inteſtines; this diviſion exiſts nevertheleſs in moſt of them. All the chelonians, moſt of the ſaurians, the ophidians, and the batracians, with the exception of the ſiren lacertina, have a long and ſlender inteſtine, inſerted into a large and ſhort inteſtine, and commonly prolonged into the cavity, ſo as to form a circular margin of a valve-like form. The ſides of the large inteſtine are almoſt always thicker and ſtronger than thoſe of the ſmall. The membranes differ too; the muſcular in reſpect to its longitudinal fibres, and the internal in its folds. The iguana is the only animal of this claſs, in which a true cæcum has been noticed.

Of the Inteſtinal Canal.—All reptiles have the inteſtinal canal very ſhort, but not of the ſame diameter in its whole length. In the firſt and moſt conſiderable portion, the capacity is much inferior to that which it is found to poſſeſs near its termination; ſo that it may be divided, as in the mammalia, into ſmall and large inteſtines. A circular valve is moſt frequently found ſeparating the two diviſions; it is formed by a prolongation of the ſmall inteſtine, which becomes dilated, and ſometimes is extended into a kind of ſac, projecting more or leſs into the cavity of the large inteſtine, and rendering the parietes double at that part. It is thus found in the Schneiderian ſcink.

In tortoiſes, the diameter of the ſmall inteſtine gradually diminiſhes from the pylorus to the point of its inſertion into the large: the area of which is four times greater than that of the ſmall, and its parietes have the ſame ſtructure as in the other reptiles. The cavity is regular throughout, there being no partial dilatations or ſacculi. The internal membrane has folds, more or leſs broad, and of a membranous ſtructure, in different ſpecies, ſometimes connected in a reticular form at the commencement of the ſmall inteſtine, having a longitudinal and parallel direction in the reſt of its extent, and arranged more or leſs irregularly in the large. The large inteſtine proceeds in a ſtraight direction to the anus, whilſt the ſmall makes many irregular turns in its courſe.

Blumenbach found the inteſtinal canal of the hawk's-bill turtle (teſtudo caretta) five times as long as the whole animal. The ſmall inteſtine, as it is called, was larger than the ſhort portion of the large inteſtine; the whole internal ſurface was covered internally with an abundance of mucus. Syſt. of Compar. Anat. p. 173.

The internal coat of the inteſtine of the turtle is covered with innumerable thin longitudinal proceſſes, lying cloſe together, and increaſing the ſurface of the gut to a vaſt extent. They are moſt numerous in the upper part of the canal, and gradually diminiſh in number, until they ceaſe altogether, below. In the latter reſpect they reſemble the valvulæ conniventes of man, and the villi of all animals. For theſe ſtructures are always moſt diſtinct at the commencement of the canal, where abſorption goes on to the greateſt extent. The alimentary matter is deprived more and more of its nutritious parts, as it deſcends in the inteſtine; and hence a leſs extenſive abſorbing ſurface is ſufficient, in the lower part of the canal, for taking up the remains of really nutritious particles. Yet Blumenbach ſays that he found theſe folds ſo numerous in the rectum of the hawk's-bill turtle, that a ſection of the gut reſembled a broad radiated band. Lib. cit. p. 173, note.

In the crocodile of the Nile, the ſmall inteſtine may be diſtinguiſhed into two portions, the one more capacious, having thinner coats, and making four turns in ſuch a manner as to form four permanent angles; the other, more contracted and having thicker parietes, incloſes between its internal and muſcular coats a layer of glandular ſubſtance, ſemi-tranſparent, of a grey colour and pulpy conſiſtence. In the internal membrane lining the glandular ſubſtance, there are ſeen longitudinal folds arranged in a zigzag form, and connected together laterally, by ſmaller folds, ſo as to form a reticular ſurface. In the firſt portion of the ſmall inteſtine, where the glandular ſubſtance is not manifeſt, the folds arranged in a zigzag form are replaced by fine villous eminences. Near the termination of the ſmall inteſtine there are only ſeen ſome waving folds, connected by a few, proceeding tranſverſely. In the large inteſtine, the folds are arranged irregularly, forming a velvet-like ſurface.

The form of the rectum (under which term is included the large inteſtine of fiſhes and reptiles) is cylindrical in the crocodile of the Nile; and the ſmall inteſtine, where inſerted into it, is nearly of equal diameter. In the gavial

(Gangetic

(Gangetic crocodile), the large inteſtine has a pyriform figure, the termination of the ſmall being inſerted into its broadeſt part.

In the lizards, the rectum is cylindrical, and much broader than the ſmall inteſtine which is inſerted into it; the latter, after having turned forwards from the pylorus, is folded backwards, and proceeds in a tortuous direction as far as the rectum, which purſues a ſtraight courſe to the anus. The parietes of the inteſtinal canal are thin and tranſparent; the internal membrane has folds arranged in a zigzag form.

In the cameleon, the coats of the inteſtine have the ſame ſtructure; the capacity of the ſmall is not much inferior to that of the ſtomach and large inteſtine, in the greateſt part of its extent; but it becomes much contracted a little before its inſertion into the latter. There is no valve indicating the ſeparation between the different portions; the internal membrane has waving folds, the looſe edges of which have a fringed appearance; they are directed longitudinally, and contracting as they approach the rectum, diſappear at ſome diſtance from that inteſtine, where the internal membrane becomes ſmooth and without any folds. The muſcular coat is thicker in the rectum than in the ſmall inteſtine, where it is indiſtinct. The cellular coat is not manifeſt.

In the dragon, the inteſtinal canal forms two turns and a half before it arrives at the anus; the commencement is diſtinguiſhed only by the different appearance of its coats, which are much thinner than thoſe of the ſtomach.

In the iguana, the parietes of the inteſtinal canal are thin and tranſparent, gradually contracting from the pylorus to the inſertion of the ſmall inteſtine into the rectum; the latter is of an elongated form, but contracted at one part, by which it becomes divided into two portions almoſt of a cylindrical ſhape. The internal membrane has ſome folds directed longitudinally in the ſmall inteſtine. In the common iguana, which has the inteſtinal canal long and very capacious, there is a true cæcum, diſtinguiſhable from the large inteſtine by the greater thickneſs of its coats, and by a partition ſeparating their cavities, ſo that it is through a very narrow orifice that the fecal matter paſſes from the cæcum into the ſucceeding part of the large inteſtine. The inſertion of the ſmall into the former takes place near its middle. The coats of the cæcum have in ſome degree a ſaculated form. The internal ſurface is ſmooth and without folds. In the large inteſtine the internal membrane has the ſame ſtructure, except at the commencement, where there are found about ſix tranſverſe valves, which do not extend around the whole tube of the inteſtine. In the ſmall inteſtine there are longitudinal folds. The pouch formed by the cæcum is about three-fourths of an inch in length, and twice as much in breadth.

In the gecko à gouttelettes the parietes of the inteſtine are alſo tranſparent, the ſmall has but little capacity, but is unequal at different parts; it is inſerted into the centre of the firſt portion of the large inteſtine, which is of a globular form; and is ſeparated, by a contraction in its coats, from the ſecond portion, which is elongated and oval, the ſmall extremity correſponding to the anus. In the Schneiderian ſcink the thin and tender coats of the inteſtinal canal are much dilated at the commencement of the ſmall inteſtine, and contracted at the part where it is introduced into the large. We have already mentioned that it is dilated into the form of a bladder, and enveloped by the firſt portion of the large inteſtine, ſimilarly dilated. The excrements, which paſs through the ſmall aperture in the veſicular dilatation of the ſmall inteſtine, find their way partly into the interval between the latter and the internal ſurface of the large. Beyond the firſt portion the rectum becomes cylindrical. The ſmall inteſtine is divided into many pouches by contractions which pretty nearly correſpond to its different turns.

In the ophidian order the inteſtinal canal purſues a ſerpentine direction as far as the rectum, and preſerves nearly the ſame diameter throughout, dilating but little in the large inteſtine. In the ſmall, the internal membrane forms broad longitudinal layers, folded in the manner of ruffles; it is rugous, and in the rectum forms thick, irregular folds, which are continued to the anus. In the coluber natrix, according to Blumenbach, the whole length of the inteſtinal canal does not equal that of the animal. The ſmall inteſtine forms a very conſiderable valve at its entrance into the large. Lib. cit. p. 174.

In the ſalamanders, the ſmall inteſtine is very narrow in compariſon with the rectum, where the internal membrane forms thick and fimbriated folds. In toads and frogs, we find a nearly analogous conformation and ſtructure, there being only a ſlight variation in the form of the rectum, which is more or leſs of a conical or pyriform ſhape, as in many frogs, or cylindrical, as in toads. But in the tadpoles of both, the inteſtinal canal is altogether very different from that of the ſame animal in the perfect ſtate. Long, narrow, and nearly of uniform diameter in the ſmall inteſtine, making irregular turns in its courſe, its volume augments at the rectum, which becomes of a ſacculated form, and makes two ſpiral turns upon itſelf, before it proceeds to the anus. There is no valve ſeparating the two portions of the inteſtine.

In the ſiren lacertina the inteſtinal canal proceeds almoſt in a ſtraight courſe from the pylorus to the anus, making but one ſmall turn near its middle, from which it proceeds ſtraight to its termination. Its coats are tranſparent, and its diameter nearly equal throughout, not admitting of any diviſion into ſmall and large inteſtines.

Phyſiology of the digeſtive Organs.—Blumenbach aſſerts that moſt reptiles are omnivorous, while ſome are confined to one ſpecies of food, as the bufo or rana calamita, which feeds on a few ſpecies only of inſects, and thoſe alive. (Specimen Phyſiol. Comp. p. 29.) We cannot help doubting the accuracy of the firſt part of this ſtatement: the food ſeems to us almoſt entirely animal. Serpents, frogs, and lizards, live on the ſmaller animals or inſects; and even the turtles, which eat particular kinds of marine plants, feed alſo on the molluſca. The ſimple ſtomachs, the ſimple and ſhort alimentary canals of the whole order, correſpond very clearly to what we underſtand concerning their carnivorous habits. Newts ſeem to care for living inſects and worms only, which they ſeize with their jaws, and ſwallow whole.

Two apparently contradictory circumſtances have been noticed in this order; great voracity in many inſtances, but in all a wonderful power of abſtinence. Salamanders ſometimes devour their own excrement, and earth. Serpents often take in a quantity of food, which diſtends their bodies inordinately, and leaves them inactive, and hardly capable of motion. The ſalamanders will ſometimes ſtuff themſelves to ſuch a degree with worms, that they crawl up again out of their ſtomachs. See Spallanzani's Diſſertations, vol. i. p. 110.

"A newt," ſays Bonnet, "having devoured a large earth-worm, I ſupplied it with another above four inches long, and thick in proportion. It immediately ſwallowed the whole, except a line or two that hung out of the mouth; but the worm was ſoon thrown up, and the ſame repeated twice, but the worm ſtill lived." Spallanzani's Tracts, vol. ii. p. 366.

The inſtances which are recorded of the abſtinence of reptiles ſeem at firſt almoſt incredible. Not to mention the toads,

toads which have been found incloſed in blocks of ſtone, and which probably have been in a torpid ſtate, nor the more common inſtances (ſee L. Th. Gronovius ad Plinium de Aquatilium Natura, p. 38.) we have the reſpectable authority of Caldeſi for the fact of tortoiſes having remained without food, and not in a torpid ſtate, for a year and a half. Blumenbach reports of a tortoiſe, which he kept for three quarters of a year, that the harmleſs creature never ate any thing the whole time, although every thing that the houſe and garden afforded was offered to him. For the laſt three months (from November to February) he exhibited the loweſt degree of vitality, manifeſted, in addition to extremely ſlow locomotion, with almoſt cloſed eye-lids, merely by the ſingle ſenſe of touch or feeling, particularly of warmth and drafts of air. When he died, the muſcles were as fleſhy and freſh-coloured as in the beſt nouriſhed tortoiſes. Abbildungen, &c. No. 66.

Redi had a land tortoiſe live eighteen months, a cameleon eight, and vipers ten, without food. (Spallanzani's Tracts, Introduction, p. 42.) Toads were quite lively at the end of fourteen and eighteen months, incloſed in pots. Ibid.

Blaſius mentions, in his "Anatomia Animalium," that a land tortoiſe which he kept ten months would take no food during the whole time.

Bonnet, ſpeaking of newts, ſays, "theſe animals can ſupport the want of food very long. Some of mine have lived two months without it. Sign. Spallanzani had remarked the ſame; and obſerved, that although long deprived of nutriment, they reproduced their members equally well as thoſe plentifully ſupplied with ſuſtenance." (Spallanzani's Tracts, v. 2. p. 364.) Blumenbach has kept ſalamanders eight months without taking food, or appearing to ſuffer from the want of it. (Handbuch der Natur geſchichte, p. 220.) Daudin aſſerts that ſnakes and vipers may be kept for ſix months without food, yet ſeem to loſe none of their activity: t. 1. Introd. p. 270.

Some protei, which Dr. Schreibers of Vienna had kept in his poſſeſſion for two years, had taken no food, and were quite well. (Cuvier, Rech. ſur quelques Rept. douteux; l'Anat. du Proté.) Bruce ſtated that he had kept the ceraſtes in a bottle for two years without food, and Lacépéde reports, on the authority of Shaw, that a Venetian apothecary kept two of theſe faſting for five years. (See Daudin, vol. vi. p. 186.) This power of faſting belongs, in a greater or leſs degree, to the whole order. For a compariſon between the power of abſtinence of warm-blooded animals and reptiles (the ſtate of torpidity being excepted), ſee Diſſ. Academ. Inſtit. Bonon. ap Benedictum 14. Pont. Max. de ſervor. Dei Beatificatione, lib. 4. p. 1. pag. 328.; alſo Beccarius in Comm. Inſtit. Bonon. t. 2. p. 1. pag. 223.

No reptiles maſticate: the herbivorous amphibia gnaw off the vegetable productions on which they feed, but they do not chew them. The ſtructure of their jaws, teeth, and tongue, gives them the power of ſwallowing entire animals: this proceſs of deglutition, being often exerciſed on animals as broad as themſelves, and broader, is very ſlow, and occupies even hours. The œſophagus muſt of courſe poſſeſs a great power of dilatation. In his account of the newt, Bonnet ſays, "that worms are ſeized with a ſudden motion of the animal's jaws, and ſwallowed alive, with gentle ſhocks of the whole body, and particularly of the anterior part. The prey is always ſwallowed without maſtication: the minute teeth, which are not employed in chewing, ſerve to prevent the eſcape of the animal, which twiſts itſelf about moſt actively. Long worms are devoured entire, notwithſtanding all their exertions to eſcape. They twine round the neck of the newt like a ſerpent: every moment they become ſhorter, and gradually diſappear. Thus have I ſeen a newt ſwallow a worm more than ſix inches long in leſs than five minutes. A large worm, ſeized by the middle, is ſeldom ſwallowed in the ſame poſition, becauſe it is too large, if doubled in the mouth, and the newt gradually ſhakes it out, until it can ſeize one of the extremities; which being accompliſhed, the worm is ſoon devoured. However, I have obſerved a large one ſwallow a worm taken by the middle, without ſeizing an extremity; but a quarter of an hour was occupied in the meal. The ſucceſſive motions of deglutition are very ſenſible; it is performed by repeated ſhocks. Though they have flexible jointed fingers, they make no uſe of the hand, either to ſeize their prey, convey it to the mouth, or retain it there." Spallanzani's Tracts, v. 2. p. 364.

The length and capacity of this tube, and its large communication with the ſtomach, are well ſuited to the nature of ſerpents. The prey, always ſwallowed without maſtication, is often too long to paſs entirely into the ſtomach: it remains in the œſophagus until room is made for it. Travellers have even aſſerted that one end of an animal ſometimes hangs out of a ſerpent's mouth, while the other is in the ſtomach.

As there is no maſtication in this claſs, nor any proviſion like the gizzard of birds, for comminuting the food when ſwallowed, the proceſs of digeſtion muſt be effected by the action of the ſtomach alone on the prey ſwallowed entire. The juices of the organ are fully adequate to this effect; and the proceſs has been demonſtrated by experiment in ſeveral genera by Spallanzani. He incloſed food in tubes, and conveyed them into the ſtomach of the frog, the newt, and different ſerpents; and always found that it was diſſolved in a longer or ſhorter time: it thus appears that the eſſential nature of digeſtion is the ſame as in the warm-blooded animals: but the proceſs exhibits ſome modifications, as the different nature and habits of the animals would naturally lead us to expect. The chief difference is that the ſolution requires a conſiderably longer time than in warm-blooded animals. The fleſh in the tubes, conveyed into the ſtomachs of frogs, was not completely diſſolved until the third and even the fifth day. (Diſſertations, v. 1. p. 102.) Yet although the gaſtric liquor of frogs acts ſo ſlowly, it is capable in time of diſſolving even bone: Spallanzani met with a mouſe in the ſtomach of a frog; all the ſoft parts of the limbs were gone, ſo as to have only the naked bones, which were conſiderably waſted, and converted into a ſemi-gelatinous ſubſtance. (Ibid. p. 102.) Earth-worms encloſed in tubes were converted into a whitiſh pulp in thirty hours, in the ſtomach of the water newt; p. 104. He found numerous ſmall white worms in the ſtomachs of three-fourths of all the newts he examined, from five or ſix in number to a hundred and more. Theſe were ſo delicate that they would not bear even ſlight preſſure; and thus afford a proof that nothing like trituration can go on in the ſtomach, but that digeſtion is ſimply ſolution by the gaſtric liquor; p. 104—111. In ſerpents the proceſs occupied from two to five days. The tibiæ of frogs were almoſt completely diſſolved in five days; § 118—122. As the animals ſwallowed by ſerpents often lie in part in the œſophagus, a queſtion ariſes, whether they undergo any digeſtion in that tube, or whether this function be the excluſive attribute of the ſtomach. A viper, ſays Charas (Deſcrip. Anat. de la Vipère,) vomited a lizard, which had been ſwallowed twelve days before. All the front of the body, which had been in the ſtomach, had merely

merely the bones remaining, while the other parts were nearly as perfect as if they had been ſwallowed the ſame day. Spallanzani confirmed this want of digeſtive power in the œſophagus, by direct experiment; § 125. Naturaliſts, ſays this indefatigable inquirer, were already apprized of the tardineſs of digeſtion in ſerpents. Bomare, in his Dict. d'Hiſt. Naturelle, gives an account of a ſerpent at Martinique, which retained a chicken in its ſtomach for three months, and did not completely digeſt it. "It is remarkable that fleſh does not become fœtid from remaining long in the ſtomachs of theſe cold animals, which I had occaſion to obſerve particularly in a viper. A lizard was retained in its ſtomach for ſixteen days, at the end of which time it had no odour but that of the gaſtric juice. Yet ſuch was the heat of the ſeaſon, that another lizard, which I had placed in a cloſe veſſel, containing a little water, emitted an inſupportable ſtench before the expiration of the third day; § 127. The gaſtric liquor of a ſnake approaches in colour to that of ſoot; it had the fluidity of water, and evaporated very ſlowly; it had both a ſalt and bitter taſte, and was not inflammable. It ſtrongly reſembled the gaſtric fluid of other animals, and this reſemblance extended to the odour, which was exactly like that of the correſponding juices of birds of prey; § 123.

The idea of Blumenbach, that the venom of the poiſonous ſerpents ſupplies the place of maſtication, and promotes digeſtion by ſome ſeptic power, ſeems completely unfounded. It is a proviſion calculated merely for purpoſes of offence. Where is this ſeptic power, or what ſupplies its place in the harmleſs ſerpents, and in all other amphibia?

The whole alimentary canal of the amphibia abounds with a viſcid tenacious mucus, the abode of ſeveral genera of worms.

Blumenbach failed completely in very numerous and diverſified attempts to cram frogs and lizards with madder root, and thus to produce in their bones that beautiful roſe colour, which is ſo quickly produced in the mammalia of birds, when thus fed. Specimen Phyſiol. p. 31.

Abſorbing Veſſels. – This ſyſtem has been very little examined by anatomiſts, probably on account of the minuteneſs of the tubes, and the conſequent difficulty of injecting them. We have nothing to add to the account given by Hewſon, who firſt deſcribed them in the Philoſophical Tranſactions, 1769.

No lymphatic gland has been yet ſeen in a reptile: birds have none in their meſentery, but they are ſeen connected to the large lymphatics of the neck.

It has been aſſerted that the chyle is colourleſs, and hence anatomiſts have explained why the veſſels were ſo long undiſcovered. In animals which have white chyle, the appearance of this fluid through the tranſparent coats of the lacteals ſupplies the place of injection, and affords an eaſy method of demonſtrating them. Mr. Hewſon ſtates that he ſaw white chyle in a crocodile.

The diſtribution of the lacteals (if that term may be employed where the chyle, inſtead of being like milk, is tranſparent) on the inteſtine of the turtle, forms one of the moſt elegant preparations in comparative anatomy. By fixing the injecting tube in a veſſel near the inteſtine, and waiting with a little patience, the quickſilver will gradually find its way into the minute ramifications of the lacteals. The large trunks on the meſentery contain valves, ſo that we cannot ſucceed in filling the abſorbents of the inteſtine from them; but the ramifications on the inteſtine itſelf are deſtitute of theſe folds, ſo that when once the quickſilver has reached the ſurface of the gut, it will run forward without any obſtacle. The peritoneal ſurface of the gut is completely covered with ſtraight parallel branches, running according to the length of the inteſtine. Its inner ſurface is no leſs thickly covered with lacteals of a different appearance. When dried it ſeems as if the quickſilver were contained in ſmall cells, covering the whole internal ſurface of the inteſtine ſo completely, that the point of a pin could ſcarcely be placed between them. Mr. Hewſon has particularly deſcribed this appearance, and was doubtful whether it ought to be referred to extravaſation or not. But we are convinced, from frequent examinations of this cellular ſtructure, that it is a part of the natural organization; becauſe the cells are regular and uniform in their ſize and arrangement; no force is uſed in the experiment; and a real extravaſation preſents an appearance altogether different. The extent of the abſorbing ſyſtem, as demonſtrated in this way, is beyond any thing we could form an idea of from injections in man or warm-blooded animals.

After leaving the inteſtine, the lacteals accompany the blood-veſſels on the meſentery, running at their ſides, and communicating acroſs them. Each artery has two veins, and there is a lacteal or more at each ſide of each of the three veſſels; ſo that their number conſiderably exceeds that of the blood-veſſels. A coarſe repreſentation of them, on the meſentery, is exhibited in Monro's Phyſiology of Fiſhes, tab. 30.

Near the root of the meſentery the large lacteals anaſtomoſe, ſo as to form a net-work, from which ſeveral large branches go into ſome conſiderable lymphatics on the left ſide of the ſpine. Theſe laſt can be traced downwards almoſt to the anus, and belong to the parts ſituated below the meſentery, and particularly to the kidnies. At the root of the meſentery, on the left ſide of the ſpine, the lymphatics of the ſpleen join the lacteals, and immediately above this union a ſort of plexus or net-work is formed, which lies upon the right aorta. From this plexus a large branch ariſes, which paſſes behind the right aorta to the left ſide, and gets before the left aorta, where it aſſiſts in forming a large receptaculum, lying in front of that artery. The thoracic ducts ariſe from this receptaculum. From its right ſide goes one trunk, which is joined by that large branch which came from the plexus to the left ſide of the right aorta, and then paſſes over the ſpine. This trunk is the thoracic duct of the right ſide; for having got to the right ſide of the ſpine, it runs upwards on the inſide of the right aorta, towards the right ſubclavian vein. And when it has advanced a little above the lungs, or within three or four inches of the ſubclavian vein, it divides into branches, which, near the ſame place, are joined by a large branch that comes up on the outſide of the aorta. From this part upwards, thoſe veſſels divide and ſubdivide, and are afterwards joined by the lymphatics of the neck, which likewiſe divide into branches before they join thoſe from below; ſo that between the thoracic duct and the lymphatics of the ſame ſide of the neck a very intricate net-work is formed. From this net-work a branch goes into the angle made by the jugular vein, and the lower part, or trunk, of the ſubclavian: this branch, therefore, lies on the inſide of the jugular, whilſt another gets to the outſide of that vein, and ſeems to open into it a little above the angle between that vein and the ſubclavian. Into the above-mentioned receptaculum the lymphatics of the ſtomach and duodenum enter: they have numerous anaſtomoſes, forming a beautiful net-work round the artery which they accompany. From this receptaculum likewiſe, beſides the trunk already mentioned, which goes to the right ſide, ariſe two other trunks, nearly equal in ſize; one of which runs upon the left ſide, and the other upon the right ſide of the left aorta, till they come within two or three inches of the

left ſubclavian vein; where they join behind the aorta, and form a number of branches, which are afterwards joined by the lymphatics of the left ſide of the neck: ſo that here a net-work or plexus is formed, as upon the right ſide. From this plexus a branch iſſues, which opens into the angle between the jugular and the lower part or trunk of the ſubclavian vein. In theſe net-works, formed by the lymphatics near their termination in the veins, this ſyſtem in the turtle differs remarkably from that in birds. Hewſon's Account of the Lymphatic Syſtem in Amphibious Animals, Philoſ. Tranſ. vol. 69. p. 198.

The Liver, which is divided in the mammalia into ſeveral lobes diſtinct from each other, and is more uniform in birds, is ſtill leſs divided in reptiles. Often it has no diviſion of lobes, but is merely irregularly fiſſured on its looſe and thin edge. Its proportionate ſize, however, is more conſiderable than in the two claſſes juſt mentioned. Occupying uſually the two hypochondria, it extends far backwards under the inteſtines, and is ſupported in its poſition by folds of the peritoneum, analogous to thoſe which exiſt in the mammalia. Its colour is no longer that reddiſh-brown which is ſeen in the mammalia and birds; but it partakes more of yellow.

In the chelonians the liver exhibits a peculiar arrangement, being divided into two rounded irregular maſſes, of which the right occupies the ſame hypochondrium, and the other is connected to the ſmall curvature of the ſtomach. They are united by two narrow productions of the ſame ſubſtance, in which the principal veſſels paſs. In the green lizard, the geckos, the dragons, the iguanas, it forms a ſingle maſs of various figure, flat or convex below, concave above. Its looſe edge has two fiſſures in the dragon, dividing it into three lobes, of which the right is prolonged into a ſort of tail. There is only one fiſſure in the geckos, and the right part is equally more extenſive than the left. In the common iguana it is lengthened into a long appendix. In the crocodile and cameleon the liver has two very diſtinct lobes; and moreover, in the latter, a long appendix. It has only one lobe in the ſerpents, in whom it is long and cylindrical. Like other organs, it aſſumes in this order a figure correſponding to the elongated form of their bodies. There is one lobe only in the ſalamanders, but two in the other batracians.

Hepatic Canals.—The common trunk of theſe canals is uſually ſeparate from the cyſtic duct, and not inſerted with the latter in the inteſtinal canal, in reptiles, as well as in birds. This has been obſerved in the chelonian and ſaurian orders, in ſeveral ophidians, and ſome batracians. Yet this arrangement is not conſtant. For, in the crocodile, where the hepatic is ſometimes ſeparate from the cyſtic duct, it ſends at other times a branch to the gall-bladder, which is inſerted a little above its neck, and is itſelf united to the cyſtic canal, not far from the inteſtine. The mouth of the common canal was diſtant from the pylorus, ſays Cuvier, 0.26 in a crocodile, whoſe whole inteſtinal canal was rather more than a metre (about 39⅓ inches) in length.

In the teſtudo græca the hepatic canal ſends a branch of communication to the cyſtic canal, not far from the gall-bladder; but theſe two canals open ſeparately into the inteſtine, though near each other; the former before the latter.

The Gall-Bladder has its fundus uſually directed backwards. Its proportional volume is leſs conſiderable than in mammalia and birds; and it is more intimately connected with the liver than in theſe claſſes. In the teſtudines it is almoſt entirely concealed in the right lobe of the viſcus; and is placed under the ſame lobe in the crocodile. Where the liver is not divided into lobes, the ſituation of this reſervoir is marked out by a fiſſure. In the ophidians the gall-bladder is abſolutely ſeparated from the liver, and ſituated at the ſide of the ſtomach, near the pylorus, a ſhort diſtance beyond the poſterior extremity of that viſcus. Its form is generally oval, but it approaches to the cylindrical figure in the iguana.

The connections of the cyſtic and hepatic canals have been already mentioned. The former remains generally diſtinct from the latter, by the ſide of which it is inſerted into the inteſtine. Sometimes it receives the branches of the latter in ſucceſſion.

The Pancreas is a conglomerate gland, as in mammalia and birds, and poſſeſſes the ſame ſtructure (with ſome unimportant modifications of colour, conſiſtence, lobular diviſions, &c.) as in man. Its poſition and figure vary in reptiles. In ſeveral chelonians it is triangular. That of the Nilotic crocodile is divided into lobes: it is irregular in the ophidians, and ſituated on the right of the origin of the inteſtinal canal. In the frog its figure is equally irregular, and it is ſituated in the arc formed by the ſtomach towards the front. It is placed in the firſt curve of the inteſtine in the ſalamander.

There is either a ſingle or double pancreatic canal. In the Nilotic crocodile, for example, there are two, inſerted in the inteſtine after the biliary canals, while there is only one in the land ſalamander, the inſertion of which precedes that of the biliary tubes.

The Spleen.—This is a viſcus, of which the uſe is not hitherto underſtood. It exiſts in all the vertebral animals; but its importance ſeems to diminiſh as we paſs from mammalia to birds, from the latter to reptiles, and from theſe again to fiſhes; at leaſt, if we may judge from the ſucceſſive diminution of its volume in theſe four claſſes.

Its figure varies conſiderably in this claſs. It is ſhaped like the kidney in the teſtudines; ſmall and ſpherical in the frogs and toads; elongated in the ſalamanders, as well as in the ſaurian and ophidian orders.

The abdominal Cavity, Peritoneum, and its Proceſſes.—The offices of this membrane, in covering and inſulating the various viſcera, confining them, by its continuations and folds, more or leſs cloſely to the ſides of the cavity, and facilitating, by its ſmooth ſurface, their motions with reſpect to each other, and to the containing cavity, will convince us of the importance of the membrane, and lead us to expect that it ſhould exiſt very generally. We, conſequently, find it in all the vertebral animals. Generally white, delicate, and tranſparent, it is ſometimes black in reptiles.

In this claſs, as in birds, there is no diaphragm, and conſequently no diſtinction of abdominal and thoracic cavities. All the viſcera are contained in one large cavity, and ſurrounded by one membrane. Geoffroy, however, deſcribes ſome muſcular fibres coming from the ſternum, and fixed to a membrane covering the convexity of the liver, which ſeem like the rudiment of a diaphragm. Annales du Muſeum, v. ii. p. 50.

In the chelonians, the membrane produces certain ſubdiviſions of the common cavity of the thorax and abdomen. We remark, 1ſt, the cavity of the lungs, which are continued far backwards, above the heart, liver, and inteſtines; 2dly, that of the heart, or pericardium, which touches the following behind; 3dly, that of the abdominal viſcera, containing the ſtomach, liver, inteſtines, ovaries, teſticles, and urinary bladder. In front it covers the liver, forming a ſort of membranous diaphragm, ſeparating it from the heart; and it cloſes the cavity of the pelvis behind. It alſo furniſhes the meſenteric folds. The texture of this membrane appears ſtronger in the teſtudines than in other reptiles.

The meſentery exhibits, in the different orders of reptiles, ſome varieties, which we ſhall ſhortly notice. The firſt fold, which is attached to the ſmall inteſtine in the teſtudines, does not come immediately from the vertebral column, and does not form the meſentery properly ſo called, until after it has fixed the arch of the colon by means of a meſocolon. The duodenum is confined in the right hypochondrium, and loins, by laminæ of the common membrane, which cover it, and are then continued to the abdominal parietes. The meſentery of ſerpents is a narrow fold, not coming immediately from the vertebral column: the blood-veſſels form numerous anaſtomoſes between its laminæ, as in warm-blooded animals.

The ſaurians have a meſentery tolerably developed. The production, which goes to the large inteſtine, like that which belongs to the ſmall, comes from the vertebral column. There is no tranſverſe meſocolon.

Reptiles have no *omenta;* but ſtructures apparently analogous to theſe fatty membranes occur in ſome of them. The ſerpents have membranous proceſſes, containing much fat, and extending, like the great omentum of the mammalia, under the inteſtinal canal. Many ſaurians have alſo two productions of peritoneum, loaded with fat, advancing from the front edge of the pelvis under the abdominal viſcera; there are fatty lobes attached to the teſticles and ovaries of frogs. The latter are not regarded by Blumenbach in the light of omenta. "The yellow appendices," ſays he, (ductus adipoſi, appendices luteæ,) "which are found in the frog, on either ſide of the ſpine, and ſometimes form one maſs, ſometimes are divided into ſeveral ſmaller portions, were conſidered by Malpighi as a kind of omentum. (De omento et adipoſis ductibus, oper. t. 2. p. 35, &c.) That this reſemblance is very remote, appears from ſeveral circumſtances; and particularly from the conſtant and remarkable variations of ſize which occur in theſe parts at the pairing ſeaſon." Comparative Anatomy, tranſlated by Lawrence, p. 193.

Theſe bodies, being apparently connected to the teſticles and ovaries, are deſcribed with the generative organs by Swammerdam and Roeſel. They conſiſt of a pedicle, attached more particularly to the emulgent vein on each ſide, and of two, three, to ſeven or more pieces joined to it, varying in ſize according to the age and ſeaſon. They are proportionally large in the tadpole. They may be ſeen ſmall in female frogs, which have not yet laid their ova, although Roeſel aſſerts that they increaſe in ſize with the generative organs. In this ſmall ſtate, Cuvier obſerves, that a veſſel, filled with venous blood, and producing no branches, may be ſeen in the axis of each fringed portion. Theſe veſſels all join to form a common trunk in the pedicle; and this trunk terminates in the emulgent vein.

The abſence of omentum in this claſs does not accord with its ſuppoſed uſe to keep the inteſtines warm. Is there any proof that the inteſtines are warmer with it, than they would be without it? And is there not as great a neceſſity for preventing the eſcape of heat in reptiles, or in birds, (which alſo have no omentum,) as in the mammalia? Cuvier obſerves, that many of the hybernating mammalia have two lateral omental appendices, which, with the principal omentum, are abundantly furniſhed with fat in the winter, ſo as to form "an adipous covering for the inteſtines, which no doubt contributes powerfully to retain their natural heat, to prevent the acceſs of cold, and to ſupply the place of food." All reptiles are torpid in the winter, yet they have no omenta.

Urinary Organs.

The Kidnies.—Theſe are diſtinguiſhed from the ſame glands in mammalia, and reſemble thoſe of birds and fiſhes, in the impoſſibility of diſtinguiſhing in them the two ſubſtances (ſee KIDNEY), and in the abſence of infundibula and pelvis. Their ſituation, form, and relative ſize, vary in the different orders.

In the chelonians and ſaurians, they lie far back in the abdominal cavity. They adhere cloſely to the pelvis in the lizards properly ſo called, under the ſacrum, and penetrate even under the tail; they go as far back, but they advance farther in front, in the ſalamanders. They lie altogether farther forwards, and very near each other, in the other batracians. In theſe three orders both kidnies are ſituated at the ſame height, and covered by the peritoneum on their inferior ſurface only. In the ophidians, the right is placed further forwards than the left; and they are connected, on each ſide of the vertebral column, merely by a prolongation of peritoneum, which ſurrounds and ſuſpends them, without fixing them to the ſpine. There is a manifeſt relation between the peculiar arrangement, and the great mobility of the column in theſe animals.

Their form is ſhort and thick in the chelonians, more or leſs elongated and flattened oval in the ſaurians and batracians, and extremely elongated in the ophidians. They conſiſt, in the latter, of numerous ſeparate lobes, placed in a chain one before the other. They are alſo minutely divided in the chelonians, at leaſt on their two ſurfaces; for all the lobes are united in the centre. They form, on their ſurface, a kind of convolutions reſembling thoſe of the brain, and giving the glands a peculiar aſpect.

Among the ſaurians, the crocodiles have them much divided, at leaſt at a certain age. In a ſmall crocodile, about a foot in length, Cuvier ſaw no diviſion, while there were many in a larger individual of the ſame ſpecies. It would be ſingular if this ſhould turn out to be a conſtant difference, as it is exactly the converſe of that which exiſts in man. They are without lobes, or only ſlightly divided in other genera of the ſame order. They have no diviſions in the batracians.

The origin of the ureters is analogous to that of birds; and their length varies according to the ſituation of the kidnies.

They end in the urethra in the chelonians, and the urine paſſes from that canal into the bladder.

They are ſhort, large, and thick-ſided in the crocodile, and pierce the ſuperior ſurface of the cloaca, at a conſiderable diſtance from each other.

The principal ramifications of the urinary canals are eaſily ſeen in the ophidians, ending ſucceſſively, as they come out of each lobe, in a common trunk, which follows the internal edge of the kidney, and forms the ureter. Arriving near the cloaca, each is dilated into a ſmall oval bag, and then terminates ſeparately.

In general they terminate in the cloaca or bladder, according as the latter reſervoir exiſts or not.

Urinary Bladder.—Reptiles vary much in reſpect to the exiſtence of this part. The chelonian and batracian orders have it: and it is found in the following genera of ſaurians; *viz.* the iguana, tupinambis, cameleon, dragon, ſtellio: while it is wanting in the crocodile, lizard, agame, gecko, other genera of the ſame order; and in the ophidians.

The bladder is very large, with thin ſides and weak muſcular fibres in the chelonians; and it has a more or leſs marked diviſion at its fundus into two portions. A very ſhort urethra opens on the inferior ſurface of the cloaca: its cavity preſents two prominences on each ſide, of which the anterior is pierced by the orifice of the vas deferens, the poſterior by that of the ureter.

The

The bladder always receives the urine by its neck, or by a beginning of an urethra, which opens immediately into the cloaca.

There are two large membranous bags in the frog and toad, occupying the ſituation of the urinary bladder, generally conſidered as ſuch, and ſo deſcribed by Blumenbach and Cuvier. Townſon doubts whether they ought to be conſidered as part of the urinary apparatus. (See his Tracts and Obſervations, p. 66. tab. 3.) They have no connection with the ureters. Indeed it is very clear, that the latter tubes open on the ſuperior ſurface; while theſe two receptacles terminate on the inferior ſurface of that inteſtine. They contain a pure water. Their ſize, which exceeds all ordinary proportion to the bulk of the kidney, renders it likewiſe probable that they are not receptacles of urine.

Renal Capſules.—The parts to which this name has been given, and which are found in the three firſt orders of reptiles, are ſtill ſmaller in proportion, than in mammalia and birds, and are completely ſeparate from the kidnies. In the chelonians they are connected to the emulgent veins. In the ſaurians and ophidians they lie in the fold of the peritoneum, which unites the ovaries and oviducts.

For a deſcription of the fringed fatty appendices, which are found in the batracian order near the teſticles and ovaries, and the veſſels of which join the emulgent veins, ſee the account of the omenta.

Organs of Circulation.—The whole of nutrition is effected at one operation in zoophytes: chyle paſſes into the parts in proportion as it is made; in inſects alſo it bathes them as ſoon as it is formed, and they appropriate it. In the ſuperior animals, there is an intermediate operation: a particular fluid only, always moving in a certain ſyſtem of veſſels, immediately nouriſhes the parts; and this fluid is renewed by the chyle. The motion of this peculiar fluid, of this blood, is called circulation;—a proceſs confined to the ſuperior claſſes, that is, to the vertebral animals, the molluſca, the worms, and the cruſtacea.

There are two principal points for our conſideration in the circulation; its agents, and the routes of the blood.

That part of the latter is particularly intereſting, which conducts the blood to the reſpiratory organ. One of the chief purpoſes of the circulation is to conduct the blood conſtantly, in greater or ſmaller quantity, into an organ, where it may undergo the mediate or immediate action of oxygen; and, as the qualities of the blood depend much on the degree of force of this action, and in the modification which the blood receives from it, while all parts of the body, being nouriſhed by this blood, partake of its qualities, it follows that the whole nature of an animal will be in ſome ſort determined by the diſtribution of its circulating organs, and by the route which this diſtribution marks out for the blood.

Hence ariſes the importance of the ſtructure of the heart, in reference to natural hiſtory, and the correctneſs of the characters drawn from it for the formation of claſſes. Men of genius had foreſeen, rather than demonſtrated this importance; but it has been eſtabliſhed on rational principles only in modern times.

The circulations through the body and the lung are called, reſpectively, the great and the minor. In the former, all the blood returning from the body by the *veins*, which joining together from all parts, ultimately end in one trunk, goes again to theſe parts by the *arteries*, of which a common trunk is gradually divided and ſub-divided, until the laſt diviſions, as well as their union with the roots of the veins, eſcape the eye.

If the common trunk of the veins communicated directly with the common arterial trunk, there would be a ſingle circulation; the blood brought back to the centre, would be ſent again immediately to the parts, to return again directly, and ſo on; but this never takes place entirely.

Before the blood, brought back to the common trunk of the veins, can again enter that of the arteries, it muſt be ſent in part, or altogether, to the pulmonary organ, in order to undergo the action of the atmoſphere.

If the circulating organs be ſo arranged that every drop of the blood goes through the lung, by the minor circulation, before it can enter the arterial trunk, the common trunk of the veins of the body ſending all its blood into the pulmonary arterial trunk, whoſe ultimate ramifications communicate with veins united into a common trunk, ſending all its blood into that of the arteries of the body, there is a *double circulation.*

If, on the contrary, the common trunk of the general veins, inſtead of being diſtributed entirely to the lung, ſhould only ſend to it a branch, while the reſt of its blood ſhould go directly into the common trunk of the general arteries, the minor circulation would be only a fraction of the great, more or leſs conſiderable, according to the ſize of the branch devoted to it. In each circuit of the blood, reſpiration would be exerciſed on a part only of this fluid, and the reſt would go again into the body by the arteries, without having paſſed through the lung. This blood, and the parts nouriſhed by it, would participate leſs, ceteris paribus, in the qualities which reſpiration could impart to it. This is what takes place in reptiles; their pulmonary circulation is only a fraction of the great, more or leſs conſiderable in the different genera. The other claſſes, *viz.* the mammalia, birds, fiſhes, molluſca, and worms, have a double circulation, and no part of their blood can return into the great, until it has gone through the minor circulation.

Yet we are not to conclude that the ultimate effect of reſpiration is the ſame, becauſe circulation is the ſame. The mode of reſpiration may be different, and, as this is one of the factors, the product will be affected by its alteration. All the animals laſt enumerated have an entire pulmonary circulation, while, in reptiles, it is only a fraction: let them be, for example, as 1 to $\frac{1}{2}$. Now fiſhes, molluſca, and worms, breathing in water, and that oxygen only, which is mixed and contained in this water, may be conſidered as having a half-reſpiration, while reptiles, breathing air itſelf, have an entire one. An entire reſpiration, multiplied by a half-circulation, and a half-circulation by an entire reſpiration, give the ſame product; which is, in both caſes, a half-oxygenation of the blood, uſing this term merely to expreſs the changes taking place from breathing.

Mammalia have an entire circulation and reſpiration; and conſequently an entire oxygenation. The quantity of the latter is even greater in birds in conſequence of the peculiar manner in which air is introduced into all parts of their body.

The fraction of $\frac{1}{2}$ is only adopted for the purpoſe of illuſtration; the quantity probably varies in the different genera of each claſs, and cannot be rigorouſly appreciated.

By theſe conſiderations we may eſtimate, and in a manner calculate, the nature of each animal. As reſpiration gives to the blood its heat and energy, and through its medium imparts excitability to the organs, its quantity will determine the degree of vigour in the animal functions. Hence we deduce the great force of the moving powers, the acuteneſs of the ſenſes, the rapidity of digeſtion, and the heat of the paſſions in birds. Hence the more moderate degree of all theſe in the mammalia; hence the inertneſs, the inactivity, and apparent ſtupidity, of the other claſſes. Hence, too, the various modifications of vital temperature natural to

each of theſe claſſes, which are in an exact ratio to the degree of their other qualities.

The circulation is effected by means of muſcular powers, which are applied particularly to the arterial ſyſtem; the venous ſeeming to be merely paſſive. A hollow muſcle, called a *ventricle*, poſſeſſing great and continued irritability, and contracting forcibly on the blood whenever it arrives, is placed at the union of the venous and the correſponding arterial trunk. Valves are placed at its two openings; one valve allows the blood to enter, and prevents it from going back again, while the other permits its exit, and cuts off the return. The ventricle then cannot contract without diſtending the arteries, puſhing forwards the blood, which they contain already, and thus producing the *pulſe*. The ventricle, having expelled the blood which irritated it, is relaxed and dilated, and then immediately filled with a freſh quantity of blood from the veins. Before entering the ventricle, the vein is dilated into a muſcular ſac, called the *auricle*, with much leſs conſiderable muſcular fides. This is irritated by the blood received from the vein, contracts on it, and ſends it into the ventricle. It is hardly neceſſary to add, that the auricle and ventricle contract alternately.

Animals with a ſimple circulation have a ſingle ventricle; but they poſſeſs ſometimes two auricles. When the circulation is double, there may be a ventricle at the origin of each artery, or at that of one only. Mammalia and birds have two, and the ſepiæ among the molluſca.

All other animals have a ventricle at the origin of one only of the two arteries, but not of the ſame in all. It is placed, in fiſhes, at the origin of the pulmonary artery; in the molluſca at the origin of the artery of the body, or the *aorta*, which is the name of that artery.

The union of the auricle and ventricle conſtitutes the *heart*. We find, therefore, in fiſhes and molluſca, a ſimple heart, *pulmonary* in the former, *aortic* in the latter. Reptiles, alſo, have a ſimple heart, at once pulmonary and aortic. Mammalia, birds, and ſepiæ, have a double heart, or rather two, a pulmonary and an aortic, hearts.

In mammalia and birds the two hearts are united, and form one maſs, which commonly bears the name of heart, as if it were a ſingle organ. This is not the caſe in the ſepiæ. See VERMES, in *Comparative Anatomy*.

We may now underſtand what naturaliſts mean, when they ſay that mammalia and birds have a heart with two auricles and two ventricles; reptiles and fiſhes a heart with a ſingle auricle and ventricle. The latter phraſe, beſides compriſing, in a common expreſſion, two things really very different, contains alſo an error of fact; for many reptiles have two auricles.

Reſpecting the hearts of mammalia, birds, fiſhes, and molluſca, ſee the articles MAMMALIA, BIRDS, FISHES, and VERMES, in *Comparative Anatomy*. For the phyſiology of the circulation, the powers and actions of the heart, and the other organs concerned in it, ſee CIRCULATION and HEART.

The eſſential ſtructure of the heart is the ſame in all animals; there are only modifications of greater or leſs importance. It is covered externally by a ſmooth membrane, the reflected portion of the pericardium; its cavities are lined by another ſmooth membrane, continuous with the linings of the blood-veſſels; and there is more or leſs muſcular ſubſtance interpoſed between them. The exiſtence of the pericardium is as general as that of the heart; its nature and diſpoſition are ſo nearly alike in all animals, that it is not worth while to notice the modifications.

Of the Heart.—In the different orders of reptiles, the heart is found to vary in ſome parts of its ſtructure; there is, however, no eſſential difference, when viewed in relation to its functions. The three firſt orders have a heart conſiſting of two auricles and a ſingle ventricle, which is ſometimes divided into many cavities, communicating with each other. On the other hand, in the batracians there is but a ſingle auricle and ventricle, with its cavity of a ſimple form. We ſhall enumerate ſucceſſively the differences of ſtructure in the four orders of this claſs of animals.

Firſt in the chelonians. In the animals compoſing this order, the heart has a form altogether peculiar. The length of the organ is much exceeded by its breadth; in ſome inſtances, it reſembles the ſegment of a ſphere; in others, it is of a ſquare but elongated form, and curved in its longitudinal direction. In its natural ſituation, it is found beneath the lungs, in front of the liver, and partly between the two lobes of the latter. The pericardium, which is capacious and ſtrong, is in contact with the membrane inveſting thoſe organs, and is as firmly adherent to it as the pericardium is to the diaphragm in man.

The magnitude of the two auricles is much greater in proportion, than in any animals of the claſſes of mammalia or birds; the capacity of each is at leaſt equal to that of the ventricle; they are ſituated in part above the latter, projecting upon its lateral and anterior parts. They poſſeſs ſomewhat of a rounded form, are without any appendix, and have their parietes thin, with ſome fleſhy faſciculi in their ſtructure. The right auricle, which exceeds in a trifling degree the ſize of the left, receives, by a ſingle opening at its upper part, the blood returning from the body. Two valves are placed around the borders of the opening, giving it the appearance of a ſimple fiſſure. The pulmonary veins alone terminate in the oppoſite auricle; their termination is provided in the ſame manner with two valves. A ſimple membranous partition ſeparates the cavities of the two auricles and their openings into the ventricle. It is on the ventricle that depends the form which we have deſcribed as belonging to the heart. Its cavity is very ſmall in compariſon to its ſize, which is owing to the great thickneſs of the parietes. Theſe are found to be compoſed exteriorly of a moderately thick layer of fibres, which have a direction parallel to the external ſurface of the ventricle. Beneath theſe, there are other numerous muſcular faſciculi, varying in their direction, but proceeding principally from the ſuperior to the inferior ſurface; the greater number of them are only contiguous, or ſeparated from each other, allowing the blood to paſs through the intervals formed between them as through a ſponge. It reſults from this ſtructure, that the cavity of the ventricle is diminiſhed to one-third of its volume; it occupies the middle and right ſide of its baſe. In its greater part, it is lined by a continuation of the membranous fold which covers the auricular orifices, performing to them the office of a valve; it is of a ſquare form, attached at the middle of its external ſurface to the partition between the auricles, and by its ſuperior and inferior ſides to the correſponding parietes of the ventricle; it is only looſe and unconnected in its right and left borders. The firſt is extended over the opening of the auricle on the ſame ſide, and the latter over that of the oppoſite auricle; ſo that theſe openings appear in the ventricle ſeparated by the breadth of the fold, while in the auricles there is but the thin ſeptum intervening between them. The blood returning from the lungs into the left auricle is directed into the ventricle by means of the valve belonging to the former, in a courſe directly contrary to that leading to the opening belonging to the arteries of the body. It muſt, therefore, neceſſarily paſs through the whole cavity of the ventricle, from the left to the right,

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and into the intervals of the muſcular faſciculi compoſing the parietes. From this ſtructure it reſults, that there muſt be an admixture in the ventricle between the blood returning from the lungs, and that portion which has not been ſubmitted to the influence of the ſurrounding element in its paſſage through thoſe organs. The opening between the right auricle and the cavity of the ventricle is in a ſituation immediately directed towards the two cavities leading to the pulmonary arteries and arteries of the body; they are both ſituated completely to the right, in the cavity of the ventricle. The firſt, which is not always of the ſame magnitude, is placed inferiorly to the other, having a wide communication with it. In ſome inſtances the opening is extended very far towards the poſterior part of the heart; in others it is ſo ſmall, as in the land tortoiſes, that it does not exceed the diameter of the cavity leading to it. It is only in the firſt conformation, of which we find examples in many of the ſea tortoiſes, that the appellation of pulmonary cavity can be applied to it. The blood arriving from the right auricle purſues a direction more particularly towards that part, by a channel leading from the one to the other. There is but one opening leading from the pulmonary cavity, which is that of the pulmonary artery; it is provided with two valves, and penetrates the baſe of the heart more inwardly than the openings to be next mentioned. Theſe are the terminations of the two aortæ, which are found near to each other on the right ſide of the ſuperior cavity, the ſame which receives the blood of the two auricles. The termination of the left aorta is ſituated a little more inwardly than that of the right, and inferiorly to it. They are each provided with two ſemicircular valves. This is the ſtructure found in the ſea tortoiſe; but in the land ſpecies the arteries of the body ariſe by a ſingle opening from the ventricle. The heart of the turtle is beſt delineated by Mery, in the Acad. des Sciences, 1703.

In the ſecond order of reptiles, the ſaurians, we ſhall commence with a deſcription of the heart of the crocodile, which preſents an example of the moſt complicated ſtructure that we have found in the animals of this order, or even in the whole claſs of reptiles. The pericardium is found, as in the chelonians, adhering to the peritoneum inveſting the convex ſurface of the liver. The apex of the heart is connected by a very ſtrong tendinous chord to the looſe part of that bag, which is extremely thick, and has a fibrous ſtructure externally. In its natural ſituation the organ is found occupying the ſpace between the two lobes of the liver and the lungs on each ſide. The ſize of the auricles is ſomewhat leſs than in the chelonians; in other reſpects they are ſimilar. The parietes are ſtrengthened by fleſhy faſciculi proceeding in different directions. The ventricle preſents an oval form, and has its parietes of great thickneſs. Its cavity is divided into three compartments, communicating by numerous openings. One of theſe diviſions is ſituated inferiorly and to the right. The auricle of the ſame ſide projects into its anterior part the blood received from the veins of the body by a wide opening, which is provided with two valves. The termination of the left deſcending aorta is found in the ſame cavity, in its left and anterior ſide. Behind this latter opening is ſeen an oriſice, which leads into the ſmalleſt of the three diviſions, at the middle of the baſe of the heart, and in which is found the common trunk of the pulmonary arteries. It reſults from this conformation, that there are two channels offered to the blood which has paſſed from the right auricle into the cavity of the ſame ſide; the one by the left deſcending aorta; the other into the cavity leading to the pulmonary artery. It may even take a third route, and paſs through the numerous holes which penetrate the partition ſeparating the ſuperior and left cavities. The left auricle projects into the latter the blood received from the pulmonary veins. A membranous valve is found attached to the border of the opening on its right ſide. The trunk common to the right deſcending aorta, carotids, and axillary arteries, is ſituate to the right of the valve. The blood muſt either paſs into the arterial trunk, and from thence be diſtributed to the head and extremities, or penetrate into the intervals between the fleſhy faſciculi of that cavity, and from thence into the two others. It reſults from this ſtructure, that the blood diſtributed to the anterior parts by the carotids and axillary arteries, to the poſterior parts by the iliacs, and to the tail by the middle ſacral artery, is nearly all derived immediately from the lungs, whilſt a portion of that which is diſtributed to the other viſcera by the left aorta comes from the right cavity and from the auricle of the ſame ſide, and conſequently has not been modified by its paſſage through thoſe organs. The pulmonary blood is not ſo intimately admixed with that from the body, as in the chelonians. Such is the ſtructure of the heart in the crocodile of the Nile, and the caiman or American alligator. For a view of the crocodile's heart, ſee Cuvier Leçons, t. 5. pl. 45.

It is leſs complicated in the common iguana (iguana delicatiſſima). In this animal, the ſituation of the heart is very remote from the liver, beneath the origin of the lungs, and in the moſt projecting part of the cheſt. It is of a conical form, being very broad at its baſe, and acute at its ſummit. The auricles preſent nothing remarkable. In the ventricle, there are but two cavities, the one ſituate to the right, which forms the proper cavity of the ventricle, the other to the left and ſuperiorly, appearing as a ſinus of the former. The openings of the pulmonary auricle and right deſcending aorta are found in the latter, nearly in the ſame manner as in the crocodiles. The opening of the right auricle is ſituated towards the middle of the great cavity or that of the ventricle, and is provided with a ſemilunar membranous valve, in the ſame way as that of the left auricle. The orifices of the pulmonary artery and left deſcending aorta are placed lower down in the ſame cavity; the firſt on the left, the other on the right. There is no pulmonary cavity. The interior of the ventricle is furniſhed with faſciculi of fleſhy fibres.

The ſtructure of the heart in the third order of reptiles, the ophidians, differs but in a trifling degree from that of the ſaurians, poſſeſſing the moſt ſimple conformation of this organ. There is no diſtinct pulmonary cavity. The auricles are of conſiderable ſize; that which receives the blood from the body is the largeſt. Their parietes are thin and tranſparent in the intervals between the fleſhy faſciculi, by which their ſtrength is augmented, and which are irregularly interlaced together. Their cavities are ſeparated by a membranous partition. The figure of the ventricle is generally that of an elongated cone, irregularly formed in conſequence of an appendix of the ſame figure, which projects from the left ſide beyond its baſe. The interior is divided into two cavities, the one ſuperior, the other inferior, the former being extended into the appendix. An imperfect ſeptum intervenes between them, having a looſe unconnected edge on its right ſide, and is extended horizontally from the baſe to the apex; it is compoſed of fleſhy faſciculi, allowing the blood to penetrate in their intervals. A conſiderable opening, by which the two cavities communicate, is found towards the right ſide of the baſe of the ventricle, at the part where the ſeptum terminates. The parietes of the ventricle, of themſelves moderately thick, afford attachment to a multitude of fleſhy fibres, giving

additional

additional ſtrength, but greatly diminiſhing the cavity of the ventricle. Theſe faſciculi are moſtly ſeparate from each other, allowing the blood to permeate between them as through a ſieve; thus effecting the more perfect admixture between the portion arriving from the lungs and that from the body. The openings of the auricles are found cloſe to each other, at the middle of the baſe of the heart, above the ſeptum. Each orifice is cloſed by a ſemicircular valve of a membranous ſtructure, the looſe edge of which correſponds to the auricle of the ſame ſide. The termination of the arteries is found in the right ſide of the baſe of the organ; that belonging to the pulmonary artery is ſituate towards the left and in the lower part, correſponding to the inferior cavity. On the left of the latter is found the opening of the left aorta, correſponding to the ſame cavity, and placed oppoſite to the opening which forms the communication between the ſuperior and inferior cavity. The opening of the right aorta is found immediately behind the laſt, and correſponds more particularly to the ſuperior cavity, in which is received both the blood from the lungs and that from the body; the two portions united are projected partly into the right aorta and partly into the inferior cavity, and from thence into the left aorta and pulmonary artery.

In the fourth order of reptiles, the batracians, the heart preſents a ſtructure the leaſt complicated of the whole claſs. It conſiſts of a ſingle auricle of a rounded figure, broader than the baſe of the organ, with its parietes ſtrengthened by fleſhy faſciculi. At the baſe of the auricle is the orifice of communication with the ventricle, which is ſingle, having a ſimple cavity, with fleſhy columns, not ſeparated from each other. At its baſe is found the common trunk of the arteries, ariſing by a ſingle orifice, ſituate more to the right and lower down in the ventricles than the opening of the auricles. The heart of the frog has been delineated by Swammerdam, Bibl. Natur. tab. 49; and by Roeſel, Hiſtor. Ranar.

Of the Blood-Veſſels.—The diſtribution of the blood-veſſels in the four orders of reptiles is varied according to the ſtructure of the heart, and many other circumſtances in their organization. In the batracians the arrangement differs in the greateſt degree from that of mammalia and birds. All the arteries ariſe by a ſingle trunk; conſequently there is but one opening in the heart. In the three other orders, there are at leaſt two openings, frequently three, which give origin to as many diſtinct trunks, one of which is deſtined excluſively to the lungs.

Of the Arteries in the Chelonians.—The arteries of the body ariſe from the heart by a ſingle or double trunk in different ſpecies; thoſe of the lungs by a ſingle trunk. They are firmly connected together for a ſhort diſtance from their origin. The trunk of the pulmonary artery ariſes on the left, lower down than that of the body. It quickly ſeparates into two branches, one of which proceeding to the right lung, turns from the left to the right, then advances forwards to arrive at the anterior part of the organ, where the inſertion of the bronchus takes place. The other proceeds in a contrary direction, paſſing acroſs the œſophagus, it arrives at the ſummit of the left lung.

The trunk of the arteries of the body takes its origin at the right extremity of the baſe of the heart, and divides almoſt immediately into two great branches, the right and left poſterior aortæ. When the trunk is double at its origin, they ſeparate, forming theſe two branches. The right aorta furniſhes, near its origin, another conſiderable artery, which may be denominated the anterior aorta. This ſoon divides into two branches, each of which is again ſubdivided into two others, the internal of which, the ſmalleſt, is the common carotid, and the external, the ſubclavian or axillary artery. The common carotid proceeds by the ſide of the neck, concealed by the muſcles going to the os hyoides, ſending branches to the œſophagus and adjacent muſcles. It arrives at the head, to the parts of which it is ultimately diſtributed, without dividing previouſly into two principal branches analogous to the carotids of mammalia. The ſubclavian or axillary artery furniſhes nearly the ſame branches as the arteries bearing the ſame name in mammalia, with the exception that there is no branch correſponding to the inferior thyroid. The continuation of the trunk forms the brachial artery. The two poſterior aortæ proceed on each ſide upwards and outwards; then bending backwards, they approximate again, and are connected by a communicating branch, which the left aorta gives to the right; nearly oppoſite to the fifth dorſal vertebra.

The right aorta, previouſly to communicating with the left, furniſhes many arteries to the back or upper ſhell, correſponding to the intercoſtals. The left aorta furniſhes conſiderable arteries to the viſcera of the abdomen, which conſume great part of its blood. When the trunk arrives beyond the cardia, it divides into three branches; the firſt, which is the ſmalleſt, furniſhes a branch to the œſophagus, and then is diſtributed to the ſtomach. It is analogous to the coronary ſtomachic of mammalia. The ſecond, almoſt as conſiderable as the trunk from which it proceeds, diſtributes arteries to the inteſtines, ſpleen, pancreas, and liver, in the following manner. The hepatic artery is the firſt given off on the right ſide; it turns backwards and downwards to arrive at the liver, and divides into two branches, near the baſe of the viſcus, from one of which proceeds a ſmall branch to the pancreas, and numerous others to the duodenum. The ſecond branch is one of ſmall ſize, and is diſtributed to the ſecond turn which the colon makes to the right. It is the colica dextra. The third branch paſſes from the right to the left, and diſtributes its branches to the tranſverſe colon. It is the colica media. After having given off theſe branches, the trunk purſues a ſhort courſe between the layers of the peritoneum, in a direction downwards and backwards. It then diſtributes the following branches. The pancreatic, which paſſes from behind forwards upon the left border of the pancreas. The ſplenic, a very ſmall artery, diſtributed excluſively to the ſpleen. A very conſiderable branch, belonging to all the right part of the colon and cæcum. It is a ſecond colica dextra. A ſmall artery, which, after having given a branch to the cæcum, proceeds to anaſtomoſe with the next, the proper meſenteric artery, which is larger than any of the preceding, and ramifies in the meſentery of the ſmall inteſtine, to which it is ultimately diſtributed. Laſtly, the third branch, reſulting from the diviſion of the poſterior left aorta, the ſecond in magnitude, proceeds obliquely to the right and backwards, and anaſtomoſing, as has been mentioned, with the right aorta, without furniſhing any branch. The common trunk, formed by their union, appears rather as a continuation of the right aorta; it extends along the vertebral column to the pelvis, giving off the following branches in its courſe. Five or ſix ſmall branches on each ſide, correſponding to the intercoſtal or lumbar arteries. The ſpermatics. One or two branches on each ſide to the kidnies. A ſmall artery correſponding to the poſterior meſenteric, which is diſtributed to the cloaca.

The common poſterior aortic trunk terminates by four branches, in the individuals belonging to the teſtudo græca, which we have diſſected. The firſt on the left was the external iliac of that ſide, then came the internal iliac of the

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ſame ſide, and oppoſite to it the primitive iliac of the right ſide. Between the two latter aroſe the artery of the tail, correſponding to the middle ſacral artery. The branches of the internal iliacs are very analogous to the ſame arteries in mammalia. The trunk divides into two branches; one ſending branches to the bladder and cloaca; the other dipping into the pelvis, and correſponding to the iſchiatic and poſterior iliac arteries. The external iliac proceeds forwards upon the border of the pelvis, furniſhes an analogous branch to the epigaſtric, from which ariſes the anterior iliac. The firſt deſcends upon the internal and inferior parietes of the upper ſhell, and paſſes in a direction from behind, forwards. A ſecond branch, which ariſes from the external iliac, oppoſite to the epigaſtric, deſcends along the anterior border of the pelvis, as far as the ſymphiſis of the pubis, and is loſt in the muſcles of that part. After having furniſhed theſe two arteries, the external iliac paſſes out of the pelvis, takes the name of crural artery, giving off firſt the circumflex arteries, then the profunda, and in the reſt of its courſe is analogous to what it is found in mammalia.

The diſtribution of the principal arterial trunks in the ſaurians differs but little from that which has been deſcribed in the preceding orders.

In the crocodile there are three arterial trunks, each having a diſtinct opening in the ventricle, provided with two ſemi-lunar valves. The pulmonary artery, which ariſes from the cavity bearing the ſame name, is ſituate to the left, and ſomewhat ſuperiorly; the poſterior left aorta, which ariſes from the right and inferior cavity, and is ſituate between the pulmonary trunk and the next to be mentioned; the poſterior right aorta, correſponding to the ſuperior cavity. Theſe three trunks are connected together for a ſhort diſtance from their origin. From the latter proceed, in the firſt place, the trunk common to the ſubclavian and left carotid, which remains attached for ſome extent to the poſterior left aorta, then advances obliquely forwards, paſſes beneath the bronchus, and divides beyond that canal. Secondly, a ſimilar trunk for the ſame arteries on the right ſide. The poſterior aorta, after having given off theſe branches, turns in a direction, firſt from below upwards, then from before backwards, and divides in a direction obliquely inwards beneath the ſpinal column, without furniſhing any remarkable branch until it receives the communicating branch from the left aorta. This latter turns around the bronchus on its own ſide, and paſſes backwards and inwards in the ſame way as the preceding. After having paſſed the cardia, it divides into many branches, which proceed to the ſtomach, ſpleen, pancreas, and duodenum. Theſe receive the greateſt part of the blood of the trunk. The latter has no communication with the right aorta, but by an artery, the diameter of which is ſcarcely equal to a fourth part of the trunk from which it proceeds.

We have already alluded to the conſequences reſulting from this arrangement of the arteries, in the deſcription of the heart. All the other arteries derived ordinarily from the abdominal aorta, with the exception of the cæliac trunk, here take their origin from the right poſterior aorta. It is remarkable that the anterior meſenteric takes its origin at a very conſiderable diſtance from the cæliac trunk, or from the arteries ordinarily compoſing it; while, in the chelonians, it moſt frequently ariſes very near, or is even a branch derived from it. The ſplenic is alſo given off by the cæliac. After having paſſed through the ſubſtance of the ſpleen, from its anterior to its poſterior part, and diſtributed to its ſubſtance many ſmall branches which ariſe at a right angle from the trunk, it paſſes out almoſt as large as at its entrance, and proceeds to be diſtributed to the rectum, and the termination of the ſmall inteſtine; that branch of the ſplenic having the latter diſtribution, forms a conſiderable communication with the anterior meſenteric.

The pulmonary artery, very ſoon after its origin, divides into two branches, which proceed to the lungs, in the ſame manner as in the chelonians. Their diameter is nearly equal to that of the trunks formed by the carotids and ſubclavians on each ſide.

In the common iguana, which has the heart placed very far forwards in the cheſt, the arteries of the body have, in the ſame manner, two diſtinct trunks ariſing from the two cavities of the heart, although they are united at their origin. The left poſterior aorta does not furniſh any branch before it becomes united to the right. The latter gives origin to the carotids and ſubclavians, as in the crocodiles; but with this difference, that the latter do not ariſe from the ſame part as the former, but much farther backwards, on account of the heart being placed ſo much anteriorly.

In the lizards properly ſo called, the two aortæ advance forwards out of the cheſt; the right having firſt divided into three branches, the left without forming any diviſion. The latter turns backwards upon the ſides of the neck, to proceed afterwards along the vertebral column; and at the point where it takes a direction from before backwards, it receives the left branch of the right aorta, which forms a curvature in front of it. From its convexity ariſes the left carotid. The two other branches of the right aorta turn backwards, and unite in the ſame manner on the right ſide of the neck, forming two arches in front of each other. The carotid of the ſame ſide ariſes in a ſimilar manner from the anterior arch, formed by the middle branch. The ſubclavians ariſe from each aorta a little before their junction. We have ſeen that in the crocodiles and the common iguana, they are produced both by the right aorta. The trunk formed by the union of the two arteries, which unite ſpeedily after their origin from the heart, produces the different pairs of intercoſtal arteries in ſucceſſion. It gives off, near its commencement, an artery to the œſophagus; farther on, a ſmall artery which proceeds to the liver; and ſtill farther, an artery which quickly divides into two branches; the anterior of which diſtributes its ramifications to the ſtomach, ſpleen, pancreas, and duodenum. The poſterior belonging to the inteſtinal canal is properly the anterior meſenteric. From the trunk the following arteries next proceed: the lumbar, the ſpermatics, the poſterior meſenteric, which proceeds immediately to the rectum, the renal, which are among the laſt given off, ſince the kidnies are ſituate very far back in the abdominal cavity. Laſtly, it produces the iliacs and middle ſacral artery. The latter is of ſo conſiderable a ſize, that it may be regarded as a continuation of the aortic trunk, of which the iliacs appear only as branches. This circumſtance evidently depends on the great ſize of the tail, in compariſon with the extremities.

The diſtribution of the principal arterial trunks in the third order of reptiles, the *Ophidians*, becomes much ſimplified from the deficiency of extremities, and there being but a ſingle lung. The number of the trunks is the ſame; the relations between their openings in the heart have been already mentioned in the deſcription of that organ. The pulmonary artery aſcends and turns backwards upon the baſe of the heart, and ſpeedily arrives at the inferior ſurface of the lung, where it paſſes from before, backwards to the left of the vein. The right aorta aſcends on the ſame ſide, bends backwards, paſſes above the œſophagus, and obliquely backwards and inwards, to join itſelf to the left aorta, ſome diſtance beyond the point of the heart. It gives off, near its origin, ſome ſmall arteries, which proceed to an orbicular

orbicular gland, placed in front of the baſe of the heart, likewiſe to another gland of a more conſiderable ſize and elongated form, ſituate beneath the jugular. The trunk then furniſhes the common carotid, the only one exiſting in this order of reptiles. It paſſes obliquely to the left, and advances, by the ſide of the left jugular, between the trachea and the œſophagus, and laſtly beneath the latter. It ſends a great number of ramifications to theſe organs, and divides near the head into many branches diſtributed to the adjacent parts. Near to the vertebral column, the right aorta produces a conſiderable branch correſponding to the vertebrals and ſuperior intercoſtals which proceeds along the ſpine, ſending to it branches, and wholly penetrating into it near the head. When the communication takes place between the right and left aorta, the diameter of the former is become very ſmall, ſo that the greateſt part of the blood which it has received from the heart is diſtributed to the parts in front of that viſcus: it is properly the anterior aorta. The left aorta aſcends and turns backwards to the left, paſſes beneath the œſophagus; then by the ſide of and always beneath the lung, receiving the right aorta beyond the heart; and continuing to paſs in a direction backwards, it gives off branches correſponding to the intercoſtals, likewiſe arteries to the viſcera. Thoſe branches proceeding to the ſtomach, pulmonary bladder, and liver, are detached ſucceſſively from the aorta, as it proceeds backwards; thus there is no cæliac trunk. Nearly oppoſite to the pylorus, the aorta furniſhes the anterior meſenteric, which proceeds parallel to the inteſtinal canal one half of its extent, ſending to it branches. Farther backwards the inteſtinal canal receives three other ſmall branches in ſucceſſion, from the ſame artery: as it paſſes backwards, it alſo ſends ſimilar branches to the kidnies, ovaries, &c.; arrived at the lower part of the abdomen, it penetrates beneath the vertebræ of the tail and is loſt in that part.

In the laſt order of reptiles, the Batracians, the aorta, which proceeds from the baſe of the ventricle, ſoon divides into two branches, which ſeparate and purſue a very oblique direction from within, outwards and a little forwards. Each branch gives off a pulmonary artery, a common carotid, an axillary, a vertebral, and arteries correſponding to the intercoſtals; then turning backwards, and approaching its fellow, it ſpeedily becomes united to it. The trunk formed by their junction gives off, firſt, the cæliac trunk, then all the other arteries which ariſe ordinarily from the abdominal aorta, preſenting nothing worthy of remark.

Of the Veins.—In the *Chelonians* there are two poſterior venæ cavæ, which paſs through the liver on each ſide, and receive in their courſe numerous ſmall hepatic veins. Immediately after their exit from the liver, they are joined by two anterior venæ cavæ, one on each ſide, or by the common trunk of the jugular and ſubclavian. They all terminate in the right auricle by an opening in the form of a fiſſure, provided with two valves; they do not terminate in the cavity of the auricle, but in a receptacle communicating with it. The pulmonary veins united in a ſingle trunk terminate in an analogous receptacle, which opens into the left auricle; around the borders of the opening, there is placed a fleſhy valve in the form of a half moon.

In the *Saurians* and *Ophidians*, there is but one poſterior vena cava, and two anterior, that belonging to the left ſide paſſes acroſs, and above the heart, in a direction from left to right, and terminates in the common receptacle by the ſide of the poſterior vena cava. This receptacle, ſimilar to that found in the chelonians, has in the ſame manner its entrance into the right auricle, in the form of a fiſſure, and provided with two valves. In this order, likewiſe, the anterior venæ cavæ are more properly conſidered as the jugulars. They have alſo a double azygos, one formed by the intercoſtal veins in front of the heart, the other poſterior to it. They both join the right auricle by the ſide of the right jugular. It appears that they are rendered neceſſary by the ſituation of the venæ cavæ, which is very remote from the vertebral column, and more inferiorly.

The pulmonary veins in the ſaurians are ſimilar to thoſe of the chelonians.

In the ophidian order there is only one, which terminates in the ſame manner in the left auricle. Its volume exceeds that of the artery, which we have not obſerved in the other reptiles.

In the batracians the veins have a diſtribution ſimilar to that of the arteries which reſults from their terminating in a ſingle auricle, in the ſame way as the latter ariſe from a ſingle ventricle. There are two anterior venæ cavæ which receive the blood from the head, neck, anterior extremities, and from the veins analogous to the external mammary, which are very conſiderable, extending beneath the ſkin to the groins, and likewiſe a poſterior vena cava, which receives the veins from the other parts, preſenting nothing worthy obſervation.

The blood-veſſels of the tadpole are deſcribed in the account of that creature in the diviſion concerning the generative functions; and thoſe of the proteus and ſiren, in the ſeparate deſcription of thoſe animals at the end of this article.

Phyſiology of the Circulating Organs.—The nature of the blood in reptiles, the points in which it differs from the correſponding fluid in other claſſes, its difference in the various orders and genera, its relations to the food and to the ſecretions and excretions, are ſo many intereſting topics of inquiry, on which we have abſolutely no information to offer. Chemiſtry does not yet appear to be ſufficiently advanced for the ſucceſsful inveſtigation of theſe and ſimilar matters.

We may obſerve, in the firſt place, that the reptiles of theſe climates at leaſt, poſſeſs, in compariſon with warm-blooded animals, a much ſmaller quantity of blood in proportion to their ſize: hence their muſcles are whiter, and ſome of their viſcera, particularly the lungs, which are loaded and gorged with ſuch a profuſion of blood in the warm animals, preſent in this reſpect an appearance altogether contrary in reptiles.

"I made an experiment," ſays Blumenbach, "on the water ſalamander, (lacerta lacuſtris, L.) of which I diſſected twenty-four, adult, lively, recently taken in the early ſpring, and weighing together $1\frac{1}{2}$ ounce, in order to meaſure the quantity of blood they contained: I could preſerve from the whole of the bodies of all, only two ſcruples and a half. This ſmall quantity of blood is to the whole body as $2\frac{1}{2}$ to 36; while in an adult and healthy man the proportions are calculated at 1 to 5. Haſſelquiſt obſerved the ſame circumſtance of the ſmall quantity of blood in proportion to the body, in the crocodile of the Nile." Voyage dans le Levant & en Paleſtine.

It is alſo remarkable, that the arterial blood of our reptiles differs in external appearance in the ſmalleſt degree, if at all, from the venous, ſo that one can be diſtinguiſhed from the other only by the ſituation and courſe of the veſſels; while, on the contrary, the bright ſcarlet arterial blood of the mammalia offers ſo remarkable a contraſt to the dark livid or purple venous fluid; unleſs when they have been for ſome time in a warm bath or other warm medium, when it appears from the elegant experiments of Dr. Craw-

ford, that the venous blood, becoming gradually leſs and leſs dark coloured, approaches more nearly to the vivid redneſs of the arterial ſtream. (See Philoſ. Tranſact. v. 71. p. 487.) Haller obſerved that there is no difference between the arterial and venous blood in the frog. (Oper. minor. v. 1. p. 183.) And Spallanzani noticed the ſame fact in the ſalamander or water newt: "avutaſi egualità di diametro, il colore del ſangue venoſo e ſomiglianteſſimo al colore del ſangue arterioſo." De' fenomeni della circolazione, pag. 100. And again, "il ſangue arterioſo in nulla differiſce dal venoſo, ſia nel colore, ſia nella denſità." P. 193.

In this circumſtance reptiles reſemble the fœtus of warm-blooded animals; in which, ſo long as it remains immerſed in its uterine bath, we know that the arterial and venous bloods are of the ſame colour.

Yet all animals of this claſs are not alike in this reſpect. Accurate obſervers have aſſerted, that in the tortoiſe the venous blood is black, and the arterial crimſon, as in the warm-blooded claſſes. (Caldeſi, Oſſervazioni Anatomiche intorno alle Tartarughe, p. 60. Mery, Hiſt. de l'Acad. des Sci. de Paris, 1669. v. 2. p. 210.) This difference probably correſponds with the diverſity of ſtructure obſervable in the reſpiratory organs, which are calculated, in the different orders of reptiles, to admit of a more or leſs intimate expoſure of the blood to the air in reſpiration.

The colour of the blood varies in our amphibia according to the ſtate of their nutritive functions: it is paler when they have faſted, of a deeper red when they have been well fed. If, under the latter circumſtance, it be drawn from a vein, and expoſed to the air, it exhibits a bright florid redneſs as it forms the coagulum.

The component elements of the blood of amphibia, conſidered in a general way, ſeem nearly to reſemble thoſe of the warm-blooded animals, except that in the former, when examined alive, there are almoſt always ſeen bubbles of air mixed with their purple ſtream, performing, like the blood itſelf, the circulation, and dividing that fluid in the veſſels into intervals, as the mercury is interrupted in a badly made thermometer. Redi and Perrault obſerved this fact in tortoiſes; Jacobæus in ſerpents; Daudin in the green lizard, frog, and ſalamander (Hiſt. Nat. des Reptiles, Introd. p. 184.); and Blumenbach in the amphibia of Germany. Now, although in certain ſtates the veins may be very turgid, and elaſtic air may be found in them after death, nothing of this kind is ever known to take place in a healthy and ſtrong individual. The air indeed is ſuppoſed in the mammalia to conſtitute one-thirtieth of the blood, but it is ſo diſſolved, and ſo intimately mixed in the vital ſtream, that it can only be extricated and exhibited in its elaſtic aerial form by artificial means.

The phenomena of the circulation are common on the whole to the reptiles with the warm-blooded animals, and are very familiar in the former, ſince the wonderful circulating motion of the blood was not only firſt actually ſeen and deſcribed in frogs by the great Malpighi, but is alſo ſtill examined to the preſent time in thoſe animals. The branchiæ of the tadpole are very favourable objects for inveſtigations of this kind.

As the circulation can be actually ſeen in theſe animals, we may inquire on this ſubject, whether the globules of the blood, entering the minute veſſels, can be really obſerved to change their figure, and become oval inſtead of ſpherical. "In warm-blooded animals," ſays Blumenbach, "I have never heard or read that any one has ſeen ſuch a change; and I certainly have never ſeen, either in the incubated chick, in which the circulation of *warm* blood may be moſt clearly and beautifully obſerved, particularly on the fifth and following days, or in the frog or lizard, any oval globules: yet Reichel aſſerts that he has ſeen globules changed from ſpherical to oval in the meſentery of the frog, and has given an elegant plate in illuſtration of the fact. See Experimenta de Sanguine ejuſque motu, fig. 3." Blumenb. Specimen Phyſiol. p. 10. He doubts, however, whether this change can be conſidered as a natural occurrence in the healthy circulation, or ought to be referred to the diſturbance naturally following the ſufferings of the animal.

The motions of the heart, conſiſting in our amphibia of a ſingle auricle and ventricle, agree in the alternate contractions and relaxations of thoſe parts, with the analogous ſucceſſion of ſyſtolic and diaſtolic changes obſervable in the double auricles and ventricles of the warm-blooded claſſes.

A queſtion was formerly raiſed, concerning this ſyſtole or contraction, whether the ventricles are really ſhortened, or experience merely a diminution of diameter? The former, ſays Blumenbach, has now been proved by the moſt careful obſervations both in cold and warm-blooded animals; he adds, that he has never ſeen it demonſtrated more clearly, and beyond every ſuſpicion of inaccuracy or miſtake, than in the common ſnake (coluber natrix), in ſpecimens of which, two yards long, from the woods of Germany, he has obſerved, and frequently demonſtrated, a ſhortening of the ventricle equal to two lines. Blumenbach ſtates further, that the ventricle is completely emptied in its ſyſtole, not the leaſt drop of blood flowing back into it from the aorta, in the ſnake, frog, and toad, and alſo in the incubated chicken. But he does not venture to decide, whether the ſame thing occurs in man and the other mammalia, or whether the ſemilunar valves may intercept ſome drops of blood, which thus are made to flow back into the ventricle.

Reproduction.—As the nutrition and growth of parts, in the healthy ſtate, are among the moſt important functions of the blood-veſſels, ſo the reparation of injury, and the reſtoration of what is mutilated, conſtitute another very ſtriking inſtance of their powers, and a very impreſſive example of thoſe prerogatives, which belong excluſively to living organized beings. Although this power of reproduction, taken in its moſt extenſive acceptation, cannot be ſaid to be withheld entirely from any animal, ſeveral genera of reptiles poſſeſs it in a more remarkable degree than any of the other vertebral claſſes. There is an intereſting account in the Memoirs de l'Acad. des Sciences de Paris, 1686, particularly of the reſtoration of the tail of lizards. Spallanzani, Bonnet, and Blumenbach, have employed themſelves in reſearches on this ſubject. The former firſt called the attention of the public to it in his "Prodromo di un' Opera da imprimerſi ſopra le Riproduzioni Animali." Bonnet publiſhed his memoir on the reproduction of the limbs of the water newt in the Journal de Phyſique, 1777. His enquiries were again publiſhed in his "Œuvres d'Hiſtoire Naturelle," t. 5. and there are three memoirs by him on the ſubject, tranſlated into Engliſh, in Spallanzani's "Tracts on the Natural Hiſtory of Animals and Vegetables," v. ii. The experiments of Blumenbach are contained in his "Specimen Phyſiologiæ comparatæ." The experiments have been made chiefly with the water newt; on the lacerta agilis of the terreſtrial kind, ſee P. T. Hartmann, dubia de generatione viviparorum ex ovo, p. 26; reſpecting the lizards of the Antilles, ſee Oldendorp Geſchichte der Caraibiſchen Miſſion, p. 97.

"It might be ſuppoſed," ſays Bonnet, "that the amputation of the limbs is moſt painful, and that the animals would ſuffer long and ſeverely from it; however, one of my obſervations apparently infers the reverſe. I cut the left

hand and the right foot off a large newt; and a ſtream of blood, as thick as a hog's briſtle, continued ſpouting out nearly two minutes without intermiſſion. Not only did the animal ſeem not in the leaſt enfeebled by the loſs of blood, but, in ſcarcely a quarter of an hour, to my great ſurpriſe, it ſwallowed two earth-worms." Spallanzani's Tracts, v. ii. p. 367.

The following narrative is extracted as a ſpecimen of Bonnet's experiments. "On the 6th of June I cut off the right arm and left leg of a large newt cloſe to the body. (It ſeems from the accompanying figure that the ſections paſſed through the femur and humerus reſpectively.) A ſtream of florid blood ſpouted a minute and a half from each wound; however, the veſſels ſoon cloſed, and the newt was apparently as well as thoſe unmutilated. But it will eaſily occur, that it did not ſwim with equal facility. When about a month had elapſed, I began to perceive a papilla, of a violet grey colour, near the edge of the trunk or ſection. This was the origin of a new arm and leg, which gradually increaſed, and were quite perceptible, although ſtill very ſmall, on the 14th of July. The two papillæ grew more in length than in thickneſs: they became minute ſtumps, and on the 1ſt of Auguſt were two lines long. A kind of cleft hardly perceptible announces the appearance of two toes: no cleft appears on the originating arm. The new parts were very diſtinguiſhable from the old by their lighter colour. The two toes were eaſily recogniſed on the ſeventh: they were real miniatures, and truly moſt minute. The ſtump of the arm had increaſed, but there was no indication of fingers.

"It is pleaſing to obſerve the little hand fully unfolding, while only three fingers of unequal length are viſible: the middle one is the longeſt. The arm has made no ſenſible progreſs. The new foot had four toes alſo of unequal length; the firſt and ſecond of which are longeſt; the other two only begin to appear; the fourth is ſcarcely perceptible. Evolution advanced every day. The regenerated members began to deepen in colour, ſo that the line, diſcriminating the old parts from the new, was no longer ſo conſpicuous; but the black ſpecks on the toes of unmutilated newts were ſtill imperceptible. On the 22d of Auguſt four well-ſhaped fingers were already on the hand; but only four toes out of the five which the foot regenerates; and they all have to acquire more ſize, conſiſtence, and colour. I continued my obſervations on the daily evolutions of the members; and the following were their dimenſions in length on the 30th of September.

Old Members.		New Members.	
Arm -	4 lines.	Arm -	$2\frac{1}{2}$ lines.
Cubit -	$3\frac{1}{2}$	Cubit - -	$2\frac{1}{2}$
Thigh -	3	Thigh -	$2\frac{2}{3}$
Leg -	4	Leg -	$2\frac{1}{4}$
Longeſt finger	$3\frac{2}{3}$	Longeſt finger	$1\frac{1}{2}$
Longeſt toe -	$4\frac{1}{2}$	Longeſt toe -	$1\frac{1}{3}$

Even in the beginning of October, the fifth toe of the new foot was not viſible." Lib. cit. 372, et ſeq.

There is a kind of ſemi-tranſparency in the reproduced parts, which the original members have not. This continues long, and changes ſlowly as the reproductions colour. The tranſparency is evidently greater on the edges of the fingers than elſewhere; if examined with a magnifier they ſeem incloſed in a fine diaphanous envelope: but nothing of this is evident in the old fingers. (P. 376.) "It is incredible how long the new fingers require to attain the ſize of the old. I have had newts, whoſe fingers, in thirteen months and more, were not as large as thoſe of unmutilated members." (P. 393.) "When the tails of large newts were amputated near their origin, the whole died in a certain time. If the part be cut off about its middle, reproduction will follow. A tail was cut on the 11th of July, and on the 14th of Auguſt, the reproduced part was about three lines and a half long, and four and a half in diameter at the baſe. The new portion was ten lines in length on the 20th of September, and ſhaped exactly like the tail of a newt. I could obſerve no difference between the motions of this regenerated tail, and thoſe of tails unmutilated. On the 8th of October the regenerated part had a peculiar tranſparency, wanting in the reſt of the tail." P. 381, et ſeq.

"The fingers and toes are not evolved in the ſame proportion as the arm and leg. Now, when I write this, on the 10th of October, the new arm and leg of the newt, mutilated on the 6th of June, have nearly attained the ſize of the original members, while the regenerated fingers and toes have not acquired half their natural ſize; yet they are perfectly well formed, and execute all their functions." P. 390.

Blumenbach found that the true ſalamander (lacerta ſalamandra) poſſeſſes the ſame reproductive power as the water newt (lacerta lacuſtris): that a third part of the tail, or a toe, would be perfectly but very ſlowly reproduced, and remained even at the end of a year conſiderably inferior in ſize to that of the original parts. Specimen, p. 32.

Bonnet made other experiments to determine whether reproduced members poſſeſs the ſame powers of reproduction as thoſe amputated. He cut off an arm and a thigh of a large newt on the 2d of June: as ſoon as the hand and foot were viſible, he cut them off, and they were renewed: he repeated this four times, the laſt operation being on the 13th of October, and the parts were each time reſtored. P. 394, et ſeq.

He diſlocated the arms of one and the thighs of another newt, ſo that the members immediately after were pendent, as if dead, the animal having no power over them. On the following evening each newt moved the disjointed limbs with a liberty and facility which announced that nature had already repaired the diſorder. P. 431.

The moſt ſurpriſing fact in Bonnet's Memoir is the reproduction of the entire eye. "With a ſcalpel," ſays he, "I extracted the right eye of a large newt on the 13th of September, 1779; but I did not obtain the globe without much injury to the tunics. A deep bloody wound in the ſocket of the eye was the conſequence of this cruel operation. And the reader will not be ſurpriſed if I hardly expected any thing from it, and that the newt would probably remain blind for ever. How great was my aſtoniſhment, therefore, when, on the 31ſt of May, 1780, I ſaw a new eye formed by nature. The iris and cornea were already well ſhaped, but the latter wanted its peculiar tranſparency, which is very conſiderable in theſe animals. The reſtoration was complete on the 1ſt of September; the cornea being tranſparent, and the iris having acquired its yellow gilded colour. On the 8th of November 1780, it differed from the other eye only in being a little ſmaller, and in the iris, or golden circle, going only half round the ball." P. 432, et ſeq.

"I repeated," ſays Blumenbach, "the experiments of the celebrated Bonnet, concerning the reproduction of the eye in the water newt. I cut out the whole globe, at the inſertion of the optic nerve, in three inſtances, in neither of which was the organ reproduced: but a white and firm fungus, ſhooting from the cut end of the nerve, gradually filled the orbit, the animals themſelves becoming affected with a kind of dropſical ſwelling, and dying in a few

few months. Inſtructed by theſe failures, I proceeded to operate in a different way on a fourth animal, in May 1784. I firſt divided the cornea, to let out the lens and other humours, and then cut away the remaining empty and collapſed coats, leaving a ſmall portion of the common coverings of the bulb, which, from a careful examination in water with a glaſs of the parts removed, I judge to have been ſcarcely equal to one-fifth of the whole globe. In the following months the whole orbit ſeemed cloſed by the approximated eye-lids, which, however, began to ſeparate in the ſixth month after the operation, and thus diſcloſed a new little bulb ſpringing up from the bottom of the orbit. This new globe was ſtill much ſmaller than the other in April 1785, when the animal died accidentally, though in other reſpects it was moſt perfect, exhibiting the golden iris with its regular pupillar aperture behind the cornea, all which points are clearly diſtinguiſhable in the preparation which I preſerve." Specimen, p. 31.

"On comparing," ſays the author laſt quoted, "the facts juſt detailed with the very limited and much leſs perfect reproduction obſervable in warm-blooded animals, we ſhall become ſenſible of the wide difference between them and the amphibia. I am daily more and more convinced, that no parts are reproduced in man and the other mammalia, except ſuch as are compoſed merely of cellular ſubſtance, and enjoy no other kind of vital power except common contractility; and I cannot find ſufficient proof that the irritable muſcular fibre, the ſenſible nervous medulla, or thoſe parenchymata which are endowed with a peculiar modification of vitality, have ever been truly reproduced in a warm-blooded animal." Ibid. p. 32.

Tenacity of Life.—This ſubject is ſo far analogous to that which we have juſt conſidered, that we paſs naturally from the view of the facts, in which the ſurpriſing reproductive powers of the claſs is evidenced, to the no leſs aſtoniſhing examples of their very hardy vitality; of the energy and permanence of their vital forces, both in individual parts, and in the body at large.

The amputated tails of water newts, and the divided fragments of the blind-worm (anguis fragilis), exhibit very lively motions for ten hours and more. The heart of a frog or ſerpent continues to palpitate on irritation many hours after its ſeparation from the body; and the limbs of frogs are excitable by the Galvanic influence for a long time. Some reptiles, as the ſerpents and teſtudines, can open and ſhut the mouth long after the head has been ſevered from the trunk. General Gage informed Blumenbach that he had ſeen the amputated head of a rattleſnake bite long after its ſeparation: and another Britiſh officer ſtated to him that when he put a ſtick between the jaws of an American turtle, the ſecond day after decapitation, it was firmly held.

The ſame energy of the vital force in the parts, and the independence of one claſs of functions on another, in the amphibia, are further evinced by many well known facts; the limbs of turtles have moved for eleven days, nay, on the thirteenth day after decapitation (Güldenſtaedt, Theoria virium corp. hum. primitivarum, p. 74.); and a rattleſnake lived ſome days after the ſkin had been removed, and moſt of the viſcera taken away. Tyſon, in Philoſophical Tranſactions, N° 144.

In the beginning of November, Redi opened the ſkull of a land tortoiſe, and removed the whole brain. The animal did not ſeem to ſuffer, it moved about as before, but groping its way; for the eyes ſoon ſhut after loſing the brain, and never opened again, a fleſhy integument formed, which covered the opening of the ſkull, and in this ſtate the animal lived till May. Spallanzani deprived four frogs of the brain; two lived till the fifth day. He alſo deprived three newts of the brain; they ſuffered violent convulſions; their eyes cloſed, they hardly moved from one place to another; and expired about the middle of the third day. He cut the heart out of three newts; they took to flight, leapt, ſwam, and executed the ſame functions as before; however, all died in forty-eight hours. Four frogs, deprived of the heart, kept their eyes open, and preſerved the uſe of their limbs. They ſurvived thirty-ſix hours. Spallanzani's Tracts, Introduction, p. 45.

Captain Cook met with a turtle, in which there was a wooden harpoon about fifteen inches long, and barbed, between the ſhoulders. The opening by which it had entered was quite healed.

Redi and Boyle ſaw ſome ſigns of life in ſerpents after they had been twenty-four hours in vacuo. And they will live more than four hours in ſpirits of wine. See Daudin, v. 6. p. 100; and v. 1. p. 270.

In our account of the phyſiology of the digeſtive organs, we have already noticed the ſingular power which reptiles poſſeſs of remaining for ſuch long periods without food. They are equally remarkable for being able to bear, permanently, conſiderable degrees of heat and cold. Not only are moſt of the Claſs inhabitants of the warmeſt regions, but ſome of them, like ſome fiſhes, are known to live in warm ſprings, inhabiting them ſpontaneouſly, and appearing to be healthy. (See Cocchi in Spallanzani, Opuſcoli di fiſica animale e vegetabile, v. 1. p. 46.) They live in the warm ſprings of Piſa, which riſe to 37° of Reaumur, 115° of Fahr.

"Beſides a hoſt of ſuſpicious narratives," ſays Blumenbach, "of newts, and other amphibia, which have lived for a conſiderable time in the human body, there are many unexceptionable and indubitable examples of this remarkable phenomenon." See the narrative of Th. Reineſius, a moſt reſpectable authority, concerning a girl of Altenburg, in Bartholin, Act. Havnienſ. v. 2. p. 110; Harder, Apiar. obſervat. p. 89; I. R. Zwinger in Act. Helvet. v. 1. p. 22; Hiſt. de l'Acad. des Sciences de Berlin, 1770, p. 40; a maſs of citations in Jacobæus de ranis et lacertis, p. 12; Paulini de Bufone, p. 38; I. Helwig Obſerv. p. 249 and 272; Kundmann Promptuarium, p. 108; alſo Act. Natur. Curioſ.; Collectan. Vratiſlavienſ. et Commerc. Literar. Noric. &c. Theſe facts are not ſo remarkable on account of the degree of heat to which the animal is expoſed, as from the other concomitant circumſtances. We muſt obſerve, however, that theſe animals inhabited the ſtomach ſo long as they continued alive, while the individuals troubled by theſe unuſual gueſts were led, by their ſuffering, to drink copiouſly of water, and thus in a manner ſupplied the newts with their natural element.

"Reptiles have the power of bearing intenſe cold as well as great heat. I one morning found a tree-frog, which I had kept for ſome time, in conſequence of a froſt ſuddenly ſet in the preceding night ſo as to reduce the thermometer to 30° Fahr., completely incloſed in a cake of ice, like inſects in amber; of courſe it was motionleſs, the eye-lids ſhut, &c. As the ice melted, the animal recovered, firſt moving its hind legs, when they were diſengaged; the head and trunk ſtill being moſt firmly detained; when the ſolution was complete, the whole animal was reſtored, ſeemed as well as before, and ſurvived a long time. Du Fay atteſts the ſame circumſtance concerning water newts; Mém. de l'Acad. des Sciences de Paris, 1729, p. 144. The amphibia are expoſed to be frozen in their winter ſleep; but we are the leſs

ſurpriſed at the occurrence, becauſe all the functions are either entirely ſuſpended, or moſt languidly performed." Specimen, p. 10.

Organs of Reſpiration.—After deſcribing the heart, and viewing the phenomena of the circulation, we proceed to the lungs, which are not only moſt important parts in the economy of all animals that poſſeſs blood, but conſtitute, in the peculiarity of their ſtructure and functions, the moſt ſtriking marks of diſtinction between reptiles and warm-blooded animals.

All reptiles breathe by means of lungs, which in their bulk conſiderably exceed thoſe of the mammalia, while the latter are as far ſuperior in the abundance of their vaſcular ramifications, and the wonderful minuteneſs of their internal ſubdiviſions. Theſe large, but looſe and rare veſicular lungs, are contained, not in a particular cavity, ſeparated from the abdomen by a diaphragm, but, with the other viſcera, in a general cavity of the body. Hence the mode of reſpiration is as different from that of the mammalia, as the texture of the organ.

To the general poſition, that reptiles breathe by means of lungs, there is an exception in the batracian order; in ſome of which (the proteus and ſiren) there are branchial appendages or gills, as well as lungs; while in the firſt ſtate (the tadpole) of others, there is a ſimilar conjunction of theſe two modifications of reſpiratory apparatus. See the anatomy of the tadpole, in the account of the generative organs, and that of the ſiren and proteus, at the end of this article.

The Air-tubes.—The trachea is not divided into bronchi in the ophidian order, which have a ſingle lung; neither does this diviſion take place in the green lizard (lacerta agilis), whoſe trachea, having reached the united anterior extremities of the two lungs, opens into each by a large orifice: but it is found in almoſt all the other animals of this claſs. The diviſion is effected very early in the chelonians, which have conſequently a very ſhort trachea, and long bronchi; more particularly becauſe the latter, inſtead of entering the lungs directly, firſt make a turn in the cheſt. The trachea is divided much later in the crocodile, where the tube is bent from behind forwards, divided into bronchi, which alſo run forwards, and then turn from before backwards, remaining for ſome time joined to each other. The bronchi are extremely ſhort in moſt other reptiles: they begin, in the batracians, immediately below the larynx.

Reaching the lungs, the bronchi generally terminate abruptly by one or more large orifices, which open into the cavities of theſe viſcera. This is what occurs in the ophidians; but in the chelonians and the crocodile, each bronchus is continued into the interior of its lung, before it terminates. They are continued, in the teſtudo græca, into the moſt remote part of the lung, without undergoing any ſenſible change of diameter; and they communicate with the large cells compoſing theſe viſcera, by ten or twelve wide orifices, of which the outlines are circular, like the commencement of canals. In the turtles, each bronchus penetrates in like manner to the fartheſt part of the lung, but gradually diminiſhing in diameter. Their ſides are pierced with numerous holes, opening into the pulmonary cells.

The relative ſize of the trachea and bronchi does not exceed what we obſerve in the mammalia and birds, except in the ophidians, where the diameter of the former is very conſiderable. Theſe air-tubes never exhibit any inequalities, ſuch as are ſeen in birds.

They are generally compoſed of complete cartilaginous rings, and conſequently are little ſuſceptible of changes in ſize. We muſt, however, except the crocodile, in which animal the front end of the trachea preſents, on its upper ſurface, a membranous interval, which is wider the nearer we come to the larynx; (ſee Humboldt Recueil d'Obſervations, &c. tom. i. p. 11. of the crocodile of the Orinoco; and Geoffroy in Annales du Muſeum, tom. ii. of the Nilotic ſpecies); the cameleon, where the annuli are incomplete in the laſt portion of the trachea, and at its bifurcation; and the ophidians, in whom the trachea poſſeſſes cartilages only in one third of its circumference. Theſe cartilages are alſo viſible for a ſhort ſpace along the front end of the lung, in a groove of its inferior ſurface, containing alſo the pulmonary vein. The trachea, however, ceaſes ſuddenly on touching the lung, and dilates immediately to form its ſac.

In thoſe reptiles which have bronchi running throughout the length of the lungs, the portion of the tube, contained in theſe viſcera, has only imperfect and irregular pieces of cartilage, which nevertheleſs ſurround its circumference. They are more thinly ſcattered in the turtles, in proportion as we obſerve them farther back in the lung.

This cartilaginous ſtructure of the air-tubes (the trachea and bronchi) of reptiles, renders them very incapable of changing their diameter. They ſeem entirely deſtitute of tranſverſe muſcular fibres; nor do we perceive any longitudinal ones to diminiſh their length. The membranous trachea of the ophidians, poſſeſſing cartilages only in the inferior third of its circumference, ſeems equally deſtitute of muſcular fibres. On this membrane we diſcover a fine white and opaque net-work, which is continued into the interior of the lung, where its meſhes, as we ſhall ſee, border the cells, and are formed of ſtronger threads, apparently of a tendinous ſtructure, and perhaps capable of contraction.

Veſicular Structure of the Lungs.—We have mentioned that the lungs of reptiles are very large: they are immenſe in the teſtudines and cameleon, and are even conſiderable in the native amphibia of theſe climates, if you compare their relative bulk to that which they poſſeſs in warm-blooded animals. We have juſt ſeen that the bronchi do not divide, that they do not uſually enter the lungs, but terminate abruptly by one or more large orifices, as ſoon as they have reached theſe viſcera. In the batracians and ſaurians, the lungs form two ſacs, varying conſiderably in their form and relative ſize, and having their internal ſurface divided by membranous plates into polygonal cells, in which other ſmaller plates form more minute diviſions. They have been juſtly enough compared by Blumenbach to the reticulated ſtructure, in the ſecond ſtomach of ruminating animals. Theſe cells are more numerous, ſmaller, and deeper in the anterior part of the ſac: they become more open towards the poſterior part; and when the latter terminates in one or more appendages, we ſee only a net-work, with looſe and extremely fine meſhes. Afterwards the parietes of the pulmonary ſac are quite ſimple, and without any diviſion. Such is the ſtructure in the appendices which terminate poſteriorly the lungs of the cameleon, and the agame or lacerta marmorata; and of the great bladder in which the ſingle lung of the ophidian order ends.

The lungs of the ſalamander, the proteus, and ſiren, form alſo ſimple ſacs without any diviſion.

"In frogs and toads," ſays Blumenbach, "the lungs are made up of polyhedric and large cells: the ſame ſtructure is obſerved in the lacerta agilis and ſalamander. They form an oblong bladder in the aquatic lacerta (water newts). The lung of the coluber natrix forms a ſingle bag of large ſize, hollow throughout; and the ſame ſtructure ſeems, from the reports of anatomiſts, to exiſt in other ſerpents. (See Coiter Obſ. Anat. Chir. p. 126. Charas

Nouvelles

Nouvelles Obſ. ſur la Vipère, p. 39. Tyſon in Phil. Tranſ. N° 144. p. 30. tab. 1. fig. 1. tab. 2. fig. 4. Seba Theſaur. vol. ii. tab. 109. fig. 1—5.) The pulmonary bag of this coluber exceeds a Paris foot in length. Rather more than the anterior half has thick ſides, with an elegantly reticulated internal ſurface, reſembling in its general habit that of the internal ſurface of the ſecond ſtomach of the ruminating mammalia. The remaining poſterior portion is a ſimple thin membranous bladder." Specimen, p. 12.

The ſtructure is rather more complicated in the chelonian order. Each of the openings of the bronchus, which we have ſtated to be about ten or twelve in the teſtudo græca, is the entrance of a particular ſac, the ſides of which are compoſed of polygonal cells, in which there are ſtill ſmaller ones. Each of theſe cells is bordered by whitiſh and as it were tendinous chords, which appear deſigned to ſupport their ſides, and fix the ſacs to the orifices of the bronchus. The ſacs or principal cells are much ſmaller, and more numerous, in the turtles, and correſpond to the numerous orifices with which the bronchus is pierced. We ſee alſo the cords forming and ſupporting the cells, and giving to the lungs of thoſe animals the appearance of a cavernous tiſſue.

The form and ſize of the pulmonary cells may be ſomewhat different in the crocodile, but their eſſential ſtructure is the ſame. In this reſpect the crocodiles depart from the lizards, and approach the turtle and tortoiſe. Geoffroy in Annales du Muſeum, vol. ii. p. 46.

How different a notion do theſe details convey to us, of the ſtructure of the lungs in reptiles, from that which they poſſeſs in the warm-blooded claſſes! Although they may be deſcribed in the latter as cellular, ſpongy, and light, yet, when compared to the ſame organs in the former claſs, they are vaſtly more compact, made up throughout of an infinite number of ramified air-tubes, and of countleſs moſt minute bronchial cells connected to them, united and interwoven with common cellular tiſſue. Hence, if we compare any mammiferous animal with a reptile of the ſame ſize, as the veſpertilio murinus with the rana bombina, the lungs of the latter are indeed the largeſt, but are beyond all compariſon inferior to thoſe of the former in the very inconſiderable number of their cells.

As the lungs of warm-blooded animals ſo wonderfully ſurpaſs thoſe of reptiles, in the minuteneſs and number of their cells; ſo they ſtill farther excel them in the aſtoniſhing abundance of their blood-veſſels. The ſimple appearance of the organs, without any anatomical preparation, is ſufficient to ſhew this fact; and microſcopical examination, after ſucceſsful injection, fully confirms it. For, although the lungs of the amphibia exhibit their denſe vaſcular networks, beautifully painting the ſides of the cells, theſe are not to be compared to the number and ſubtilty of the ramifications, eluding even the aſſiſted eye, which every where fill up the lungs of warm-blooded animals.

Since, in the mammalia and birds, all the blood of the body muſt paſs through the lungs, before it can return again to the organs, it was neceſſary to have a large number of veſſels for its conveyance, and a ſurface for their expanſion, both extenſive on account of their number, and the neceſſity of expoſing the blood in minute portions to the air, and yet confined as much as poſſible to one ſpot, that its bulk might not be inconvenient. Thus we explain that inextricable tiſſue of blood and air-veſſels, and ſmall veſicles or cells, which compoſe the lungs of mammalia and birds. All theſe circumſtances are different in reptiles. If we may judge from the diameter of the pulmonary arteries, they receive at moſt a third of the circulating maſs, and ſometimes much leſs. It is not neceſſary that this blood ſhould paſs back again through the lungs to return to the body: it may proceed by another route, as we have explained in the account of the circulating organs; becauſe it does not require to be ſo frequently ſubmitted to the action of the air, as in the two claſſes mentioned above. Hence have reſulted the two great differences already pointed out between the lungs of the warm-blooded claſſes and of reptiles; differences which are obviouſly related to each other, the numerous vaſcular ramifications requiring numerous cells and viſcera.

The pulmonary ſerve alſo as bronchial veſſels in reptiles; at leaſt we find no arteries or veins of the latter deſcription. The arterial and venous bloods are mixed in the heart; and the ſame that goes to the lungs is conveyed to all other parts of the body for their ſupply.

Yet the pulmonary are not the only arteries conveying blood to the lungs in reptiles: the ſerpents, at leaſt, offer an exception. The ramifications of the pulmonary artery are confined to that part of the lung, which has a reticulated internal ſurface. The poſterior part of the organ, compoſing the ſimple membranous bag, receives blood only from the arteries of the body. A part of the twigs that ſupply it comes from the branches of the poſterior aorta, which are alſo diſtributed on the ſtomach. Other very minute ones are detached ſucceſſively from the vertebral column. The veins correſponding to theſe arteries pour their blood into the vena cava. In this ſingular ſtructure, we find a part of the lung executing the office of the cells of birds; and a portion of the blood, very ſmall indeed, contained in the arteries of the body, is again ſubmitted to the action of the air.

That portion of the general ſerous membrane which covers the lung has nothing peculiar in reptiles.

The form and bulk of the organs vary much more in this claſs, than in the mammalia and birds. Both are determined in the mammalia by the cavity of the thorax; in birds, by the peritoneal cells, which limit them on one ſide, and by the ribs, which cover them on the other. In reptiles, on the contrary, nothing ſeems to limit their developement, nor to give them a peculiar figure. Commonly they form oval bags, which extend in the chelonians along the back to the pelvis, above all the viſcera; they are leſs extenſive in the ſaurians and batracians. The ſerpents have a ſingle very long lung, prolonged over the œſophagus, ſtomach, and liver, beyond the latter parts. In this ſituation it is expoſed to preſſure every time the animal ſwallows a large prey. Does this check the pulmonary circulation, and contribute to the torpor which ſerpents experience at theſe times?

In the cameleon, and the agame marmorata, each pulmonary ſac is very extenſive. They are divided into large conical appendices, prolonged as far as the pelvis, placed among the viſcera, and capable of holding ſo much air, as to increaſe the animals' bulk conſiderably when they are diſtended. The lungs of the ſiren lacertina are two long cylindrical ſacs, continued to the end of the abdominal cavity. In the larvæ of the ſalamander, there is a ſmall oval cavity, opening by a narrow canal in the fauces.

Branchiæ or Gills.—The firſt orders of reptiles (the chelonians, ſaurians, and ophidians) never poſſeſs this kind of reſpiratory organ: they have only lungs. The batracians in their firſt ſtate, and the proteus and ſiren during life, have both lungs and branchiæ, or rather branchial appendages (appendices fimbriati). See the anatomy of the tadpole, and that of the proteus and ſiren, at the end of this article.

Expanſive Power of the Lungs.—" A ſingular power," ſays Blumenbach, " characteriſes theſe viſcera in reptiles, and

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is a point, in which they exceed thoſe of the human ſubject, and of the other mammalia; namely, a particular kind of tone, or energy, by virtue of which, even when the cheſt is opened, and they are expoſed to the external air, they are ſtill diſtended and ſupport themſelves, while thoſe of the mammalia, when the ſternum is removed, and the thoracic cavities expoſed, allow the air to ruſh out, and collapſe. (See Morgagni Adverſar. Anat. 5, 29, and the elegant experiments on the tortoiſe by the Pariſian academicians; Hiſt. des Animaux, part ii. p. 194.) It is even aſſerted, that when the lung is compreſſed in a tortoiſe opened alive, it has the power of diſtending itſelf again. (Coiter Obſ. Anat. Chir. p. 127.) A tortoiſe, from whom the lower ſhell had been removed, the thorax conſequently being opened, and the lungs expoſed to the air, ſurvived for ſeven days. (Hiſt. des Animaux, juſt quoted.) The cauſe of theſe phenomena can only be found in the peculiar vital properties of the lungs; as it cannot be referred to contractility, irritability, or nervous influence. I have never been able to detect, in the lungs of amphibia, any more appearance of truly muſcular texture, than in thoſe of the mammalia, to which a modern author has too liberally aſſigned irritability. (Varnier in Hiſt. de la Soc. de Médécine, 1779.) The deſign of this peculiar vitality in the lungs of amphibia will appear very obvious, when we conſider that it exiſts in animals who have a very imperfect bony thorax, or none at all, or one in great meaſure incapable of motion. Such is the caſe with frogs and toads, who are entirely deſtitute of ribs; with nearly all the tortoiſes and turtles (excepting, perhaps, a few of the ſoft ſpecies), in whom the whole coverings of the trunk are immoveable, ſo that neither the thorax, nor the abdominal muſcles, can execute thoſe motions in reſpiration, which they perform in warm-blooded animals."

Mechaniſm of Reſpiration.—In this, as well as in other points, the ſeveral orders of reptiles differ from each other. The chelonians, whoſe ribs are in the form of large oſſeous plates, conſolidated to each other, and motionleſs, are, in effect, like the batracians, ſome of which have no ribs at all, while in others theſe bones are too ſhort, and too little ſuſceptible of motion, to be capable of aſſiſting in the proceſs of reſpiration. In all theſe animals, then, we can no longer regard theſe bones as the principal agents of the reſpiratory function. They alſo want the diaphragm, like all other reptiles. Conſequently the mechaniſm of reſpiration differs in them, in its eſſential points, from that deſcribed in the article Lungs, which belongs to the whole claſs of mammalia, where the reſpiratory organs, incloſed in a peculiar cavity, follow all the motions of that cavity.

In fact, it is now well aſcertained, that the batracian reptiles *ſwallow* air into their lungs. They cloſe the mouth, and dilate the throat, when the external air, ruſhing through the noſtrils, fills the empty ſpace. The ſterno-hyoidei, carrying the os hyoides downwards and backwards, are the great agents in this dilatation of the throat: the coraco-hyoidei aſſiſt them. When the former muſcles are cut, reſpiration ceaſes. The elevation of the os hyoides, principally by the ſtylo-hyoidei, contracts the cavity of the throat, and drives the air into the lungs. The eſcape of this air from the throat by the noſe is, no doubt, ſays Cuvier, prevented by a valve; but no ſuch ſtructure has been demonſtrated. The action of the abdominal muſcles, and perhaps a contractile power of the lungs themſelves, expel the air from theſe viſcera in expiration. Townſon, who has inveſtigated this ſubject moſt attentively (ſee his Obſervationes Phyſiologicæ de Reſpiratione Amphibiorum, 8vo. Vienna, 1798, with figures; alſo tranſlated into Engliſh in his "Tracts,") obſerves, that he does not know whether the muſcles extending from the glottis to the pubes ſhould be called oblique or not. They furround the lungs in their whole extent, and have a conſiderable compreſſive force. They probably conſiſt of different muſcles; their fibres extend more or leſs tranſverſely, and are therefore well calculated to produce the effect he has aſſigned to them. He ſtates that he has always ſeen the frog's lungs collapſe when the glottis was opened, whether the animal was dead or alive.

If the muſcles and the membrane of the throat are removed, leaving only the ſterno-hyoidei, the motions of the os hyoides, which take place in reſpiration, are continued, although reſpiration itſelf is deſtroyed. The latter effect is a conſequence of the deſtruction of the throat; no cavity can now be formed to receive the air, which the animal ſwallows in breathing. The os hyoides, however, is alternately depreſſed and elevated, and the glottis continues to open and ſhut, but the lungs are permanently collapſed. If all the muſcles employed in moving the os hyoides are cut, the glottis, whoſe muſcles are entire, is opened and cloſed. In the ſame way, when warm-blooded animals have received a large wound in the cheſt, they make vain efforts to breathe, and to get rid of the painful ſenſation of ſuffocation.

It will appear, from the preceding deſcription, that the frog's mouth muſt be ſhut when he breathes: and this is ſo ſtrictly neceſſary, that the animal periſhes from ſuffocation, if his mouth be kept open. Herholdt and Rafn aſſerted this in a communication to the Academy of Sciences at Copenhagen, and the point has been verified by Cuvier and Duméril. See Bulletin de la Société Philomatique, N° 30, an. 7. p. 43.

The ſame mechaniſm is employed in the chelonians. Deglutition is the only means they can employ for introducing air into their lungs. Having the mouth cloſed, they alternately contract and dilate the throat, like the batracians, and by the ſame powers. The air is expelled from the lungs by two pairs of muſcles, analogous to the abdominal muſcles. Theſe fill the poſterior interval between the ſternum and the back ſhell, in which the poſterior extremities are folded when at reſt. We perceive, at this part, in the chelonians, thoſe motions of contraction and dilatation, which are obſerved over the whole abdomen in the mammalia.

The firſt, or outer pair, correſpond to the external oblique muſcles: it is attached to the whole anterior edge of the pelvis, to the back and front ſhell, and is extended in the whole poſterior interval of theſe parts. The internal muſcle conſiſts of tranſverſe fibres, attached above to the poſterior half of the back ſhell, near the vertebræ, deſcending on the outſide of the viſcera, incloſing them, and terminating below in a middle aponeuroſis. The latter paſſes partly under the bladder, and will ſerve to evacuate that organ when the muſcles contract. They compreſs immediately only a ſmall portion of the lungs; but they preſs ſtrongly on the abdominal viſcera, and through the latter on the lungs, ſo as to expel the air. Perhaps, too, the lungs may contract by ſome powers of their own.

The mechaniſm of reſpiration, in the faurians and ophidians, is very analogous to that of birds, inaſmuch as this function is particularly executed by the motions of the ribs and of the abdominal muſcles. In moſt of the faurians, the ribs are perfectly ſimilar to thoſe of birds, conſiſting of two portions, united by a moveable articulation, and forming an angle, which is opened in inſpiration, and cloſed in expiration. The muſcles which put them in motion are analogous to thoſe employed for the ſame purpoſe in birds.

The ribs of ſerpents, forming ſimple arcs, compoſed merely

merely of an offeous portion, are inclined backwards, and brought near the vertebral column in expiration, and are extended in inſpiration. Elevators of the ribs, ſimilar to thoſe of man, but larger in proportion, produce the latter effect, in which they are aſſiſted by intercoſtal muſcles. The muſcles carrying the ribs backwards, and thus producing expiration, lie within the cheſt. They are fixed to the ſides of the vertebral column, and correſpond in number with the ribs. They are narrow and flattened, forming a kind of muſcular ribbons, paſſing from the vertebral column, over one rib, to be fixed in the next. Other muſcular ribbons are attached to the inſide of the ribs, deſcend to be joined together, and then extend acroſs, ending in a thin aponeuroſis, which unites the ribbons of each ſide. Theſe compoſe the abdominal muſcles, and compreſs the viſcera of the great cavity.

Reſpiration, which conſiſts in warm-blooded animals of a conſtant regular ſucceſſion of alternate inſpirations and expirations, hardly admitting even a very ſhort interruption, is performed in reptiles at irregular and long intervals, admitting of very long ſuſpenſion, and capable, therefore, in a much greater degree than in the former claſſes, of modification by the will of the animal. Hence Linnæus aſſigned a "pulmo arbitrarius," or voluntary power over the reſpiratory function, as a diſtinguiſhing attribute of the claſs. The difference, however, between the reptiles and warm-blooded animals is in the length of time for which they can do without reſpiration: after a longer or ſhorter interval, its renewal is equally neceſſary to both.

All reptiles continue breathing conſtantly as long as they are awake; and the turtles moſt frequently of all. It is well known that they cannot remain long under water; but are obliged, at ſhort intervals, to come to the ſurface for a freſh ſupply of air. Blumenbach obſerved water newts, when placed in a deep veſſel of water, ſwim up to the top frequently for the purpoſe of drawing breath.

"On the whole, however," continues Blumenbach, "reptiles cannot only go much longer without breathing than warm-blooded animals, but they can alſo continue unhurt in vitiated air for a much more conſiderable time.

"Tortoiſes have been known to live more than a month with their jaws tightly tied, and their noſtrils cloſed with ſealing-wax, (Mery, in Mem. de l'Acad. des Sciences, avant 1699, v. 2.) On the ſame point we may mention the puzzling, but ſufficiently authenticated inſtances, of toads found alive in the middle of ſolid trunks of trees, and even in maſſes of marble and other ſtones. (See Luidius in Lithophylac. Britann. p. 112. Le Cat in Allion du Lac, Melanges d'Hiſtoire Naturelle, v. 3. p. 95. Gentleman's Magazine, v. 26. 1756, p. 74. Guettard in Mem. ſur differ. part. des Sciences et Arts, v. 4. p. 615. Hiſt. de l'Acad. des Sciences de Berlin, 1782.) There are numerous citations in Haller, de Corp. Hum. Fabrica et Function. v. 7. p. 151, and Kaeſtner, in the Preface to the German verſion of the Stockholm Tranſactions, v. 3.

"Reptiles can alſo bear to breathe fixed and phlogiſticated air much longer than warm-blooded animals. In my experiments at the celebrated cavern of Pyrmont, I conſtantly found that pigeons could hardly be reſtored to life if their immerſion in that bath of carbonic acid gas was protracted into the ſecond minute. Frogs, however, recovered after ſtaying in it five, ſix, ſeven, and even nine minutes. The event of ſimilar trials, made in the famous grotto del Cane, near Naples, correſponds to theſe. (See Nollet, in the Mem. de l'Acad. des Sciences de Paris, 1750, p. 72. Murray, in the Swediſh Tranſactions, 1775, v. 36. p. 249.) Della Torre found that a toad lived for half an hour in that grotto, and that a newt was ſtill alive, after having been immerſed in this pernicious atmoſphere an hour and a quarter.

"Carminati has already ſhewn how much ſooner confined air proves fatal to warm-blooded animals, than to the amphibia. (De animalium ex mephitibus et noxiis halitibus interitu, p. 96.) When I have encloſed two ſparrows under one bell-glaſs, and two frogs under another of the ſame ſize, the former have periſhed in convulſions from the vitiated ſtate of their air, while the atmoſphere of the other glaſs had experienced ſo little change, that a candle or burning coals were not extinguiſhed by it." Specimen, p. 1.

The experiments of Boyle (Philoſ. Tranſ. 1670, N° 62.), and the Florentine academicians, which have been ſince moſt frequently repeated, have ſhewn that ſerpents, frogs, &c. can remain very long (from two or three to ten or twelve hours) under an exhauſted receiver.

The nature of the changes produced in the air by the reſpiration of reptiles, has been examined by Spallanzani (Rapports de l'air avec les etres organiſés, publies par Senebier, 3 tom. 8vo. Geneve, 1807); Mr. Ellis (Inquiry into the Changes produced on Atmoſpheric Air, &c. 1807, and Further Inquiry, &c. 1811,) and others. The latter author preſents us with a ſummary of all that has been aſcertained, as well as with experiments of his own; we, therefore, extract them in his own words from the works juſt quoted.

"To obtain a knowledge of the ſpecific changes which the air ſuffers by the reſpiration of the amphibia, the following experiments were inſtituted. A toad, ſupported on a ſmall hoop, was incloſed in one hundred and eight cubic inches of atmoſpheric air contained in a jar inverted over water, and ſtanding in a room varying from 55° to 60° Fahrenheit. He died on the fifth day. The water had riſen conſiderably in the jar, and the reſidual air was ſtill farther diminiſhed by agitation with lime-water, which it rendered turbid. Fifty parts, after being waſhed in lime-water, were next ſhaken in the eudiometer with the liquid ſulphuret of potaſſa, and loſt only one part of its bulk. The experiment was repeated by confining another toad, in the ſame manner, in another jar containing forty cubic inches of atmoſpheric air, inverted over mercury. Under the hoop which ſupported the animal, was placed a ſmall cup, containing 1.5 cubic inch of the water of potaſſa, which floated on the mercury. The whole was then ſet aſide in a room, of the temperature of 64°. By the twelfth hour, the mercury had riſen nearly half an inch into the jar, which was thickly moiſtened with vapour, and the breathing of the animal ſeemed rather languid: by the twenty-firſt hour, he breathed very faintly; and, by the twenty-fourth hour, he had ceaſed to breath. The jar was allowed to ſtand ſome hours, at the end of which time the mercury ſtood about eight-tenths of an inch high, and one-tenth of an inch of fluid was depoſited on its ſurface. The jar was now raiſed, and diluted ſulphuric acid being poured into the alkaline ſolution, excited in it a very briſk effervescence. It is inferred, therefore, from theſe experiments, that the oxygenous portion of the air almoſt entirely diſappears during the reſpiration of theſe animals, after which they ceaſe to breathe; and that a large portion of carbonic acid is at the ſame period produced.

"Proceeding on the ſuppoſition, that the loſs in the bulk of air, evinced by the aſcent of the mercury, in the laſt of the foregoing experiments, aroſe from the attraction of the carbonic acid by the alkaline ſolution, we endeavoured to aſcertain the proportion which this loſs of bulk bore to that of the whole air originally employed. With this view a frog was procured, and placed in a jar of the capacity of forty cubic inches. Under the hoop which ſupported

ported him, about half way up the jar, was placed a ſmall cup, containing one cubic inch of the water of potaſſa; and the jar being then filled with atmoſpheric air, was inverted into a diſh of mercury, and kept ſteady by a weight preſſing upon it. In the room in which the animal was placed, the barometer ſtood at 29.2 inches, and the thermometer at 61°. At the end of twenty-nine hours, the animal was reſting quietly on the hoop, with no appearance of diſtreſs, and the mercury in the jar, when that in the diſh was brought to a level with it, had riſen ſix-tenths of an inch. In twenty-four hours more, the frog was ſtill alive: his reſpiration ſeemed now to labour, and he roſe often to the top of the jar, as if deſirous of eſcaping, or of obtaining freſh air: the mercury had now riſen to 1.15 of an inch. From this time, the difficulty of breathing continued to increaſe, and, at the cloſe of the fifty-ninth hour, from the commencement of the experiment, after having lain quiet for a conſiderable time, he gave a convulſive ſtruggle, and moved no more. The mercury in the diſh was now brought to a level with that in the jar, and its height was 1.2 of an inch. The barometer, at this period, was 29.8, and the thermometer 65°.

"In order to examine the reſidual air, we plunged the diſh under water, which riſing into the jar, diſplaced the mercury, and the cup, with its ſolution, was then withdrawn under water. The reſidual air ſuffered no diminution by being ſhaken with lime-water, nor by contact with phoſphorus, but it loſt rather more than $\frac{1}{100}$ by agitation with the liquid ſulphuret of potaſſa. The jar originally held forty cubic inches, but the animal, with the hoop, cup, and ſolution, occupied a ſhare equal to four, ſo that the actual bulk of air employed was 36 cubic inches. Having placed the jar on its bottom, water, to the quantity of 27 cubic inches, was poured in till it reached the point to which the mercury, during the experiment, had riſen; and this, therefore, indicated the volume of reſidual air: it then required nine cubic inches more of water to fill the jar completely, which, conſequently, was the bulk of air that had diſappeared. Hence, therefore, we have $\frac{27 \times 29.8}{29.2} = 27.5547$, but $\frac{4 \times 27.554}{483} = 22819$ and $27.554 - .22819 = 27.32651$, the corrected volume of air at the cloſe of the experiment. But farther, $36 - 27.32651 = 8.67349$, and $\frac{8.67349}{36} = \frac{1}{4.15}$, ſo that the diminution of bulk which the air ſuffered in this experiment is rather greater than $\frac{1}{4.54}$, the proportion of oxygen gas which the atmoſphere contains. In a ſecond experiment, another frog lived in the ſame volume of air about 60 hours, and the diminution which it ſuffered, after making the neceſſary reductions, amounted to $\frac{1}{4.868}$ of the whole. Where the carbonic acid, formed by the reſpiration of another frog, was ſuffered to remain, the jar, after the death of the animal, adhered firmly to the ſaucer in which it was inverted, and, when cautiouſly elevated, the ſurrounding mercury ruſhed in; and occupied only about one-tenth of the ſpace which it filled in the above-mentioned caſes: the inferences deducible from theſe facts, inſtruct us, that the diminution which atmoſpheric air ſuffers by the reſpiration of theſe animals, bears a near proportion to the oxygen gas which it contains, when all the carbonic acid is removed: and as a ſmall loſs of bulk likewiſe takes place when this acid is allowed to remain, we muſt aſcribe a part of the obſerved diminution to the neceſſary loſs which always accompanies the converſion of oxygen gas into carbonic acid.

"It follows from the preceding ſeries of experiments, that the oxygenous portion of the air is changed by the reſpiration of amphibious animals in the ſame manner as by that of the other claſſes, carbonic acid, in proportion thereto, being, in all caſes, produced; and that when the whole, or nearly the whole, of that gas is ſo changed, the animal no longer ſurvives. But, if the animal die when all the oxygen gas is changed, and all the air that has diſappeared when the carbonic acid is removed, be oxygen gas, then the bulk of air that remains, and is unchanged, muſt conſiſt wholly of nitrogen gas; and as this nitrogen gas, joined with the oxygen gas that has diſappeared, makes up the whole bulk of air originally employed, it follows alſo, that, while the oxygen gas of the air has diminiſhed and ſuffered change, the nitrogenous portion has continued undiminiſhed and unaltered.

"During all theſe changes operated on the air contained in water, by the reſpiratory functions of aquatic animals, the water itſelf ſeems to ſuffer little or no alteration. Mr. Carliſle took ſeparate glaſſes, each containing one pound of diſtilled water, which was previouſly boiled to expel all its air, and then inverting them over mercury, he put into them one gold fiſh, one frog, two leeches, and one freſh-water muſcle. The animals were confined ſeveral days in theſe ſituations, and expoſed to the ſun during January, in temperature 43° and 48° Fahrenheit; but no air-bubbles were produced in the veſſels, nor was there any ſenſible diminution of the water. The frog died on the third day, the fiſh on the fifth, the leeches on the eighth, and the muſcle on the thirteenth day. This experiment was made to aſcertain the changes produced in water by the reſpiration of aquatic animals; but the water had not undergone any chemical alteration. See Croonian Lecture in the Philoſ. Tranſ. 1805." Inquiry, p. 83—88.

Mr. Ellis adduces ſome additional evidence in his Further Inquiry. "The experiments already detailed in the former work clearly prove, that frogs and toads which belong to this claſs, entirely convert, by reſpiration, the oxygen gas of the air into nearly an equal bulk of carbonic acid, without producing any change in its nitrogenous portion. Dr. Carradori alſo diſcovered, that theſe animals lived much longer when they were immerſed in water that had a free communication with the atmoſphere, than when the air was excluded. (Phil. Mag. vol. 16. p. 245). According to Spallanzani, frogs die ſooner in boiled, than in common water. In their reſpiration, they conſume oxygen, and form carbonic acid. Thoſe which have been recently fed, conſume more of this gas than thoſe which have ſuffered a long abſtinence. Under great cold they become lethargic, but their heart ſtill continues to beat, and they ſtill, in a ſmaller degree, continue to change the air; but the conſumption of oxygen increaſes with the increaſe of temperature. Theſe animals alſo change the air by their ſkin, as well as by their lungs; and act upon it after death, and under putrefaction. (Rapports, &c. tom. i. p. 468.) The ova of frogs were likewiſe found to require air to carry on their evolution. Small tadpoles, while yet attached to the egg, were confined in veſſels half filled with water, while the other half contained air, or oxygen or nitrogen gas. Thoſe in the two former veſſels were perfectly developed, and became large enough to ſwim about; but thoſe confined with nitrogen periſhed. Rapports, &c. tom. i. p. 466.

"Spallanzani extended his experiments to many other ani-

mals of this claſs, and obtained ſimilar reſults. Different ſpecies of ſerpents he found to die in hydrogen gas, or when confined under water, but to live in common air, and convert its oxygenous portion into carbonic acid. They became lethargic from cold, and the heart then beat very ſlowly, or not at all, the reſpiration was then alſo ſuſpended, and little or no effect was produced in the air. The ſkin of theſe animals acted upon the air, as well as the lungs (Rapports, &c. tom. i. p. 249.); and when the blood was reddened by expoſure to the air, its oxygen alſo diſappeared, and carbonic acid was produced. (Rapports, &c. tom i. p. 239. 263.) Similar reſults were obtained in experiments on the reſpiration of vipers, tortoiſes, lizards, and ſalamanders. Rapports, &c. tom. i. p. 275. 287. 295. 353.

"The preceding facts ſufficiently ſhew, that various animals in all the foregoing claſſes, and in every ſtage and form of their exiſtence, require the preſence of oxygen gas to maintain the functions of life; that this gas, by the exerciſe of theſe functions, is converted into carbonic acid; and that the degree in which this converſion proceeds, depends much on the healthy condition of the animal, and the vigour of its circulating ſyſtem. Since, alſo, in every inſtance where the experiments have been made with the requiſite accuracy, the bulk of carbonic acid produced, nearly or exactly equalled that of the oxygen which diſappeared, we may conclude, from analogy, that ſuch is univerſally the extent to which this change in the air takes place in animal reſpiration; and ſince, farther, the nitrogen gas of the air appears to ſuffer no neceſſary change in the exerciſe of this function, we may alſo conclude, that as far as regards the air, the ſubſtitution of an equal bulk of carbonic acid for the oxygen gas that is loſt, compriſes the only eſſential change which the atmoſphere experiences during the performance of this animal proceſs." P. 269—272.

Vital Temperature.—"Since the reſpiratory organs," ſays Blumenbach, "may, with great probability, from the numerous inveſtigations and diſcoveries of the moderns, be regarded as the principal ſource of animal temperature, we follow a natural arrangement in paſſing from the conſideration of their ſtructure and functions, to a ſhort view of the differences between the natural heat of reptiles and warm-blooded animals.

"Animals, whoſe lungs are moſt compact, receiving the greateſt ſupply of blood, and furniſhed with all the apparatus neceſſary for ſending the whole circulating maſs through the minor circulation, are obliged to keep up the reſpiratory proceſs uninterruptedly from the time of birth, expelling, inſtead of the pure aerial fluid which they inſpire, a noxious air, which corrupts the ſurrounding atmoſphere if confined, poſſeſs a high natural temperature, about the 98th degree of Fahrenheit's ſcale in man, rather higher in ſome mammalia, and particularly in birds. In reptiles, on the contrary, poſſeſſing lungs of a rare and looſe texture, with comparatively ſlender ſupply of blood, reſpiration is irregular, interrupted, and in ſome meaſure arbitrary; they very ſlowly vitiate confined air; and exhibit a temperature exceeding, by a few degrees only, that of the ſurrounding atmoſphere. One or two degrees, I ſay, according to the reſults of accurate obſervation on tortoiſes (Walbaum Chelonograph. p. 26.): for my own experiments on amphibia have not exhibited reſults ſufficiently conſtant to allow me to draw any certain inference from them." (Specimen, &c. p. 18.) Braun, indeed, has aſſerted, in the Nov. Comment. Acad. Petrop. t. 13. p. 427, that frogs poſſeſs only the temperature of the ſurrounding medium; but the facts which we ſhall advance preſently, completely diſprove this aſſertion.

The power which modern inveſtigations have proved warm-blooded animals, and more particularly the human ſubject, to poſſeſs in ſo high a degree, of being able to endure expoſure to heat much above the natural temperature of the body, without having their own heat increaſed; and, on the contrary, of bearing, with equal facility, the moſt intenſe cold, is not withheld from the amphibia, as is proved by the facts which we have related, in order to ſhew the tenacity of life in this claſs. It is not, indeed, clear in theſe caſes, as in the experiments, of which man and different mammalia have been the ſubjects, that the reptiles, when expoſed to a degree of heat greater or leſs than their own, have maintained their own temperature at an uniform ſtandard; on the contrary, indeed, it ſeems that in a great cold their heat is abſtracted, and they become frozen; and it will alſo be ſeen, from facts to be brought forward preſently, that their heat is variouſly changed under different circumſtances. Now we know that the temperature of the mammalia is not raiſed beyond its natural level by expoſure in an atmoſpheric medium of 280° Fahr. (ſee Tillet in Mém. de l'Acad. des Sciences, 1764); and that its ſtandard is equally undiſturbed, when the atmoſphere is below the freezing point of mercury. (See HEAT, *Animal*, and MAN.) We may therefore ſafely aſſert that man and the mammalia very far exceed reptiles in the power of reſiſting either great heat or cold; that is, of maintaining a ſtandard temperature under the action of a ſurrounding atmoſphere, conſiderably exceeding or falling ſhort of their own temperature. The following ſummary of facts, concerning the temperature of reptiles, is taken from Mr. Ellis's Inquiry.

"Amphibious animals exhibit a great variety in the ſtructure of the reſpiratory organs, and, conſequently, in the degrees of animal heat. Frogs and land tortoiſes poſſeſs a temperature about five degrees higher than that of the medium they inhabit, according to Dr. Martine. The ſame may be ſaid of ſea tortoiſes, toads, vipers, and all the ſerpent kind, all of whom have lungs of the ſame fabric and the ſame cold conſtitution of body. (Eſſay on Thermometers, p. 142.) Mr. Hunter obſerved that the frog and toad were about four or five degrees warmer than the atmoſphere when it was at 35° or 36°; and that, ſome hours after death, they gradually fell down to the temperature of the ſurrounding air. (Treatiſe on the Blood, p. 298.) The difference of temperature appears to increaſe in a warmer atmoſphere; for Mr. Carliſle kept three frogs for many days in an equable atmoſphere of 54°, and their ſtomachs preſerved a temperature of 62°. (Philoſ. Tranſact. 1805, pt. 1.) In an atmoſphere of 58°, Mr. Hunter found the thermometer, introduced into the ſtomach of a healthy viper, to ſtand at 68°; but, after the animal was put into a pan, and the pan into a cold mixture of 10°, where it remained about ten minutes, the heat was reduced to 37°, and, in twenty minutes more, to 31°, nor did it ſink lower; its tail now began to freeze, and the animal was very weak. A frog alſo, whoſe temperature was 44°, when put into a cold mixture, ſoon fell down to 31°; and beyond this point it was not poſſible to leſſen the heat without deſtroying the animal. (Obſ. on the Animal Economy, p. 104.) A toad being placed in cold water, juſt deep enough not to cover his mouth, the whole was put into a cold mixture between 10° and 15°. The water froze around the toad, and, as it were, cloſed him in, but he did not die, and therefore was not frozen. Why the animals, mentioned in theſe experiments, died before they were frozen, while thoſe which are

expoſed to the atmoſphere, in very cold climates, do not die, is a point which Mr. Hunter does not pretend to determine; not knowing the difference, he ſays, between the effects of a natural and artificial cold. Ibid. p. 89, 90.

"The experiments of Mr. Hunter farther prove that the temperature of moſt of the foregoing animals not only falls rapidly in a colder medium, but that it riſes more quickly in a warmer one than that of thoſe which poſſeſs a higher ſtandard temperature. In the ſtomach of a frog, the thermometer roſe from 45° to 49°; the animal was then placed in an atmoſphere made warm by heated water, where it remained for 20 minutes, and upon introducing the thermometer again into the ſtomach, the mercury roſe to 64°. (Ibid. p. 90.) A healthy viper was put into an atmoſphere of 108°, and, in ſeven minutes, the heat of the animal, both in the ſtomach and anus, was found to be 92°.5, beyond which it could not be raiſed in the above heat. An eel, very weak, whoſe heat was 44°, which was nearly that of the atmoſphere, was put into water heated to 65°, for fifteen minutes; and, upon examination, it was of the ſame degree of heat with the water. The heat of a tench was, in ten minutes, raiſed from 41° to 55°, both in the ſtomach and rectum, by being put into water at 65°.

"He found alſo, that a living and dead tench, and a living and dead eel, put together into warm water, received heat equally faſt; and when they were expoſed to cold, both the living and the dead admitted the cold likewiſe with equal quickneſs. (Ibid. 104, 105.) Hence, therefore, the animal heat, in all the claſſes of animals hitherto mentioned, whether they inhabit the air or the water, ſeems to follow nearly that of the medium in which they are placed; and their ſtandard temperature cannot, in conſequence, be reſtricted to any fixed point, but muſt be conſidered always in relation to that of their ſurrounding medium.

"Notwithſtanding, however, the low degree of heat which theſe ſeveral claſſes of animals poſſeſs, hardly, in ſome inſtances, exceeding that of the medium in which they live, yet this ſmall exceſs is a proof that they poſſeſs, within themſelves, a power of producing heat. The loſs of heat which inſects ſuffer under cold, the fall of temperature which many of the vermes claſs undergo from the ſame cauſe, the melting of ſnow by the heat of fiſhes, and the decline of animal heat which the amphibia, when expoſed to great cold, experience, all demonſtrate that the ſurrounding medium, whether it be air or water, is conſtantly drawing off their heat, which renders neceſſary as conſtant a re-production of it." P. 218—221.

The great ſize and beautiful ſtructure of the lungs of reptiles lead us to conclude that they are very important organs in the economy of theſe animals, although their uſes and relations are not yet all ſatisfactorily aſcertained. It ſeems tolerably certain, that beſides their office as reſpiratory organs, they render the body lighter for ſwimming in many inſtances: in this point of view they may be compared to the ſwimming bladder of fiſh. It is by the inflation of its large lungs, that the cameleon can diſtend its body ſo remarkably.

"The lungs, too," ſays Blumenbach, "are ſubſervient in many reptiles to the production of ſound;—I ſay in many, becauſe ſome ſpecies, even of our reptiles, are, ſo far as I know, completely dumb: *viz.* the ſalamander, lacerta agilis (green lizard), and anguis fragilis (blind-worm); and others utter ſound very rarely, and only when in great danger, as the water newts; reſembling, in that reſpect, the mole and hare, which do not cry out until great violence is offered them.

"It has been reported that ſome mammalia loſe their voice in particular ſituations, as dogs in certain parts of America: the ſame thing has been reported of reptiles, for example frogs, which G. F. Müller found to be dumb in many regions of Aſiatic Ruſſia. Sammlung Ruſſiſcher Geſchichten, vii. p. 123." Blumenbach, Specimen, &c. p. 15.

Organs of Voice.—The larynx, varying in different genera, as in the other claſſes, has theſe characters in common; *viz.* that it has no epiglottis, and is compoſed of pieces analogous to thoſe of the upper larynx of birds. This is the only vocal organ; there is never an inferior larynx, as in birds. The voice cannot be modified by lips or velum palati, ſince they do not exiſt. The degree of aperture of the mouth, and the motions of the tongue, are alone capable of modifying the action of the larynx.

The cartilaginous ſkeleton of the crocodile's larynx contains five pieces: a nearly ſquare plate, compoſing all the under ſurface of the cavity. Two circular pieces or handles, fixed near together at one end, in the middle of the front edge of the plate, and at the other, in the middle of the ſide. Their body is a little evelated above the ſquare plate, and leaves on each ſide, between it and that plate, a membranous hollow. The anterior extremity of each piece forms a lateral and vertical prominence, conſtituting a kind of pillar under the glottis. To the poſterior external angle of this plate, a branch is fixed on each ſide; theſe join together above, and form, with the back edge of the plate, a complete ring, which is the beginning of the trachea.

The glottis is merely membranous, extending from the junction of the two laſt-mentioned branches to the middle of the os hyoides, where the membranes compoſing it are attached. There are neither ventricles nor chordæ vocales. Two muſcles act on this apparatus. One comes from below the great plate, ſurrounds the larynx, aſcending obliquely backwards, and joins the correſponding muſcle of the other ſide behind the glottis, which it has the power of cloſing. The other comes from below the back edge of the ſame plate; decuſſates the former, aſcending obliquely forwards, and is fixed to the edge of the glottis, which it opens. The firſt half of the glottis correſponds then to the broad and flat cavity of the larynx; the ſecond, beginning from the two pillars in front, is merely a long and narrow ſlit. It is only in ſtriking againſt the two pillars, that the air can produce a whiſtling noiſe, if indeed any ſuch be produced at all.

The glottis of the crocodile of the Orinoco, ſays Humboldt, is ſurrounded by a thick fleſhy ring with circular fibres, which the animal can contract to ſuch a degree, that the ſlit or opening of the trachea cannot be diſtinguiſhed. The glottis reſts on a round and flat cartilage, analogous to the thyroid of mammalia. The upper part of the trachea preſents a ſingular ſtructure, which we mention here, becauſe it ſeems ſubſervient to the production of ſound. The firſt nine cartilages are not complete rings, but are joined together above by a tranſparent, very fine and tenſe membrane. (See Humboldt Recueil d'Obſervations de Zoologie et d'Anatomie comparée, t. 1. pag. 11. pl. 4.) Geoffroy obſerved ten annuli thus united in the Nilotic crocodile; Duverney ſixteen, in a crocodile diſſected at the Academy of Sciences, and the Jeſuit Miſſionaries in Siam a larger number. To this membrane, ſtretched like the parchment of a drum, and thrown into vibrations by the air, the deep and terrific howlings or bellowings of theſe dangerous reptiles are aſcribed; the glottis being at the ſame time cloſed by its muſcular ring. Annales du Muſeum, t. 2. p. 46.

In the iguana, the pillars are ſcarcely more prominent within than the reſt of the parietes; the glottis is very

ſhort,

ſhort, and the inferior plate goes forwards and becomes broader, being turned up to form the rudiment of an epiglottis.

The ſame ſimplicity of ſtructure prevails in the tupinambis, the common lizard, the tortoiſes, and ſerpents; an inferior plate, and two lateral pieces narrowing a little the edges of the glottis. Theſe animals can only be capable of producing hiſſing ſounds.

The mud tortoiſe has, at the bottom of its organ, a rounded depreſſion, which is not ſo well marked in the turtle; but it has not any vocal chords. In a great land tortoiſe of Madagaſcar, there is a triangular membranous criſta, attached to the lower part of the larynx, and aſcending in the glottis, which it divides into two. This is analogous to a ſtructure very common in the upper larynx of birds. The edges of the glottis are flat, ſharp on the outſide, and touch completely.

In the ſcink, the edge of the glottis is turned a little inwards to form a tenſe membrane, directed backwards.

In the cameleon there are pillars, nearly as in the crocodile, but they are each furniſhed with a tenſe membrane directed backwards, and very fit for vibration. In front of them, on each ſide, a fleſhy protuberance is obſerved, contracting the glottis, which is very ſhort, and terminating in front by a tranſverſe ſlit. But the moſt remarkable circumſtance about the larynx of the cameleon, is a ſmall membranous ſac opening below, between the inferior plate of the larynx, and the firſt ring of the trachea.

Neither the iguanas nor the dragons poſſeſs a ſimilar ſac, although we obſerve in them goitres on the outſide: theſe prominences have no relation to the vocal organs.

The frogs, which are ſo noiſy, have a larynx ſuitable to this character in the ſize and prominence of its vocal chords. The inferior plate of the larynx is a ſlender tranſverſe branch, bearing on each ſide a large ring, which is the origin of the bronchus; for, in theſe animals there is no tracheal tube. On the front of the tranſverſe branch, two oval pieces are articulated, convex externally, and concave internally, ſo as to reſemble kettle-drums. On the lower edge of each a membrane is ſtretched internally, which oppoſes at right angles the courſe of the air. The edge of this membrane forms the chorda vocalis, which is conſequently more iſolated than the cartilages, and freer than in any other animal. Above it is the opening of the ventricle of the glottis, occupying all the concavity of the kettledrum cartilage. The upper edge of this cartilage forms the margin of the glottis properly ſo called. Vicq' d'Azyr conceived that the ventricles communicate by their bottom with the bronchi, and thus aſcribed three openings to the larynx of frogs: but this is a miſtake.

Beſides this apparatus, which is extremely ſonorous, male frogs have two bags, each of which opens by a ſmall hole, not in the larynx, but in the bottom of the mouth, at its ſides. They paſs under the arch of the lower jaw, to make a prominence under the ſkin on each ſide under the ear. Theſe bags are diſtended when the frogs are croaking. They are covered by a muſcular tiſſue capable of compreſſing them. The female frogs, and toads of both ſexes, and the tree-frogs, are deſtitute of the bags; but the latter have a ſimple ſac under the throat. In this larynx there is a muſcle on each ſide to ſeparate the oval cartilages; and a tranſverſe one in front, paſſing between them, and calculated to approximate them. For repreſentations of theſe laryngeal ſacs in the frog, ſee the German collection of Camper's ſmaller writings, vol. 1. pt. 1. pag. 144. tab. 3. fig. 1—4. Vicq d'Azyr has repreſented the rima glottidis of the tortoiſe, frog, and ſerpents, in the Memoires de l'Acad. des Sciences. 1779, tab. 13; and Tyſon that of the rattleſnake, in the Philoſ. Tranſ. vol. 13. The chordæ vocales, too, are larger in the male than in the female frog.

Voice of Reptiles.—The tortoiſes and turtles are ſaid to have the power of producing a more or leſs ſtrong hiſſing, when affected by any lively feeling; but we do not know of any very clear and ſatisfactory teſtimony on the ſubject. Pliny's obſervation about the ſnoring of turtles when floating aſleep on the water, has not been confirmed. The large iguanas utter ſharp whiſtling or hiſſing ſounds as they run about the tops of trees. Several ſerpents hiſs, and the large ſpecies very loudly. The noiſe made by the tail of the rattleſnake is not a vocal ſound, but produced by a peculiar organ, which we ſhall deſcribe.

Daudin aſſerts, that ſalamanders produce two kinds of feeble ſound out of the water; the firſt is a low ſound, produced in the throat, which they ſwell for that purpoſe; the ſecond conſiſts in a ſlight ſtriking of the two lips together, without any motion of the throat.

According to the traveller Bartram, crocodiles produce moſt prodigious noiſes. The ſound is terrific, particularly in the ſpring, when theſe dangerous animals copulate. The noiſe reſembles diſtant thunder, ſhaking the country and making it re-echo far and wide. When they are thus bellowing by hundreds and thouſands at a time, we might ſuppoſe, ſays Bartram, that ſome violent ſhock agitates the globe, and ſkakes it to its very foundations. He alſo ſtates, that when they ſtrike their jaws together they make a ſurpriſing noiſe, like that of a heavy plank forcibly beaten againſt the ground.

Humboldt ſays that the young crocodiles make a noiſe like cats; and that they utter very piercing cries, juſt after eſcaping from the egg, if attacked by a dog. He never heard any vocal ſound produced by the old crocodiles; although he lived among them five years, and the fire often attracted them within a few paces of the tents at night. The Indians aſſerted that the crocodile makes a noiſe like that of a cow; that its voice is very terrific, but ſeldom heard, and ſometimes juſt before an earthquake, the approach of which they are ſaid to diſcern. Recueil d'Obſ. de Zool. et d'Anat. Comp. p. 11.

Organs of the Generative Functions.—There is a very cloſe analogy in the ſtructure of theſe parts between reptiles and birds: in both claſſes there is a cloaca, that is, a cavity common to the generative organs, the feces, and the urine; in both the male has teſticles incloſed in the abdomen, while the female organs conſiſt of ovaries and oviducts. The young being leaves the mother in the form of a ſmall egg, which is generally developed out of the body. The generative proceſs, however, in many inſtances, exhibits in this claſs very ſtriking peculiarities.

Male Organs.—The teſticles: the ſituation and ſtructure of theſe glands in the three firſt orders are very analogous to thoſe which they have in birds. They are conſtantly found in the abdominal cavity, united to the inferior ſurface of the kidnies (in the chelonians), in front of the latter viſcera on each ſide of the vertebral column (in the ſaurians and ophidians), or immediately under their anterior portion (in the batracians). Their form varies in the different genera; they are ſeparated, in the ſalamanders, into two ſpherical bodies, placed one before the other.

The kidney, teſtis, and epididymis, lie cloſe together in the teſtudines, according to Blumenbach; but each of the three organs may be diſtinguiſhed by its peculiar colour and ſtructure on the firſt view. There is much obſcurity in the different deſcriptions of the male organs in the turtle and tortoiſe. Schneider has collected the various obſer-

vations on this ſubject in his natural hiſtory of the genus teſtudo.

Their ſubſtance exhibits, in the tortoiſes, large faſciculi, of which the diviſions paſs in various directions, united by cellular tiſſue: theſe faſciculi are fine, cylindrical, and eaſily ſeparable in the lizards. In the crocodile, according to Geoffroy, the teſtes are like thoſe of fiſh, narrow and elongated, and lying above and in front of the kidnies (probably more correctly in front of and below theſe glands). In the batracians we can diſtinguiſh merely an agglomeration of ſmall white grains interſperſed with blood-veſſels. No corpus Highmori can be diſcerned.

Yellow appendages, conſiſting of a fatty ſubſtance ſurrounded by a membrane, and floating in the abdomen, are connected to the front end of the teſtes in the frogs and toads.

The *epididymis* of the chelonians is a packet made up by the convolutions of a large canal (the vas deferens), which is tortuous in its whole courſe, and ends in the cloaca at the part correſponding to the baſis of the penis and its canal. It forms, in the lizards, a detached body, large and pyramidal, larger than the teſticle, adhering to it only by a ſmall thread, and evidently made up entirely of the convolutions of the vas deferens. The latter paſſes along the outer edge of the kidney to the cloaca, in which it opens.

In the crocodile the ſemen is conveyed into two veſiculæ of conſiderable ſize, contiguous to each other, placed at the back of the common cloaca, and partly included in a cartilaginous ſac. They open into the cloaca by ſix or ſeven holes on each ſide, arranged in a circular form round the meatus urinarius. Geoffroy. If theſe are veſiculæ ſeminales, it is the only example we know among reptiles of ſuch organs.

The teſtis is long and ſlender, and the relative bulk of the epididymis is leſs in the ophidians; it ſoon changes into a vas deferens, alſo very tortuous, opening in this, as in the preceding orders, into the cloaca. In the latter only the canals are inſerted in a papilla, which has been incorrectly deſcribed as a penis. A more minute account of theſe organs in the viper, may be ſeen in Charas, Deſcription Anatomique de la Vipère.

Veſiculæ Seminales.—There is no reſervoir analogous to the veſiculæ ſeminales properly ſo called, nor to the acceſſory veſiculæ of ſome mammalia in any of the other claſſes of vertebral animals. They have been ſpoken of in the viper and the batracians, as well as in ſome birds; but it ſeems that a ſimple dilatation of the vas deferens has been miſtaken for them. Poſſibly future reſearches may ſhew that the arrangement mentioned above in the crocodile conſtitutes an exception to this remark. This is the ſtatement of Cuvier. Blumenbach ſpeaks of large veſiculæ ſeminales in the frog, which are wanting in the toad. § 324. (See Roeſel Hiſtor. Ran. Noſtr. tab. 5, 6, and 21.) Charas, in his deſcription of the viper, ſpeaks of two reſervoirs connected with the vaſa deferentia, and always full of a fluid, like that of the teſticles, under the name of veſiculæ ſeminales.

The ſecretion of the teſticles, as obſerved by Spallanzani in the frog and toad, was a tranſparent fluid like water. From the parts, which he calls veſiculæ ſeminales, of the frog, he could procure at the time of copulation from two to three grains of this fluid. In the water newt it was, in colour and conſiſtence, like thick milk. He could not diſcover in it any remarkable ſenſible property—nothing pungent—nothing acid or alkaline. (Diſſertations, v. 2.) He alſo found the ſeminal fluid, both of the frog and newt, to abound with the living vermiculi. Tracts, v. 1. p. 300 and 301.

Organs of Copulation.—There are two ſpecies of union between the male and female. In the greater number there is a male organ introduced into the body of the female, and conveying the fecundating liquor: but in the batracians, which have no male organ, there is merely a conjunction of their bodies, it is a prehenſion by the male rather than a true copulation.

In the males of thoſe batracians which copulate thus, there is a peculiar organiſation of the ſkin of the hand. Firm tubercles, compoſed of hard, blackiſh or brown papillæ, cover not only the thumb, but alſo the palm of the hand. Theſe being preſſed into the ſkin of the female, give the male a very firm hold. They diſappear after the ſeaſon of copulation, and are not ſeen again until that ſeaſon recurs. The copulation of the frog kind is effected in the following way: the male aſcends the back of the female, paſſes his front limbs under her axillæ, and carries them round the cheſt, until the fingers croſs in front. He continues graſping her firmly in this way until the laying is finiſhed. The poſterior part of his body paſſes beyond that of the female, ſo that he can fecundate the eggs as they are expelled, and he is ſaid to aſſiſt in that operation. They remain joined for ſeveral days, and the graſp of the male is ſo firm, that great force is neceſſary to ſeparate him. Contuſion and laceration of the breaſt, and even the death of the female, ſometimes follow the violent ſtraining of the male. (See Spallanzani's Diſſertations, vol. i. p. 17.) The males are more brilliant at the ſeaſon of copulation, which takes place only once a-year, in the early ſpring; they inflate their vocal bladder more frequently, and indulge in their croaking noiſe. In the ſalamanders a creſt, with divided edge, appears on the back and tail, and is afterwards, in great meaſure, loſt.

The duration of copulation in the frogs is inverſely proportional to the warmth of the atmoſphere. When this is conſiderable, the female will be free in five or ſix days; but, in a cold ſeaſon, the embraces of the male continue for eight or nine days. The ſeaſon of re-production is the beginning of ſpring: in the very firſt days, the frogs begin to ſtir themſelves in our marſhes and ponds: they copulate, lay and fecundate their eggs very ſoon. At the ſame ſeaſon, the tortoiſes, lizards, and ſerpents, accompliſh the ſame proceſs. Sometimes frogs are found united even before the froſts have ended. Daudin found two frogs in copulation in the middle of February, the thermometer of Reaumur at 3° above zero; it deſcended in the night to 4° below 0; and the pond was frozen for two days; at the end of which time the female began to lay. Hiſt. Nat. des Reptiles, vol. i. p. 207, 208.

One of the toads, on which Spallanzani made his experiments, copulates in the beginning of March or end of February, before all the ſnow is melted; the proceſs laſts ten, twelve, fourteen, or even twenty days, if the ſeaſon be cold. Spallanzani, ch. 3.

The abdomen ſwells greatly in both ſexes during copulation; in the female, from the enlargement of the ova; in the male, from the depoſition under the ſkin of a very limpid water, which diſappears after the laying.

The tree-frogs, at leaſt that of Europe (hyla viridis) do not copulate like the frog and toad. The male fixes himſelf on the female, by merely applying his anterior paws under her axillæ, and employing the tubercles of the fingers. He remains in this ſituation for twelve or fifteen hours, or even, according to Roeſel, three days.

The ſalamanders do not copulate at all; the male places his head on that of the female, and diſcharges the ſeminal fluid, which is received by the female organs. See Spallanzani,

zani, Diſſ. vol. 2; and Latreille, Hiſtoire Naturelle des Salamandres de France.

Penis.—The chelonians have one; moſt of the ſaurians, and the ophidians, have two; and the batracians none. There is a papilla in the cloaca, in place of the penis, but none in the toad.

The relative ſize of the organ is more conſiderable in the chelonians than in the mammalia and birds. It is long, nearly cylindrical, and expanded at the end, which terminates in an obtuſe hook-like point, ſomewhat reſembling the end of the elephant's trunk. A deep groove runs along the whole upper ſurface of the member, and is even deeper near the glans. It terminates on the broad expanded end of the latter, by an orifice divided into two by a papilla. The approximation of its edges converts this groove into a canal: it ſupplies the place of the urethra. This penis is compoſed of two corpora cavernoſa, confounded together in a part of its extent. They begin by two vaſcular ſwellings analogous to the bulb of the urethra: their tiſſue is continued into two canals, of which the fibrous parietes, at firſt thin, ſoon become very thick, while their cavities diminiſh, and are united near the glans into one. The whole large ſwelling compoſing the glans is merely a developement of the vaſcular tiſſue of the latter, covered by a looſe and plaited ſkin, and ſupported by a prolongation of the fibrous ſide of the corpus cavernoſum.

The ſkin of the groove is covered by a cavernous texture, analogous to that of the oſtrich; and there is, on each ſide of this groove, a canal, the orifice of which is in the cavity of the peritoneum, on each ſide of the bladder, while the canal itſelf is prolonged in the ſubſtance of the penis, as far as the glans, where it ends in a cul-de-ſac, without its ſides appearing perforated in any part.

This penis has two retractor muſcles, ariſing in the pelvis, and reaching as far as the glans. They fold back the penis in the cloaca, ſo that, like the penis of the oſtrich, it ſhuts the orifice of the rectum, and that of the bladder. Erection, and the action of the ſphincter, bring it out of the cavity.

The peniſes of the lizards and ſerpents are ſhort, cylindrical, commonly beſet with white, hard, and pointed papillæ, which have been tolerably well compared to the prickles of the hedge-hog. Theſe organs, in their collapſed ſtate, are drawn within the ſkin of the tail: when erect they are protruded, and appear at each angle of the external ſlit of the cloaca. They have two retractor muſcles, ariſing under the firſt caudal vertebræ. Tyſon has figured the penis of the rattleſnake and viper in the Philoſ. Tranſ. v. 13, tab. 1; and the latter is minutely deſcribed by Charas.

The penis of the crocodile is ſingle, and lodged in a fold of the anterior part of the cloaca. It is compoſed of a firm cartilaginous ſubſtance, terminated by a glans of ſofter texture. It is excavated in its whole length by a deep groove. It has a very large retractor muſcle, which is ſo conſiderable as even to cauſe a ſwelling of the tail.

In the ſaurian reptiles, as in the frog and ſalamanders, the male fixes himſelf on the female, and obliges her to turn towards him the poſterior part of her body, and a real copulation enſues.

The act is differently accompliſhed in the ſerpents: the male and female twine round each other, are cloſely connected by ſeveral turns, and remain thus adherent for one or two hours. Is the ſmall horny ſpur, ſituated on each ſide of the anus in the boæ, and retractile under the ſkin, employed at all by the ſerpent as an organ of prehenſion, like the cutaneous tubercles of the hand of the ranæ? The ſaurians and ſerpents conceal themſelves carefully for this purpoſe.

Although the chelonian reptiles ſeem ſo little calculated for copulation, this proceſs takes place in them, the male fixing himſelf to the female by attaching the nails of his front limbs to the ſoft ſkin of her neck. Naturaliſts are ſtill uncertain, whether turtles are joined plaſtron to plaſtron, as Lacépéde has aſſerted in his Natural Hiſtory of Oviparous Quadrupeds, or whether the male mounts on the back of the female, as Bomare has repreſented it in his Dictionnaire d'Hiſtoire Naturelle. From the word *cavalage*, employed by the French mariners to denote this union, we may infer that they copulate like the frogs: the expreſſion denotes clearly that the male is mounted on the female as the ſtallion is on the mare (cavale). Cateſby, in his Natural Hiſtory of Carolina, aſſerts that they remain united for many days.

Female Organs of Generation.—Reptiles have two ovaries, uſually much more conſiderable than the ſingle ovary of birds. For moſt of the year theſe bodies are ſmall: but they acquire, at the propagating ſeaſon, an extraordinary development, and thus diſtend the abdomen very remarkably. This is particularly obſervable in the frog kind.

In autumn and winter, ſays Spallanzani, the immature eggs lie all in the ovarium, which is divided into two lobes: theſe lobes conſiſt of leſſer lobes, each of which is inveſted with a peculiar membrane. The eggs are of two ſizes; ſome very ſmall, ſo as to be ſcarcely viſible with the naked eye; others ſeven or eight times larger; both kinds are globular. The ſmaller are of a livid grey colour: of the larger one hemiſphere is white, the other black. The ſlighteſt touch is ſufficient to burſt them, after which they are reſolved into a cineritious viſcid liquor. (Diſſertations, v. 1. § 4.) The black ſpots of the ſurface, ſuppoſed by Valiſneri and others to be the rudiments of the tadpole, are attached to the internal membrane, and have no connection with the eggs. In the ſpring the eggs of the largeſt kind are ſtill larger, and they are mature when copulation takes place. In the firſt periods of copulation, they are found in the ſac of the ovarium; during the ſucceeding times, partly in the ovarium and partly in the oviducts, where they become enveloped by their covering of viſcid tranſparent mucilage.

The ovaria of the ſalamander contain a multitude of little eggs of a yellowiſh-white colour, ſmaller than huſked millet, and not floating looſe in the cavity of the ovaria, but adhering to their ſides. Theſe increaſe in ſize at the approach of ſpring.

The ovaria are connected to two long productions of peritoneum, which are fixed on each ſide of the ſpine down to the pelvis. The ova are ranged along the looſe edge of this fold, either in a ſingle row, as in the chelonians, or agglomerated in a much larger number, as in the batracians. Their blood-veſſels extend between the laminæ of theſe membranous productions. In the batracians there are yellow fatty appendages to the ovaries, like thoſe of the teſticles.

In the ſerpents, like all their other viſcera, they partake of the elongated figure of the body. The ova, conſiſting of yellow veſicles, reſemble rows of beads.

Oviducts.—There are two in all reptiles, like their ovaries. They are membranous canals, fixed on each ſide of the vertebral column by a production of peritoneum. They commence by an expanded orifice (fimbriated opening of the Fallopian tube in mammalia), at which the ova enter. The tube is firſt conical, diminiſhing a little in ſize; then it is cylindrical in the reſt of its courſe, which has a much greater proportional

tional length than in birds. In conſequence of this length of the canal it is plaited on the production of the peritoneum in the chelonian, ſaurian, and ophidian orders, or extremely ſinuous and folded on itſelf in the batracians. When the curvatures are deſtroyed, and the duct is ſtretched in a ſtraight line, it is four times the length of the animal in the ſalamander. Its parietes conſiſt at firſt of a thin membrane, they become afterwards thicker, and aſſume the appearance of a glandular ſtructure. The oviducts end in the frogs by a dilatation, which opens into the cloaca.

The thick fleſhy part of the oviduct in the tortoiſes has been frequently called the uterus: the two oviducts open ſeparately. Caldeſi oſſervaz. intorno alle Tartarughe, tab. 6, fig. 9, 10.

An uterus is alſo ſpoken of by ſome in the frogs, although the generation of theſe animals has nothing in it like utero-geſtation, and the ova are ſimply tranſmitted through the tubes, without being retained in them to undergo any part of their developement. "The frogs of this country," ſays Blumenbach, "have a large uterus divided by an internal partition into two cavities, from which two long convoluted oviducts ariſe, and terminate by open orifices at the ſides of the heart. As the ovaria lie under the liver, it is difficult to underſtand how the ova get into the above-mentioned openings. The uterus opens into the cloaca." (Comparative Anatomy, tranſlated by Lawrence, p. 446.) "The toads have not the large uterus, but their oviducts terminate by a common tube in the cloaca." (Ibid.) For delineations of theſe parts in the frog and toad, ſee Roeſel, tab. 6, 7, 8, and 21. The rana pipa (Surinam toad) has the ſame ſtructure. See Camper in the 9th vol. of Commentat. Soc. Reg. Scient. Gotting. p. 129. Alſo in his Kleinere Schriften, v. 1. pt. 1. tab. 3. fig. 1.

Female Organs of Copulation.—The male penis in copulation paſſes into the female cloaca. Does it go into the oviducts?

The chelonian reptiles have a clitoris very analogous to the penis of the male, from which it differs only in its ſmaller ſize. It is long, grooved lengthwiſe, and terminated by a rounded glans. Retractor muſcles, analogous to thoſe of the penis, draw back the clitoris into the cloaca, when it has been extended.

No clitoris has been diſcovered in the other reptiles.

Dorſal Cells of the Rana Pipa (Surinam toad, bufo dorſiger).—It is ſingular enough to meet with in a toad a ſtructure analogous to that of the abdominal pouch of the marſupial mammalia. The ſkin of the bulk is excavated in the female pipa by a large number of cells, (of which, Cuvier ſays, eighty have been counted,) in which the ova are placed, and changed into tadpoles, and the latter grow and are metamorphoſed. As far as an examination of individuals, preſerved for a long time in ſpirits of wine, will enable us to judge, the parietes of theſe cells do not ſeem to have any thing in their organization diſtinct from the reſt of the ſkin.

Naturaliſts ſuppoſed at firſt, that the ova grew on the back of the female, and that the male fecundated them in that ſituation: but obſervation of the living animal, and anatomical inveſtigations, have ſhewn the incorrectneſs of this notion; have proved, that the generative organs reſemble thoſe of other female toads; that the pipa lays her ova like the other toads; and that the male faſtened on her, as in the ordinary mode belonging to this order, covers her with the eggs after they have been fecundated. The eggs are then enveloped in a fluid, which cauſes the ſkin of the back to ſwell round them: thus they are contained in rounded cavities. The tadpoles are produced there, with their membranous tails, and are developed in this ſituation, which they do not quit until they have reached their perfect ſtate. The female then cauſes the cells to diſappear from her back, by rubbing it againſt hard ſubſtances. Beſides the works of Camper already referred to, concerning the anatomy of this extraordinary creature, ſee Blumenbach's Abbildungen, N° 36, for excellent figures of the animal, and of its young in three ſtates: 1ſt, as a long-tailed tadpole, with ſmall proceſſes of hind legs, and no trace of fore limbs; 2dly, as a four-footed creature, with the tail reduced to an inſignificant ſize; and 3dly, with the tail entirely removed. The ſkeleton is figured by Schneider, in his Hiſt. Amphib. Faſcic. 1.

Phyſiology of the Generative Organs.—In the whole claſs it is quite obvious, that the germ or rudiment of the new being is produced by the female in the ovarium, a point which does not admit of direct proof in the mammalia. This "pre-exiſtence of the germ" to the act of copulation, and its formation in a peculiar organ of the female, demonſtrated ſo clearly in reptiles, illuſtrate one of the moſt curious points in the theory of the natural reproduction of organized beings, or generation, and overturn many of the ſpeculations on that ſubject. Theſe germs acquire conſiderable ſize in the ovaries, and are therefore diſtinctly viſible before the approach of the male. They paſs from the parts juſt mentioned into the oviducts, and thence out of the body through the cloaca, having received in their paſſage through the ducts ſome external coverings. An application of the fecundating liquor ſecreted by the male is neceſſary to the evolution of theſe germs; they may be ejected from the body without the embraces of the male, as in the frog, toad, or newt, if they are forcibly ſeparated from the male after copulation has begun, but then they are not evolved.

Swammerdam and Roeſel were of opinion, that the eggs were looſe in the abdominal cavity, and taken up thence by the oviduct. Spallanzani found them in the abdomen only thrice in more than two thouſand diſſections; and hence ſuppoſes that the circumſtance muſt have been a deviation from the accuſtomed courſe in theſe inſtances.

Although the motions and vital functions of reptiles ſeem very languid in compariſon to thoſe of the warm-blooded claſſes, they exhibit conſiderable ardour and manifeſtations of lively feeling in their amours. "As ſoon," ſays Spallanzani, "as the eggs begin to be diſcharged, the agitation of the female is extreme; ſhe darts backwards and forwards, riſes towards the ſurface of the water, and then ſinks, keeping the hind legs conſtantly ſtretched out, and croaking in a low voice. The male, keeping his hind legs cloſe to his body, throws himſelf into ſtrange contortions, and accompanies the croaking of the female with a kind of interrupted noiſe, which I cannot expreſs by words." Diſſertations, v. 2. § 11.

In the work juſt quoted, which contains the moſt original and intereſting collection of facts concerning the whole affair of generation, Spallanzani gives the following account of the amours of the water newt, which are the more curious, inaſmuch as there is not only no real copulation by the introduction of a male member into the female organs, but not even any conjunction of the bodies, as in frogs and toads. "The male purſues the female, which at firſt makes a ſhow of flying, but then ſtops of her own accord. He then approaches her in ſuch a manner, that the lower part of his head comes in contact with the upper part of the head of the female; and this is done while the animals are in ſuch a poſture, that their bodies form an

angle,

angle, of which the point is made by the union of the two heads; or they may only join muzzle to muzzle. The bodies are always very near together, ſo that the angle formed by the two heads or muzzles is always very acute. Then the male erects that dentated prominence, which is placed on his back, and agitates it in a curious manner: he alſo moves his tail briſkly, bending it about, and ſtriking very gently the ſides of the female. During this time he emits from the aperture of the anus, now unuſually tumid and dilated, a copious jet of ſemen, which mixes with the water, and thus diluted arrives at the anus of the female, alſo more enlarged than uſual. In this important operation, then, the anus of the male is never in contact with that of the female, which maintains a greater or ſmaller diſtance, and never ſhews any part characteriſtic of her ſex. After the male has diſcharged this jet of ſemen, he reſts for a while, on ſome occaſions quitting the female; he then returns to his employment, and repeats the contortions of his tail, and the emiſſion of ſemen." § 80.

In the land newts there is a momentary copulation: "in the cleareſt days, and in the places moſt expoſed to the ſun, the male runs after the female, and when he has overtaken her, he twines himſelf about her, and unites his genitals to her's, but this union may be termed momentary, after which they part." § 81.

The vehemence of the propenſity in amphibia is ſo remarkable, that they actually will copulate with other ſpecies, as frogs with toads, &c. No example of hybrid offſpring, from ſuch a conjunction, has been recorded. It has alſo been known, that frogs, in want of a female, have copulated with other males, or with dead females.

That the animals are entirely abſorbed by the powerful emotions accompanying this act is evinced by a ſeries of diſguſting experiments of Spallanzani, purſued and multiplied with an unrelenting and unneceſſary cruelty, and related quite coolly, without evidence of remorſe or the ſlighteſt apology. He pricked, cut, and hacked the male frog and toads, without making them looſe their hold; amputation of the limbs, and of the head, was equally ineffectual.

Males, after ſuffering amputation of the fore or hind limbs, renewed their ſituation, and completed the generative act. "Nay, even the decapitation of a frog did not ſtop the embraces or fecundation. It is well known, that theſe animals are ſo tenacious of life, that that operation does not take it away immediately. That of which I am ſpeaking was thrown into convulſions; but neither the fore-feet nor legs quitted the breaſt of the female, which brought forth her fetuſes in an hour and three quarters, and I was an eye-witneſs to the male's beſprinkling them with ſemen; that they were fecundated there can be no doubt, ſince they came to life at the uſual time. As ſoon as he had performed this operation, he deſerted his ſituation, and died in four hours afterwards." Diſſertations, v. 2. § 90 and 109.

All reptiles may be ſaid to be oviparous; an egg, containing the germ, and as much nouriſhment as is neceſſary to ſupport it until it is ſufficiently developed to leave this abode, is formed in the body of the mother, and enters the oviduct in all. But there is a ſubdiviſion, according to the ſubſequent progreſs of the egg thus produced. In the greateſt number of reptiles, the ova or eggs are laid by the female in that ſtate, and the young reptiles are developed afterwards: but in ſome, as the venomous ſerpents, and the true ſalamander, the ovum may be ſaid to be hatched in the oviduct, although the animals ſtill come into the world ſo far enveloped by the membranes, that the character of an oviparous generation is preſerved. The reptiles of the latter kind are called ovoviviparous.

In both theſe caſes, a real egg, like that of birds, is produced, and has no connection with the body of the mother; it is a very different thing from the ovum of the mammiferous animals, in which there is no ſupply of nouriſhment for the fœtus; and the latter is connected by the umbilical chord with the veſſels of the mother, and derives from this ſource the materials of its growth. Here, as no true egg is produced in any part of the proceſs, and as the young are always brought into the world alive, they may be juſtly termed viviparous. See Lacépéde, Hiſt. Naturelle des Serpens, t. i. p. 31.

In uſing the common term ovum, we do not mean to repreſent that the thing produced is the ſame in all; nor that it is like the egg of birds in all. There are varieties in the different orders, and, in the batracians at leaſt, there is not a very cloſe analogy to the ova of birds.

The eggs of reptiles are covered with a membranous, rather than calcareous ſhell; but there is ſome earthy matter in it. In the green turtle this ſhell is flexible, but contains earthy particles. It is compoſed of a ſoft membrane, containing albumen, which heat does not harden, and a yolk which it does. The eggs of lizards have a more or leſs hard ſhell: it is flexible in the grey lizard, hard in the ſcink mabouya, and the crocodile. It has been aſſerted, that the eggs of the iguana are not hardened by boiling. The covering of the egg is ſoft and calcareous in ſerpents. The batracians lay gelatinous and ſemitranſparent eggs, without any covering.

A part, correſponding more or leſs cloſely to the yolk of a bird's egg, is produced in the ovary, eſcapes from its membranous covering, and enters the oviduct, where it receives its external inveſtment, as the yolk of the bird's egg receives its ſhell and albumen. In the turtle, the proceſs ſeems very ſimilar to what we ſee in birds. There are numerous large yolks obſerved in the ovarium, contained in calyces; and theſe, when boiled, are very ſimilar to the yolks of birds. In the crocodile and ſerpents, it is nearly the ſame. But in frogs, toads, and newts, the egg in the ovary does not ſeem to be a yolk, but the rudiment of the tadpole; and it comes forth, ſurrounded by a quantity of tranſparent glutinous matter. In the toad and newt, theſe rudiments are formed into long cords by the glutinous medium, which cords are double in the toad. In the frog they come out ſeparately in ſo many ſpheres of the gelatinous matter, about the ſize of large peas.

In all the reptiles which have a penis, fecundation is effected within the body; but in the batracians, which have no male organ of copulation, it occurs externally. When frogs are joined, it may be ſeen, that an obtuſe, tumid point, occupying the place of the penis, is elongated, and brought towards the eggs neareſt the vent. By taking them out of water while this laying is going on, an actual diſcharge of ſeminal fluid upon the eggs may be ſeen from this point. In the ſame way the male of the water newt diſcharges his fluid into the water near the anus of the female, and thus fecundation takes place. Spallanzani has inſtituted an immenſe number of experiments on this ſubject; they prove, that if breeches be put on the frog, ſo as to receive the ſeminal fluid, no fecundation occurs; while, on the contrary, the ſeminal fluid from the epididymis, or the juice of the teſticles, will produce artificial fecundation of eggs laid by the female after the male has been removed, and otherwiſe unproductive, or of eggs taken out of the lower part of the oviduct immediately after death. Dilution of the ſeminal fluid, although it diminiſhed the effect of its application, did

did not altogether prevent it. When three grains of ſeed were added to twenty-two pounds of water, ſome tadpoles were evolved in it, but much fewer than in a ſtronger mixture.

As fecundation is effected in theſe animals by the ſeminal fluid diſcharged in water, it probably is always produced by an extremely ſmall proportion. Spallanzani has made ſome calculations, in order to find out the expreſſion in numbers of the quantity of ſemen that was efficacious in ſome of his experiments. He mixed three grains of ſeminal fluid with eighteen ounces of water, and found that a globule, $\frac{1}{50}$th of a line in diameter, taken out of this mixture, was often ſufficient to fecundate a tadpole. The ratio of the tadpole to the particles of ſeed diffuſed in this drop of water, is found to be as 106,477,777,7 to one. The weight of the ſeed is $\frac{1}{199,468,750,0}$ of a grain, and its bulk $\frac{1}{300,212,042,0}$ of a cubic line. Diſſertations, v. i. § 655.

He found, however, that although ſo minute a quantity of ſeminal fluid is ſufficient to produce the effect, there muſt be contact of the groſs and viſible part of the fluid; that no vapour or effluvium, no *aura ſpermatica* will ſuffice. Diſſ. ch. 5. § 161—170.

The ſeed of one ſpecies will not fecundate another; that of the water newt has no effect on the embryos of frogs and toads; nor reciprocally: neither is there any action of the ſeeds of frogs on toads, nor *vice verſâ*. § 171—172.

The number of eggs is ſubject to much variety: it is inconſiderable in the ſerpents; from ten to twenty in the vipers and lizards; one or two hundred in the crocodile, according to Bartram, Travels in America; two or three hundred in the turtle; but the moſt numerous in the frog kind. In the toad, where the eggs are laid in a double row, forming a cord of a glutinous nature, theſe rows meaſured 43 Paris feet, and contained 1207 eggs. Spallanzani Diſſ. v. ii. § 45.

In the teſtudines, ſerpents, and lizards, which have a true yolk, this is to be regarded as a ſupply of nouriſhment for the young animal, whoſe evolution probably goes on in a manner analogous to what is obſerved in birds; although the proceſs has not been actually watched, nor the order and ſucceſſion of the changes obſerved, as in that claſs. Blumenbach has delineated the egg of the crocodile, with the young one coming forth; the ſhell is flexible, as in the other amphibia, and conſiſts of a thick, leathery, and tough, external ſtratum, marked throughout with extremely fine undulated lines, and lined by a more delicate ſmooth membrane. The recent eggs, and the young crocodiles which they contain after evolution has commenced, are eaten by various African tribes. The relation in ſize between the egg (about equal to that of the gooſe), and the full grown animal (the Nilotic ſpecies), which reaches to thirty feet in length, or even more, is at firſt view remarkable; and Herodotus has called the crocodile the largeſt animal from the ſmalleſt egg. (Blumenbach's Abbildungen, N° 27.) Seba has alſo figured a young crocodile, with the membrane of the yolk adhering to the abdomen, as in birds. Theſaurus, t. i. pl. 104, fig. 7.

In the animals juſt enumerated, the eggs, whether depoſited in the ſand of the ſea-ſhore, or of the banks of rivers, in the holes of trees, the chinks of walls and rocks, &c. undergo no proceſs of incubation like thoſe of birds, but are developed in the ordinary temperature of the atmoſphere, and the young animals come forth from their confinement, differing only in ſize and proportions from their parents.

In the venomous ſerpents, and the ſalamanders, the caſe is different. The egg containing, as in the preceding inſtances, the young animal, and a ſufficient ſupply of nutriment for its growth, until it is of ſize to quit its original abode, is hatched in the oviduct of the mother, and the young come forth from the cloaca alive, but ſurrounded by their membranous coverings. The young vipers and other venomous ſerpents, when they are born, are freed by the mother from this kind of after-birth.

A very curious circumſtance has been obſerved in ſome of theſe, recalling to our minds the abdominal pouches of the marſupial mammalia, and the mode in which they ſerve as a ſhelter for the young, while yet too ſmall to ſhift for themſelves. Paliſot Beauvois thus relates the fact we allude to. "Having perceived a rattleſnake at ſome diſtance, I approached as gently as poſſible, when, on lifting my hand to ſtrike him, he ſounded his rattle, opened his mouth, and received into it five ſmall ſerpents, about the ſize of a quill. I retreated and concealed myſelf, when the animal, thinking the danger at an end, opened his mouth, and let out his progeny. When I appeared again, they immediately took to their ſame retreat." He had heard this fact from American planters, and it has been ſince confirmed by other travellers. Daudin, Hiſt. Nat. des Reptiles, v. 5. p. 68.

The young of the ſalamander, like thoſe of the viper, are born alive. The female brings forth very delicate oval veſicles, which may be compared to hydatids, each of which contains a perfect young ſalamander, an inch in length, moving its tail, and lacerating its coverings at the time of birth, and emerging in the form of a four-footed tadpole.

"In this ſame ſtrange animal," ſays Blumenbach, "I have obſerved a curious fact, already noticed by Wurffbain in his Salamandrologia, p. 83. *viz.* that a female, kept by herſelf, and abſolutely without intercourſe with any other of her kind, has produced young ones. I have kept in a glaſs at home, for five months, a female ſalamander, whoſe tail I had cut off, and in the mean time have had no other in the houſe, nor even ſeen one. Yet this ſolitary female, which, to my ſurpriſe, ſuſtained ſo long a faſt without growing thin, has begun within a few days to bring forth young, of which thirty-four are now before me, not only living, but very lively. This obſervation will lead us to two concluſions; 1ſt, that ſalamanders really copulate, and that the male does not fecundate the ova as they are diſcharged, like what we have deſcribed in the caſe of the water newts: 2dly, that ſalamanders have the ſame nature in this reſpect as hens; which, when they have been once impregnated by the cock, will lay fruitful eggs, not for a whole year, as Fabricius ab Aquapendente aſſerted, but, according to the moſt accurate reſearches of Reaumur (art de faire eclorre les oiſeaux domeſtiques, t. 2, § 327), for five weeks after ſeparation from the male.

Theſe young ſalamanders have a two-edged tail, broadly pinnated on each edge, excellently adapted for ſwimming, and furniſhed on each ſide of the neck with fimbriated branchial appendages like thoſe of the tadpole, which however ſoon diſappear, the two-edged tail being at the ſame time converted into a cylindrical pointed one." Specimen, &c. 34.

All the reptiles of the frog and toad kind, and the aquatic ſalamanders, have this remarkable peculiarity, to which nothing at all analogous has been obſerved in the economy of the warm-blooded claſſes or the fiſhes: *viz.* that they undergo a metamorphoſis; and have, in their two ſtates, not only an altogether different external form, but alſo important differences in many of the great internal organs. In their firſt ſtate, they are little aquatic animals with tails

and

and large heads; from their twiſting movements of the former, and the great ſize of the latter, they have been called in Latin gyrini, in French têtards: the Engliſh name is tadpoles, and the German kaulquappen.

Developement of the Frog.—As the ſpawn of frogs is depoſited in ponds, ditches, or other ſtagnant water, the contained ova are evolved in the ordinary temperature of the atmoſphere. In one ſpecies of toad, Spallanzani ſays, that it proceeds at 6° above freezing of Reaumur. He found that a temperature of 111° Fahrenheit, did not interfere with the ſubſequent evolution; that the number of tadpoles produced was much diminiſhed after expoſure to 122°; and that very few were evolved after the eggs had been immerſed in water of 132°. A heat of 111° was fatal to tadpoles and frogs; although the latter bear 111° in the warm ſprings of Piſa. (Tracts, vol. i. p. 32.) Each egg lies in the centre of a tranſparent ſpherical maſs of mucilage; many of which, aggregated together, form what is called frog's ſpawn. Round the eggs are two concentrical membranes, of which the innermoſt, when pierced with a needle, diſcharges a fluid as limpid as water. The egg is round, and has a ſmooth ſurface, of which one hemiſphere is black, and the other white. When the hot ſeaſon is far advanced, the obſerver ſoon perceives the lineaments of the tadpole. The egg grows for ſome hours without loſing its round ſhape: it is next elongated; the white hemiſphere becomes darker, and the black changes into a longitudinal furrow, terminated by two perpendicular proceſſes. And, as it increaſes in bulk as well as length, the internal circular membrane is dilated, and contains more fluid. By tracing thus the progreſs of the evolution, we come to perceive that theſe bodies are not eggs, as naturaliſts ſuppoſe, but real tadpoles. The furrow and the proceſſes become longer; the ſuppoſed egg aſſumes a pointed figure, the whitiſh hemiſphere dilates, and the black is incurvated. The pointed part appears to be the tail of the tadpole, and the other the body. Further, the oppoſite end takes on the appearance of the head, in the fore part of which the form of the eyes is viſible, though they are yet cloſed. The two proceſſes alſo, by which the animal faſtens itſelf to bodies, when it is tired of ſwimming, become evident, as likewiſe the veſtige of the aperture of the mouth, and the rudiments of the gills. As the organs are further unfolded, the tadpole, which has not moved hitherto, begins to ſtir, and looſen its fetters; at this time it appears clearly, that the internal circular membrane is the amnios, in the liquor of which the tadpole floats; the umbilical chord at laſt is ſeen, and becomes ſtill more viſible the firſt day after the animal has quitted his confinement. The cord is not, as in other animals, attached to the belly, but to the region of the head. (Spallanzani's Diſſertations, v. 2. § 14—16.) We take the liberty to note what is here ſaid about the umbilical cord as a ſubject for further reſearch.

The branchiæ are viſible towards the end of the ſixth day: in the courſe of the ſeventh and eighth all the tadpoles quit the viſcid ſubſtance, which had been floating on the water, and which had hitherto ſerved them for food. By the fourteenth and fifteenth days they are ſo much grown, that two ſmall but prominent eyes, an open mouth, noſtrils, &c. can be diſtinguiſhed. About the nineteenth and twentieth days the branchial appendages are withdrawn within the ſkin, and no longer viſible. The heart can be ſeen to move, and the caudal vertebræ are recogniſable. On the twenty-fourth day the front limbs, which had already exiſted under the integuments, appear in the place of the branchiæ, or rather near where they had been. In ten or twelve days more the hind limbs come out. In this ſtate they ſwim about in the water, and grow. The tail gradually diſappears, and in about two months after they have been hatched, they are metamorphoſed into frogs. Theſe at firſt are ſmall, and then become gradually larger. Except in the caſe of the rana paradoxa, and the bufo fuſcus, in which the tadpoles become ſo large, that the animal, when it has changed, is of the adult ſize.

Anatomy of the Tadpole.—The points in which the animal differs from the organic arrangements of its perfect ſtate, are the large tail, which bears a very conſiderable proportion to the body, and is afterwards entirely loſt; comparative ſmallneſs of the mouth, to the under lip of which a ſmall organ is attached for fixing the tadpole to other objects; a kind of horny plate for jaws; two tuberoſities under the neck, which the animal can diſtend at pleaſure; the rudiments of the lungs; the inteſtines convoluted in a ſpiral maſs, which ſwells the abdomen, and far exceeds, in its ratio to the length of the body, the inteſtinal canal of the perfect animal; the branchial appendages, and the veſſels connected with them; the fore limbs, ſituated at firſt under the ſkin. For the ſeries of changes, and the anatomy of the young animal, ſee the plates of Roeſel, Hiſt. Ranar. Noſtrat.

Further particulars of the anatomy of tadpoles, and particularly of the circulating and reſpiratory organs. In his "Recherches ſur les Reptiles douteux," Cuvier has entered at ſome length into a conſideration of the anatomy of the tadpole. The following account, which is tranſlated from his memoir, as publiſhed in the "Recueil d'Obſervations de Zoologie et d'Anatomie comparée, faites dans le Voyage de Humboldt et Bonpand," v. 1. p. 195, is to be underſtood as applying to the full grown tadpole.

The tadpoles of frogs, tree-frogs, and toads, differ from thoſe of ſalamanders, principally in having their branchiæ concealed: we have already obſerved, that in their earlier ſtages the branchiæ of the former are alſo external: the only way by which the water can eſcape from them is through two holes, formed in different ſituations, according to the ſpecies: there are even ſeveral which have only one hole, on the left ſide. Such are the tadpoles of the jackie (rana paradoxa), and of the brown toad (buco fuſcus); but the tadpole of the common frog has two, both placed below.

We find, on opening the ſkin of a tadpole longitudinally, that the internal organs are divided into two parts, or contained in two membranous ſacs.

The firſt extends from the horny and falſe jaws, which form the mouth of the tadpole, to behind the branchiæ, enveloping the latter entirely. The other contains the abdominal viſcera; it is the peritoneum, on which veſtiges of the abdominal muſcles are already viſible.

The firſt ſac is very thin and tranſparent, and penetrated, like the ſkin, by holes for the exit of the water from the branchiæ.

The latter form on each ſide four tranſverſe rows of ſmall tufts or fringes, ſupported by the ſame number of ſmall cartilaginous arches, which are marked on the ſide next to the mouth by ſmall rounded tubercles. Theſe cartilaginous arcs are articulated on one ſide behind the cranium, on the other to a ſpecies of os hyoides, and have the ſame motions as in fiſhes. In their intervals the water can paſs freely from the mouth to the branchiæ, to be diſcharged ſubſequently through the ſmall external apertures.

The organization of the branchiæ in the tadpoles of frogs is, therefore, the ſame as in certain fiſhes, for example the callionymi and others, where the water can only paſs out by narrow apertures: there is, however, this difference,

that they are not covered, either by a branchial operculum, or by radiated bones.

The branchiæ, or gills, properly ſo called, that is, the immediate organ in which the pulmonary veſſels are diſtributed, are ſmall tufts formed like feathers, that is to ſay, fringed on the two ſides. Each cartilaginous arc ſupports about thirty ſuch; and in the middle of each tuft are its two principal veſſels derived from the two great blood-veſſels of the arc.

It may be obſerved here, that the fiſhes called ſyngnathi have alſo their branchiæ in the form of tufts.

The heart, placed in front of this apparatus, and receiving the blood from the body by the vena cava, which comes, as in moſt caſes, in great part through the liver, has only one auricle and ventricle, as in fiſhes, and in adult frogs and ſalamanders, without any of thoſe diviſions which are obſerved in the chelonian and ſaurian orders. The ventricle gives origin to a ſingle artery, which is completely diſtributed on the eight branchiæ, ſo that no drop of blood can go to the reſt of the body, without having paſſed through the reſpiratory organs. All the blood which has circulated through the gills, is collected in the branchial veins, which go towards the back, and are united into a ſingle trunk, which becomes the deſcending artery: but, before uniting, they furniſh arteries to the head, fore feet, lung, and liver; ſo that in the tadpole, the lung receives blood which has been already expoſed to the action of water; and this ſmall portion of the animal's blood undergoes reſpiration twice, while, with reſpect to the great maſs of the fluid, there is only one reſpiration, and that of an aquatic nature, or ſimilar to the reſpiration of fiſhes.

Great changes take place when the tadpole becomes a frog; but they are produced by very ſimple means. As the arms and head increaſe in ſize, their arteries are enlarged; the branchiæ, on the contrary, are obliterated, and their arteries are gradually reduced: but, as it is always neceſſary that blood ſhould go to the head and other parts, one of the four principal branchial arteries on each ſide is enlarged, and ſerves to convey it. Then the artery, which goes out of the heart, and was formerly divided into eight branches, is now ſimply bifurcated, and its two branches ſupply the arterial trunks of the head, arms, lungs, &c.; and laſtly, are united to form the deſcending aorta. Now this is preciſely the circulation of the frog, in order to produce which it has been merely neceſſary to obliterate ſix of the branchial arteries of the tadpole, and to enlarge the two others. Henceforward the lungs are the excluſive ſeat of reſpiration, receiving, however, at each pulſation, only a ſmall portion of the whole maſs: the frog, therefore, is now an aerial animal in reſpect to its breathing.

While theſe changes are going on in the reſpiratory organs, ſeveral others are taking place in different parts of the body. The narrow horny bill, preceded by ſmall fleſhy lips, falls off, and its muſcles diſappear; the jaws grow hard, and form a much more ample mouth.

The eyes, diſengaged from that ſkin, which only allowed them to appear through a tranſparent diſk, are now ſeen with their complicated apparatus of three eye-lids.

The fore-feet, which had been concealed between the bag encloſing the branchiæ and the peritoneum, appear externally; the hind-legs grow every day larger; and the long tail, formed by ſo many muſcular ſtrata, and ſupplied by ſuch numerous veſſels and nerves, begins to diſappear. The inteſtines, formerly of nearly uniform ſize throughout, exceſſively long and arranged in a ſpiral maſs, become ſhort, and are dilated at proper parts to form a ſtomach and colon.

Among theſe changes, which convert the tadpole into a frog, we cannot enumerate the appearance of the generative organs. The tadpole already poſſeſſes teſticles, ovaries, and their fatty appendages; and if theſe parts are not ſo large as in the frog at the ſeaſon of reproduction, they approach nearly to their ſize at other times of the year.

What we have juſt ſaid concerning the tadpole of the frog is equally applicable to that of the toad; but the different ſpecies exhibit conſiderable varieties in the epocha and the ſize at which the change occurs, as well as in the rapidity of the change. The jackie (rana paradoxa) loſes its tail very late, and long after its branchiæ; while the latter do not entirely diſappear until it has reached the full ſize of its perfect ſtate: the pipa, on the contrary, loſes both very early, and while it is ſtill very ſmall. The ſpecies which loſe their branchiæ late, are larger in the tadpole than in the perfect ſtate, becauſe theſe ſupernumerary organs ſwell out the front of the body, while the tail prolongs it behind. They ſeem, therefore, to become ſmaller under their metamorphoſis, and grow no more when they have become frogs. On the other hand, thoſe which loſe their tail and branchiæ early, have ſtill a long time to grow, and may be ſeen of all ſizes in the perfect ſtate. This has given riſe to the miſtaken notion that the jackie is changed into a fiſh; the tadpoles being larger than the adult frogs, it was not thought poſſible that the latter could be the ſecond ſtate.

We might reſtore to the larvæ of the ſalamanders the name of cordyli, which they bore among the Greeks, according to the remark of Schneider. They ought not at leaſt to have that of tadpole (têtard), becauſe they have not a large head, their branchiæ not being concealed under conſiderable coverings, but floating looſely on the exterior of the body. They are tufts arranged like the teeth of combs, ſimply fleſhy or membranous, and attached by pedicles, which allow them to float looſely in the water. The cartilaginous arcs of the ſides merely ſerve to limit the ſmall apertures through which the water paſſes out of the mouth; for, although the form and arrangement of the tufts ſeem to expoſe them ſufficiently to the action of water, there are ſtill openings from the mouth, enabling the animal to eſtabliſh a current of the fluid. In other reſpects, the circulation is carried on as in the branchiæ of the tadpoles of frogs, and it undergoes the ſame changes when the branchiæ are obliterated.

The larvæ of ſalamanders, obſerved by Cuvier, had the ſame viſcera as the adult animals, and poſſeſſed no horny bill, although their branchiæ were ſtill very complete. He therefore concludes, that in this reſpect, as well as in their feet, and in the organization and permanence of their tail, there is a much more cloſe reſemblance between theſe larvæ and the adult ſalamanders, than between tadpoles and frogs.

Theſe remarks on the anatomy of the tadpole, and of the larvæ of ſalamanders, are illuſtrated by four figures in the 13th plate of the work quoted above. Figs. 1, 2, and 3 repreſent the anatomy of the tadpole of the bufo fuſcus; and fig. 4. that of the larva of the ſalamandra aquatica.

The co-exiſtence in the ſame animal of branchiæ and lungs, that is, of organs calculated for breathing air, and of thoſe which are fitted to extract air from the water, is not peculiar to the larvæ of frogs and ſalamanders; it is obſerved alſo in the ſiren lacertina and the proteus anguinus, two animals whoſe conſtruction is in many reſpects ſo ſingular, that the opinions of naturaliſts concerning them have been long extremely unſettled. Many have ſuppoſed them to be the larvæ of ſome large reptiles, for which opinion,

other

other circumſtances in their organization and habits, beſides the poſſeſſion of branchiæ and lungs, have been adduced as arguments. Others have contended that they are perfect animals; and the more exact reſearches of modern naturaliſts and anatomiſts ſeem to have finally proved that this is the caſe. The anatomical details, by which this concluſion is ſupported, will be found towards the end of the article.

As the ſiren and proteus, truly perfect animals, have been ſometimes conſidered as larvæ or imperfect ſtates of unknown reptiles, ſo the contrary error has been committed, of deſcribing the larvæ of known ſpecies as perfect animals allied to the ſiren and proteus. Laurenti, one of the firſt naturaliſts who endeavoured to reduce the claſs of reptiles to regular order, eſtabliſhed a genus (proteus) for ſuch batracian reptiles as, according to him, poſſeſſed both branchiæ and lungs. To this genus he has aſſigned the tadpole of the rana paradoxa, under the name of proteus raninus; and another, which he himſelf inſpected, and which has ſince been aſcertained to be the larva of an aquatic ſalamander, under that of proteus tritonius. (See his Specimen medicum exhibens ſynopſin reptilium.) The ſiren operculata of M. de Beauvois (Tranſactions of the Philoſophical Society of Philadelphia, vol. iv.) is conſidered by Cuvier as a ſimilar inſtance, and perhaps as the very axolotl or Mexican animal, which will be deſcribed preſently. He regards, in the ſame light, an animal deſcribed by the very learned writer on amphibia, Mr. Schneider, as found in the lake Champlain: ſee Hiſt. Amphib. Nat. et Litter. Faſcic. 1. p. 50. He ſays it may be objected that we cannot eaſily conceive that ſo complicated an apparatus as that of the branchiæ, their cartilaginous arches, and the muſcles moving them, ſhould diſappear and leave no trace behind; but, as the larvæ of our ſalamanders experience ſuch a change, the ſingularity of the phenomenon cannot be pleaded as an objection to it. Recherches, &c. p. 117.

Anatomy of the Axolotl, or large Mexican Salamandrine Tadpole.—Another animal of this kind is one found very commonly in the lake ſurrounding the city of Mexico, and noticed by the early writers in their accounts of thoſe countries, and of the intereſting objects they produce, although not methodically deſcribed or ſcientifically inveſtigated until very lately. Hernandez ſpeaks of it in two places; in one, under the name of the eatable tadpole (gyrinus edulis), or atolocatl (Hiſt. Anim. Miner. Nov. Hiſp. lib. unic. Tract. 5. cap. 4. p. 77: this book is placed at the end of the abridgement by Recchi); in the other, under that of luſus aquarum, piſcis ludicrus, or axolotl (ibid. cap. 2. p. 76, and in the large abridgement by Recchi of the whole work of Hernandez, lib. 60. cap. 4. p. 316.) This account, accompanied by a figure of ſome other animal, was copied into other works with various errors.

Dr. Shaw deſcribed an individual ſent immediately from Mexico to the Britiſh Muſeum, and gave two good figures of it; in the Naturaliſt's Miſcellany, N° 343, under the name of gyrinus mexicanus; and in the General Zoology, vol. 3. pt. 2. pag. 612. pl. 140, under that of ſiren piſciformis, conſidering it as allied to the genus ſiren.

Mr. de Humboldt met with it in Mexico, and recogniſed it as the axolotl of the Mexicans and firſt Spaniards, under which name it is ſtill known. He brought ſpecimens of it to Europe, and entruſted their anatomical inveſtigation to the experienced hand and profound judgment of Cuvier, whoſe deſcription we extract from the Recherches ſur les Reptiles douteux, already quoted, pag. 109. et ſeq. pl. 12.

Anatomy of the Axolotl.—In its ſize and general configuration it very cloſely reſembles the ſalamander terreſtris (lacerta ſalamandra) of Europe. No one would heſitate in calling it a ſalamander, were it not for the branchiæ, which latter reſemble very narrowly thoſe of the larvæ of ſalamanders, and float looſely at the ſides of the neck.

The openings communicating with the mouth are four in number, and much larger than in the ſiren. A fold of the ſkin of the head forms a ſpecies of operculum for the four. There are four arches, as in fiſhes, and we ſhould hence expect five openings, but the fourth is immediately united to the trunk. The two intermediate arches have, towards the mouth, two rows of pointed denticuli; but the firſt and fourth poſſeſs, each, only a ſingle row. None of theſe denticuli exiſt towards the operculum, ſo that the firſt of the four openings is not denticulated in any direction. Each of the four arches has, towards the outſide, a ſharp membranous criſta, which might deceive ſuperficial obſervation by cauſing a reſemblance to the gills of a fiſh; but there is no vaſcular net-work for reſpiration, and the arterial trunks follow, without any diviſion, the three firſt arches to arrive at the branchial tufts, which are the only true gills. There are three of theſe tufts on each ſide, attached to the three firſt arches, where the ſkin joins them together; the operculum and the fourth arch have none. Theſe tufts are much more ramified than thoſe of the ſiren, but their ramifications reſemble a lock of hair, and are not arranged with ſo much regularity.

Oſteology.—The head is the ſame as in the ſalamanders, except that the cranium is rather broader. The teeth are placed in the ſame way on the edges of the jaws; there are moreover two plates immediately behind the edge of the upper jaw; but the two longitudinal ſeries, which are obſerved along the palate of the European ſalamanders, could not be perceived. The head is articulated in the atlas by two condyles, as in the ſiren and ſalamanders.

The apparatus for ſupporting the branchiæ is very ſimilar to that of the ſiren; and, at the time of the metamorphoſis, a part of it probably remains to form the os hyoides of the ſalamander. The middle piece is cylindrical, ſhort, and terminated behind by a forked extremity. The front end ſupports two cartilages, the ends of which, ſuſpended to the angles of the jaw, correſpond to the hyoideal branches of fiſh: they are immediately under the membranous operculum. From the poſterior end of this middle piece proceed two other branches on each ſide; a broad one ſupporting the firſt cartilaginous arch, and a more ſlender one trifurcated to ſupport the three other arches. The four branchial arches are ſuſpended, by their outer extremities, to the firſt vertebra.

There are ſeventeen vertebræ from the head to the pelvis; and twenty-three from the latter to the end of the tail. The ſpinous proceſſes of both are longer than thoſe of the ſalamander; and they exiſt on both aſpects of the caudal vertebræ, which makes the vertical meaſurement of this part exceed that of the European aquatic ſalamanders.

There are thirteen ſmall ribs on each ſide, ſimilar to thoſe of the ſalamander.

The oſteology of the limbs reſembles in all reſpects that of the ſalamander, excepting the more pointed form of the laſt phalanges, which has occaſioned them to be taken for nails.

Organs of Senſe.—The eye is ſmaller in proportion than in European ſalamanders; but not ſmaller than that of the ſpecies brought from the Alleghany mountains by Michaux.

Organs of Circulation.—The vena cava receives the termination of the veins of the head; of the branchiæ, and their arches; of the lungs; of the fore-feet; laſtly, of the inferior vena cava, which has traverſed the liver, and received, as

uſual, the blood of the vena portarum. It enters a large and ſingle auricle; there is alſo a ſingle ventricle, giving origin to a large muſcular artery, ſimilar in all points to that of fiſhes, of the ſiren, and of tadpoles. It produces for the branchiæ three arteries on each ſide, which proceed, as we have already mentioned, along the three firſt arches. The branchial veins are quickly united behind into a ſingle trunk, under the back of the head, and this veſſel, following the direction of the ſpine, becomes the great artery of the body. This is exactly the circulation of the batracian larvæ; and the axolotl, being larger than any of the European ſpecies, affords a convenient opportunity of examining this kind of arrangement in the circulating organ.

Organs of Reſpiration.—The branchiæ of the axolotl, exhibiting on a larger ſcale the ſame motions as thoſe of the ſalamandrine larvæ, the mechaniſm can be better underſtood; and the following deſcription of the muſcles will, therefore, be received with intereſt.

Each of the cartilages analogous to the hyoideal branches has a very ſtrong muſcle, deſcending from the baſis of the ſkull along their convex ſides to their inferior extremities. Theſe muſcles open the branchial arches, by ſeparating their inferior extremities from the palate.

The arches are approximated by a muſcle fixed behind to the inferior extremity of the laſt, advancing under that of the three others, and giving a ſlip to each. Its antagoniſt is a ſmall muſcle, fixed, on one ſide, to the inferior extremity of the hyoideal branches; and proceeding backwards as far as under the firſt branchial arch, to which it is attached, oppoſite to the ſlip of the preceding.

The os hyoides is carried forwards by two genio-hyoidei, and backwards by two pubio-hyoidei: which latter ſupply the place, as in the ſalamanders, both of the ſterno-hyoidei and recti abdominis. It is elevated by a muſcle ſimilar to the mylo-hyoideus of the ſame animals.

Laſtly, the three tufts are themſelves elevated and depreſſed by as many pairs of muſcles, which are attached above and below to the convexities of the branchial arches, and have their other fixed points in the baſes of the tufts.

The lungs are two large bags, on the internal ſurface of which the blood-veſſels form a looſe but very conſpicuous net-work. There are no cells. They open into a common, membranous, opaque, and tolerably wide canal, ſupplying the place of trachea, but unfurniſhed with cartilaginous rings, and contracted to form a ſmall larynx with two membranous lips. The glottis is ſmall, formed by two membranous projections, behind each of which is a ſmall hollow or ventricle, which may be ſuppoſed to produce a more powerful voice than that of the ſiren.

Organs of Digeſtion.—The tongue poſſeſſes but little power of motion; it is free in front, but fixed behind to the anterior extremity of the os hyoides.

The œſophagus is ſhort, folded longitudinally, and continuous with the ſtomach, which is large and membranous, but conſiderably narrowed, and more muſcular towards the pylorus. It was filled, in the two individuals from which this deſcription was drawn up, with freſh-water cray-fiſh, like the European, which had been ſwallowed without maſtication, ſo that entire limbs were found even in the rectum.

The inteſtinal canal is tolerably large, particularly behind, and of moderate length. It makes two principal folds, and has neither cæcum nor any internal valve. The liver is rectangular, without any deep notches; no gall-bladder was obſerved. There is a ſmall ſpleen in the centre of the meſentery, which is ſimple, as uſual.

All theſe inteſtines are like thoſe of the ſalamander.

Generative Organs.—The ovaries, ſmall, flaccid, and hardly containing viſible ova, reſemble, in their ſituation and fatty appendices, thoſe of the ſalamander. The oviducts were ſo delicate, that they could ſcarcely be ſeen.

From all the circumſtances juſt detailed, and from the cloſe reſemblance of all its organs to thoſe of ſalamanders, and their larvæ, we may conclude, that the Mexican axolotl, or ſiren piſciformis of Shaw, is the larva of ſome large ſalamander.

Growth.—The age of puberty ſeems to be the limit of growth in many of this claſs, as in birds, and we may almoſt ſay, in all mammalia. But others, particularly the crocodiles, turtles, and ſerpents, grow conſtantly; of which continual increaſe the whales ſeem to afford an example among mammalia; at leaſt, no limits can at preſent be aſſigned to their ſtature. We know little about the length of life of the amphibia. Many, particularly the tortoiſes, ſerpents, and crocodiles, are prodigiouſly long-lived; coming forth originally from an egg, which is very ſmall in compariſon to their future ſtature, growing very ſlowly, and reaching an immenſe ſize. Niebuhr ſaw at Surat a tortoiſe 125 years old.

Organs of the Animal Functions.

Organs of Motion. Deſcription of the Bones.—We know of nothing peculiar in the organiſation of the bony ſubſtance of reptiles. In the larger ſpecies, the bones poſſeſs as much firmneſs as in the mammalia; but in the ſmaller, as the frogs for example, they are more cartilaginous. Cuvier ſtates, in general, that the bones of reptiles contain more gelatine than thoſe of the mammalia. Caldeſi aſſerts, that there are no medullary cavities in the tortoiſe; according to Cuvier, there are conſiderable ones in the crocodiles. Leçons d'Anat. Comp. tom. i. p. 110. They have never been ſeen tinged with madder.

The Head.—A very diminutive cranium, and enormous jaw, make up the head in this claſs.

As the brain of reptiles and fiſhes occupies only a ſmall part of the cavity of this cranium, no important conſequences can be deduced from its ſhape and ſize. In the tortoiſe, this cavity is large, narrow from right to left, elevated anteriorly and depreſſed poſteriorly. Its lateral parietes are almoſt vertical, and its baſe is parallel to the palate. The external form of the head, and its apparent magnitude, are occaſioned by the acceſſory bones, between which and the cranium there is a large ſpace occupied by muſcles and glands. The greateſt part of the ſkull is occupied by the large lateral hollows, holding the eye, and the powerful muſcles, that move the lower jaw.

The ſmall ſize of the cavity of the cranium, with reſpect to the external bulk of the head, is ſtill more extraordinary in the crocodile. In an individual four metres long (between thirteen and fourteen feet), that cavity will hardly admit the thumb, and the area of the ſection of the cranium is not one-twentieth part of that of the whole head. (See a ſection of the ſkull of a crocodile in the Annales du Muſeum, tom. x. pl. 4. fig. 5.) The length of the cranium is not one-fifth of the length of the head in the gavials (longiroſtres, Cuvier); and it is leſs than one-fourth in the alligators or caimans (alligatores, Cuv.), and in the true crocodile (crocodili, Cuv.) The figure of the ſection is oblong, rather larger anteriorly, and deſcending poſteriorly. There is a conſiderable depreſſion for the pituitary gland. Its breadth is equal to its height; and the lateral parts of the head, as in the tortoiſe, cover only the temporal foſſæ.

The relative ſize of the cranium and jaws undergoes a very remarkable change, in proportion to the gradual developement of the crocodile. The head, when it comes out of the ſhell, is thick and rounded, and the forehead prominent; ſee Seba,

Seba, Theſaurus, tom. i. pl. 104, figs. 3 and 6; and Blumenbach's Abbildungen, N° 27. The eyes are now equidiſtant from the end of the ſnout, and the poſterior extremity of the head; of which the cranium forms nearly one-third. When we look at the adult animal, we are aſtoniſhed to find the frontal prominence gone, leaving the head quite flat, and the jaws ſo elongated, that the eyes are three times farther from the end of the ſnout than from the back of the head; and the proportion of the face to the cranium is 20 inſtead of 3 to 1. Geoffroy St. Hilaire in the Ann. du Muſ. vol. x. p. 77.

The cameleon exhibits alſo a great diſproportion between the cranium and the reſt of the head. Its brain, according to the deſcription of the Pariſian diſſectors, does not ſeem larger than a pea; and the remainder of the head, which is of conſiderable ſize, conſiſts of the large maxillary bones, the orbits, and immenſe temporal foſſæ, which, not being ſeparated by any partition, give the cranium a very ſingular appearance. Deſcription Anat. d'un Cameleon, &c.; or Blaſii Anat. Anim. vol. i. p. 14.

The cranium of frogs and ſalamanders is almoſt priſmatic.

The French naturaliſts have furniſhed excellent deſcriptions and engravings of the heads of various crocodiles. It will be as well for us to enumerate here the ſources of information concerning the oſteology of this animal altogether, and to give a few references to good figures of the ſkeletons of other reptiles.

There are tolerably good repreſentations of the crocodile's ſkeleton (the Eaſt Indian) in Grew's Muſeum Societatis Regiæ, and in Faujas St. Fond, Hiſtoire de la Montagne de St. Pierre de Maeſtricht, pl. 44. The head of the crocodile of the Nile (croc. vulgaris, Cuvier), is figured by Geoffroy in the Annales du Muſeum, vol. ii. pl. 37, fig. 2. In pl. 4. vol. 10. of the ſame work are four figures of the ſkull to illuſtrate a paper of Geoffroy St. Hilaire, entitled "Determination des Pièces qui compoſent le Crane des Crocodiles;" and pl. 1, of the ſame volume, contains nineteen figures of the heads of various crocodiles in different views, to illuſtrate Cuvier's paper "Sur les differentes Eſpèces de Crocodiles vivans & ſur leurs Caractères diſtinctifs." In the 12th volume of the Annals, Cuvier has given his "Obſervations ſur l'Oſteologie des Crocodiles vivans," with two plates, in which moſt of the bones are carefully figured. For the ſkeleton of the tupinambis, ſee Cuvier, Leçons, v. 5. pl. 3; of frogs, Roeſel, Hiſtoria Ranarum Noſtratium; of the ſalamander, Latreille, Hiſt. des Salamandres de France; of the tortoiſe, ſalamander, frog, cameleon, lizard, and a ſerpent, Daudin, Hiſt. Nat. des Reptiles, vol. 1.; of the proteus, ſiren, and Mexican axolotl, Humboldt, Recueil d'Obſerv. de Zool. &c. t. 1; of the tortoiſe, Blaſii Anatomia Animalium; Cuvier, ſur les oſſemens foſſiles; and Geoffroy St. Hilaire, ſur les tortues molles, in the Annales du Muſeum, vol. 14. The ſkeleton of the tortoiſe is alſo figured in Cheſelden's Oſteology; in Coiter's Lectiones Fallopii de Partibus ſimilaribus, fol. Norib. 1575; and in J. D. Meyer's Zeitvertreib mit Betrachtung curioſer Vorſtellungen allerhand Thiere. t. 1. tab 29, 31; t. 2. tab. 62; and the ſeparate parts in Caldeſi oſſervazioni anatomiche intorno alle Tartarughe. Firenze, 1687. The ſkeleton of the common green lizard may be ſeen in Coiter, pl. 4; in Meyer, t. 1. pl. 56; that of the ſalamander and water newt, and of ſeveral ſnakes in Meyer: that of the cameleon is prefixed to Cheſelden's 6th ch. Schneider has figured that of the rana pipa in his Hiſtor. Amphib. faſcic. 1.

For the form of the head in the different ſpecies, a point belonging rather to natural hiſtory than comparative anatomy, we muſt refer to the figures already quoted. The ſurface is more or leſs rugous in different ſpecimens; and in many very conſiderably ſo; theſe differences are ſpecific, only where individuals of the ſame age are compared, for the rugoſities increaſe in ſize and prominence in each ſpecies with the increaſe of years. The bony ſubſtance is often perforated by many ſmall holes, as if it were carious or worm-eaten. The ſutures are conſtant; they are not effaced in the oldeſt heads obſerved by Cuvier.

The Cranium.—The cranium of the crocodile, viewed from behind, has the form of a very irregular truncated pyramid; of which the point or narroweſt portion is downwards, and the baſe excavated to lodge the brain, is upwards. This pyramid has three ſurfaces, one poſterior, which forms the occiput, and two lateral. The occipital ſurface is almoſt triangular; one of the angles (the apex of the pyramid) is inferior, the other two are ſuperior, and greatly prolonged backwards and to the ſide, in order to form the enormous articular proceſſes, which receive the lower jaw. Their poſition is almoſt horizontal. The foramen magnum is ſituated in the middle of this ſurface, and under it the ſingle condyle for articulating the head with the vertebral column.

The ſutures depart from the foramen magnum, which divide the occiput into particular bones. The ſuperior part of the cranium is formed by a ſingle parietal bone. Anterior to it there is an os frontis, alſo ſingle, which forms the roof of the orbits.

The oſſa temporum are ſituated on each ſide of the parietal bone, and are partly ſupported by that articular proceſs for the lower jaw, already mentioned.

A ſmall arch on each ſide, different from the zygoma, leaves between it and the parietal bone a large round hole, which perforates the temporal foſſa. The arch is partly formed by a proceſs of the os temporum, and partly by a particular bone articulated to the junction of the parietal and frontal. The particular bone occupies the place of the poſt-orbitar proceſs of the os frontis in the mammalia; for it deſcends behind the orbit to join the cheek-bone; and with it finiſhes the frame of the orbits.

The unuſual configuration of the whole head in the crocodile neceſſarily involves very extraordinary modifications of the individual bones, which it is in many caſes exceedingly difficult to refer to their correſponding ones in the crania of the mammalia. For a more minute account of this matter, which could not be eaſily underſtood without plates, we refer to the memoirs and engravings, already quoted, of Geoffroy and Cuvier.

A cranium ſimilar to this of the crocodile, is found in the other lizards, notwithſtanding the great differences in the form, proportion, and the direction of the parts. In the cameleon, therefore, the foramina, by which the temporal foſſa communicate with the cranium, are ſo large, and the bony edges which form them ſo thin, that the latter repreſent three ſlender branches riſing to ſupport the kind of helmet which diſtinguiſhes this animal. The articular proceſſes are not directed backwards, but downwards.

The laſt peculiarity is alſo obſerved in the other lizards, but they have not the creſts of the cameleon, and the upper part of their cranium is broad, like the crocodile.

In frogs and ſalamanders the cranium is nearly of a cylindrical form, flat ſuperiorly, and enlarged poſteriorly; the frontal bones have the ſhape of an elongated rectangle, and occupy the interval of the orbits. The Surinam toad has the cranium much flatter than the other genera.

The eminences intended to aſſiſt in the articulation of the jaw are turned directly towards the ſides.

The ſtructure of the cranium of tortoiſes bears more reſemblance to that of crocodiles than of frogs. The frontal bones form only the roof of the orbits, and the cranium does not paſs between theſe cavities. They are very ſhort, and the parietalia are three times longer. The latter are not confined to covering the cranium. They extend on each ſide, and form an arch over the temporal foſſa. In the ſea tortoiſes this arch is completed by two peculiar bones, which extend from the os parietale to the zygoma, and the anterior of which bounds the orbit behind.

The articular proceſſes are directed downward, as in the cameleon. Above theſe and the meatus auditorius, we find conſiderable maſtoid proceſſes, which are pointed ſuperiorly in land tortoiſes, but are rounded and marked by a longitudinal furrow in the ſea tortoiſes.

Serpents have two frontal bones almoſt ſquare, and a ſingle parietal bone. Their cranium advances forward between the orbits, as in frogs. The occipital bone has a proceſs directed backward, and connected with a particular moveable bone, analogous to the ſquare bones of birds, to which the lower jaw, and the arches which form the upper, are articulated.

The general form of the cavity of the cranium of reptiles is oblong, and almoſt of an equal breadth, being merely a little contracted between the ears. The tortoiſe has a kind of ſella turcica, the four clinoid proceſſes of which are directed forward. The ſphenoidal foſſa is ſomewhat depreſſed in the ſerpents, but it has no clinoid proceſſes. It is a ſemilunar depreſſion, the plane of which is ſituated from before backwards.

The baſilar foſſa is lower than the other foſſæ in the crocodile, and in ſome tortoiſes.

Foramina of the Cranium.—The interior part of the cranium is frequently not cloſed by oſſification in reptiles and fiſhes, and the olfactory nerves paſs through a large vacant ſpace, which is not ſubdivided into particular holes. This at leaſt is the caſe with the cameleon, the iguana, tortoiſes, the pike, the anarrhichas, &c. In others, the olfactory hole is contracted, but is ſtill ſimple, as in the crocodile. It is double in frogs and ſalamanders. The rays and the ſharks have alſo two holes, which are conſiderably removed from each other.

The optic holes are likewiſe ſometimes united into one, as in the crocodile: thoſe of the tortoiſe are much removed from each other, and are diſtinguiſhed from the great hole in the front of the cranium, by only a ſmall bony partition. The ſtructure of the cranium in the pike is ſimilar. In the frogs, the rays, the anarrhichas, and it ſhould ſeem in the greater number of fiſhes, the optic holes are at a great diſtance from each other, and perforate the ſides of the cranium. Theſe animals have no ſpheno-orbitar fiſſure, and the ſmall nerves tranſmitted to the eyes paſs each through a particular foramen.

There is, in general, only one hole on each ſide for the three branches of the fifth pair of nerves, which, therefore, ſupplies the place of the foramen rotundum, foramen ovale, and in part of the ſpheno-orbitar fiſſure. This hole, however, is divided into three in the carp.

The meatus auditorius internus exiſts in reptiles.

The Face.—In the crocodile the face reſembles one-half of a cone irregularly flattened on its convex ſurface. It is chiefly formed by two oſſa maxillaria, and two oſſa naſi, which are ſituated almoſt parallel to each other, and two oſſa intermaxillaria, which form the end of the muzzle, and ſurround the aperture of the noſe like a ring.

The bones analogous to the lacrymalia are four in number, two on each ſide. The os malæ, which is very large, after forming the inferior, and affording a ſmall proceſs to the poſterior edge of the orbit, extends directly backwards to join the great maſtoid protuberance: thus the temporal foſſa has no communication outwardly, except by a hole which is ſmaller than the orbit, and the greater part of which is covered by theſe bones, as by an arch.

The naſal foſſæ are continued in a long and narrow tube under the foramen magnum. They perforate the oſſa palati, and a particular bone which is analogous to the pterygoid proceſſes of the os ſphenoides. This bone is ſituated almoſt preciſely under the cranium, and is enlarged on each ſide until it forms a kind of ſquare and almoſt horizontal wing. An oſſeous branch unites it laterally to the os maxillare and os malæ, in ſuch a manner that a large hole is left on each ſide of the arch of the palate.

In the cameleon the face is concave ſuperiorly, and bordered by a ſerrated ridge throughout the whole of its circumference. We obſerve two holes which communicate with the orbits, and two other oval foramina, which correſpond to the inciſive holes in the palatine ſurface. The bones which compoſe the face are nearly the ſame as thoſe of the crocodile. The other lizards exhibit ſtill leſs difference.

The frog and the ſalamander have the naſal and intermaxillary bones very ſhort, and broader than long, which renders their face round anteriorly. The os maxillare is very narrow, and is ſcarcely contracted in forming the zygomatic arch. The orbits are large, but have no inferior ſurface, and therefore communicate with the palatine foſſa. The oſſa palati form the anterior edge of the orbitar foſſa inferiorly. They reſemble portions of a circle. They are furniſhed with pointed teeth on their circumference. The canal of the nares is very ſhort in the ſalamander. There is only a ſimple hole in the frog.

The face of the Surinam toad is very flat, but the bones are the ſame as in the frog. The orbitar foſſæ are oval, and no aperture ſimilar to the canal of the nares can be diſtinguiſhed.

The face of ſerpents is rounded nearly in the ſame manner as that of lizards. Between the os frontis and os parietale, there is a particular bone which terminates the frame of the orbit poſteriorly. Theſe animals have no os malæ. We can, however, eaſily diſtinguiſh two oſſa naſi, two oſſa maxillaria ſuperiora, two oſſa intermaxillaria, and ſome analogous to the palatine arches of birds, which are furniſhed with teeth, and which are articulated to the bone which ſupplies the place of the os quadratum, with reſpect to the lower jaw. Two particular bones unite theſe arches to the maxillaria ſuperiora.

In thoſe that have teeth, or poiſonous hooks, as the viper, the rattleſnake, &c. there are beſides two ſmall peculiar bones, articulated and moveable, which ſupport thoſe teeth. They are ſituated upon the intermaxillary bones and the anterior extremity of the oſſeous branch, which joins the ſuperior maxillary bone to the arch of the palate.

The face of the tortoiſe is circular before, and rounded on every ſide. It is compoſed of nearly the ſame bones as that of the crocodile. The intermaxillary bones are, at a very early period, conſolidated with thoſe of the upper jaw. The bones analogous to the os malæ are three in number, one articulates with the os temporum and with the two others; it is ſituated poſteriorly, and forms the zygomatic arch. The other two portions are received on its anterior extremity; one extends upwards, and unites with the orbitar angle of the os frontis; the other is directed

downward, and articulates with the poſterior and external proceſs of the os maxillare ſuperius.

The oſſa palati are broad, and form the poſterior arch of the naſal foſſa.

The bones of the face of tortoiſes commonly cover each other at their edges, which are refined into thin laminæ. It is therefore very difficult to diſtinguiſh the ſutures.

In the ſea tortoiſes the temporal foſſæ, which are very deep, are covered by an oſſeous lamina, which forms a very ſolid arch above them.

The deſcription of the jaws, and the temporal foſſæ, is given at the beginning of the account of the digeſtive organs.

Cavities of the Face.—1. *Naſal Cavity.* It is a broad ſpace in the tortoiſes, occupying the whole thickneſs of the ſnout in front of the eyes, and very ſhort from before backwards. Its front opening is large, and nearly ſquare, with its plane but little inclined; ſurrounded by ſix bones. There are two round openings behind, correſponding nearly to the middle of the palate.

In the crocodile it is a long and narrow canal, extending from the end of the ſnout under the occiput: its bony opening, formed entirely in the two intermaxillary bones, is turned upwards.

Other lizards have the naſal apertures ſituated nearly as in birds: that is, the front or outer on the ſide of the ſnout, and the back or inner in the middle of the palate. They are ſtill ſhorter in the frogs.

2. The orbit is never ſeparated from the temporal foſſa in reptiles by a partition, but merely by a bony branch; and even this is complete only in the lizards and tortoiſes, not in the frogs, ſalamanders, or ſerpents. The plane of its margin is lateral in the tortoiſes, ſerpents, and cameleon; it is more or leſs directed upwards in the crocodile, ſalamanders, and frogs. The figure varies from circular to triangular. The inferior ſurface or floor is never complete: either it is altogether deficient, or it is perforated by a very large aperture. The ſame remarks are applicable to the inter-orbitar ſeptum.

The zygomatic foſſæ are ſpoken of in the deſcription of the jaws and their movements, under the diviſion of *Organs of the Vital Functions.*

Foramina of the Face.—Where there is no diſtinction between the orbit and temporal foſſa, the ſpheno-maxillary fiſſure is of courſe wanting. There are no internal orbitary holes, as the relation between the orbits and noſe is altogether different from what is obſerved in the mammalia.

The crocodile, frog, and ſalamander, poſſeſs a large foramen inciſivum. The tortoiſe has two ſmall ones: the ſtructure of the lizards is not known.

There is no ſuborbital opening, reptiles having no lips to receive the artery and nerve, which it tranſmits in the mammalia.

The ſpheno-palatine canal appears as a ſimple hole in the os palati.

Motions of the Head.—The articulation of the head of reptiles is conſiderably behind, but the motions vary in different ſpecies.

In the crocodile there is only one condyle, ſituated at the under ſide of the foramen magnum: the atlas is formed of two portions; the poſterior is ſhaped like the ſegment of a ring; the anterior, which is thicker, receives the condyle, and is articulated to the ſecond vertebra: there are two lateral proceſſes, long, flat, and turned backward, which ſupply the place of tranſverſe proceſſes.

The odontoid proceſs of the ſecond vertebra is ſhort and thick; it is articulated within a cavity in the body of the atlas. This ſecond vertebra has tranſverſe proceſſes ſimilar to thoſe of the firſt.

All other lizards have nearly the ſame conformation; but the condyle ſeems divided in two by a longitudinal ſuperficial furrow.

The tortoiſes have likewiſe only one condyle. In the land ſort it is prolonged, and divided into two, as it is in the lizards. In the marine ſpecies it preſents three articular faces, like a trefoil leaf. As this condyle penetrates deep into the correſpondent cavity of the atlas, the lateral motion of the head is much confined. The other motions of the head of the tortoiſe are thoſe of projection and retraction; they depend upon the flexion and extenſion of the cervical vertebræ.

The frog, the toad, and the ſalamander, have the head articulated by two condyles upon the firſt vertebra, which is almoſt immoveable.

Serpents have three ſurfaces, in the manner of a trefoil, cloſe together, upon one condyle, beneath the occipital foramen. The head is not more moveable on the atlas, than the reſt of the vertebræ are upon each other.

Bones of the Spine.—The number of vertebræ, and every other attribute of the ſpine, are more varied in this claſs of animals than in any other.

In the tortoiſes, ſeven vertebræ are aſſigned to the neck: the firſt is only a ſingle tubercle, the annular portion of which is very diſtinct. The ſurface, by which it is articulated with the head, is formed of three planes; one anterior, and two lateral. The point in which they unite is the moſt prominent, and to this is attached a ſtrong ligament. The ſurface which unites it to the next vertebra is a glenoid cavity; the ſecond and the following vertebræ have a prominent longitudinal ridge upon the fore-part of their body. The articular proceſſes deſcend below the body: there are no ſpinal proceſſes, except one to the ſecond vertebra, which points forward, and one to the third in the form of a ſimple tubercle. The two laſt vertebræ, at a certain age, become anchyloſed. There are eight dorſal vertebræ; but they are all anchyloſed, together with the ribs and the back-ſhell, in one immoveable piece. They have, therefore, neither proceſſes nor articular ſurfaces: they are all narrower in the middle than at the ends. The lumbar and ſacral vertebræ are likewiſe conſolidated with the back-ſhell, but thoſe of the tail are free and moveable. The condyle, which forms the body of theſe vertebræ at its articulation with the others, inclines backward, and not towards the head, as thoſe of the neck do. There are likewiſe upon the fore-part of the body, at its baſe, two ſmall tubercles; but all the proceſſes of theſe vertebræ reſemble thoſe of the mammalia.

In the family of lizards, the crocodile has ſeven cervical vertebræ, diſtinct indeed, but ſo cloſely articulated as not to be moveable. The proceſſes are ſo numerous, long, and cloſe, that the animal cannot bend its neck, and the cervical column may, therefore, be regarded as a ſingle piece. This correſponds with the reports of travellers, that the crocodile is unable to turn his head round. The anterior ſurface of the body is concave, and the poſterior convex, throughout the vertebral column of the crocodile. The atlas is compoſed of ſix pieces, which appear to continue ſeparate through life: the vertebra dentata has five only. The other cervical vertebræ have on each ſide two ſhort tranſverſe proceſſes, which ſerve to ſupport the ſmall ribs or appendices, which limit the flexion of the neck. Each has two pedicles, attached to the two proceſſes juſt mentioned: the appendix projects into a ſharp proceſs before and behind, which touch thoſe of the contiguous vertebræ. The

five

five firſt dorſal vertebræ have a lateral tubercle for the head of the rib, and another on the tranſverſe proceſs for its tubercle: thus the rib is articulated only to one vertebra. But the firſt of theſe articular ſurfaces is wanting in the remaining ribs, while each of their tranſverſe proceſſes has two articular faces. The ſame number (ſeven) is found in moſt lizards, though the cameleon has only two. The ſacral vertebræ are very few in every ſpecies, and none of them have a large os ſacrum.

As frogs have no ribs, no diſtinction can be formed with reſpect to the three firſt orders of vertebræ in them. They have in general eight between the neck and the pelvis, all furniſhed with pretty long tranſverſe proceſſes. The laſt are the longeſt, and touch the oſſa ilii. In the toads, the tranſverſe proceſſes are very large, and ſhaped like hatchet blades. The os ſacrum conſiſts of a ſingle bone only: it is long, pointed, compreſſed, and has no coccyx. In the pipa, which has the tranſverſe proceſſes of the ſecond and third vertebræ much longer than the others and almoſt like ribs, this bone is oſſified with the laſt vertebræ.

The ſalamanders have fourteen vertebræ between the head and the ſacrum; they have all nearly the ſame ſhape, except the firſt, which receives the head, and the laſt, which is articulated to the ſacrum. The two extremes of the ſpine alone want the veſtiges of the ribs, which conſiſt of ſmall oblong moveable bones, actually articulated to the tranſverſe proceſſes, which here take a poſterior direction. The articular proceſſes are large, and wedged together. The poſterior reſt upon the anterior, ſo as to impede the motion of the ſpine backward. The ſacrum conſiſts only of a ſingle vertebra, but there are twenty-ſeven in the tail.

In ſerpents, the vertebræ alone conſtitute almoſt the whole ſkeleton. It appears in general, ſays Blumenbach, that the number of vertebræ, in red-blooded animals, is in an inverſe proportion with the ſize and ſtrength of their external organs of motion. Serpents, therefore, which entirely want theſe organs, have the moſt numerous vertebræ; ſometimes more than three hundred. (Comp. Anat. p. 118.) In confirmation of this remark, we may obſerve how numerous the vertebræ are in the elongated fiſhes, as the eel, and in the whales, as the porpoiſe, (above one hundred in the former, and between ſixty and ſeventy in the latter). Birds, whoſe wings give them ſuch vaſt power of locomotion, have very few vertebræ, if we conſider the anchyloſed ones as forming a ſingle piece; and the frog, with its immenſe hind extremities, has a very ſhort ſpine, conſiſting of ſtill fewer pieces than that of birds. The vertebræ of this order are nearly of the ſame form, from the head to the tail: the body, as well as the ſpinous, articular, and tranſverſe proceſſes, are eaſily diſtinguiſhed. In certain kinds, for inſtance the boæ, the ſpinous proceſſes, which are continued throughout the whole length of the back, are ſeparated from each other, and allow reciprocally a motion ſufficiently conſpicuous. Wherever this diſpoſition of the ſpinous proceſſes prevails, the body of the vertebræ, on the ſide next the belly, preſents only an obſcure projecting line. In other kinds of ſerpents, as for example the rattleſnake, the ſpinous proceſſes are long, and ſo large as to touch each other. They have, for their baſis, the articular proceſſes, which lie on each other like tiles. In conſequence of this ſtructure, the motion of the ſpine towards the back is very circumſcribed, but its motion towards the belly and ſides much augmented. The bodies of the vertebræ play very eaſily in theſe directions upon one another, and are armed with a ſharp ſpine tending towards the tail, which only obſtructs their motion when it might produce a luxation. The firſt vertebræ differ from thoſe of the reſt of the body, only in having the rudiments of the ribs much ſmaller: there is no neck in theſe animals. The vertebræ of the tail differ no farther than in having no ribs, and that their ſpines, both ventral and dorſal, are double, or form two ranges of tubercles. The articulation of the bodies of the vertebræ with each other is very remarkable: the anterior part of the body of the vertebra preſents a ſmooth hemiſpherical tubercle, and the poſterior part a correſponding cavity; ſo that each vertebra becomes connected to thoſe next it by a ſort of knee-joint. This mode of articulation fully explains the motion of reptiles, which is performed winding from ſide to ſide, and not up and down, as it is repreſented by painters.

Table of the Number of the Vertebræ in Reptiles.

I. Oviparous Quadrupeds.

Species.	Vertebræ of the Neck.	Vertebræ of the Back.	Vertebræ of the Loins.	Vertebræ of the Sacrum.	Vertebræ of the Tail.
Turtle - - -	7	11	0	3	20
Crocodile - -	7	12	5	2	34
Tupinambis -	7	18	4	2	104
Iguana - - -	5	11	9	2	72
Cameleon - -	2	17	3	1	69
Salamander - -	1	12	1	1	26
Frog - - - - -	10 in all.				
Pipa or Surinam toad,	8 in all.				

II. Serpents.

Species.	Vertebræ to which Ribs are joined.	Vertebræ of the Tail.
Viper (berus) - - - -	139	55
Spectacle ſnake (naia) -	192	63
Garter ſnake (natrix) - -	204	112
Amphiſbæna - - - -	54	7
Boa (conſtrictor) - - -	252	52
Common ſnake - - - -	244	More than 60.
Rattleſnake - - - -	175	26
Slow worm (anguis fragilis)	32	17

Of the Ribs and Sternum.—The thorax of reptiles is very various in its ſtructure. Frogs have a ſternum, but no ribs; ſerpents have ribs, but no ſternum; tortoiſes have the ribs oſſified to the back-ſhell, and the ſternum included in the breaſt-plate; the crocodile and lizard have perfect ribs, but their ſternum is almoſt entirely cartilaginous. In the crocodile, the firſt portion of the ſternum is oſſified and elongated. It receives the two clavicles. The remaining part is entirely cartilaginous. It is united with the os pubis, and ſends off eight cylindrical cartilages to the parietes of the abdomen. This ſtructure, conſtituting a ſpecies of abdominal ſternum, apparently for ſupporting the viſcera, is quite peculiar to the crocodile. The ribs are twelve in number, the two firſt and two laſt of which are not attached to the ſternum. The intermediate ribs have upon their poſterior edges cartilages partly oſſified, which ſupply the place of the angles of the ribs in birds. All the poſterior ribs, beginning at the fifth, are only articulated to the tranſverſe proceſſes of the vertebræ, which are of great length. The five firſt articulate with the vertebræ at two points, one on its

its body, and the other on the tranſverſe proceſſes. The iguana and the tupinambis have only the upper part of the ſternum oſſified: it is broad, and receives ſix ribs and the clavicles; the other ribs are free. The cameleon poſſeſſes likewiſe the upper portion of the ſternum; but almoſt all the ribs have cartilages, which extend to the middle line, and are there united to the oppoſite ones. Frogs, though they have no ribs, have nevertheleſs a very conſpicuous ſternum. It forms on the anterior part a cartilaginous appendix, furniſhed by a diſk ſituated below the larynx. It next receives the clavicles, and then expanding, it terminates at laſt in another diſk ſituated under the abdomen, and which affords an origin for muſcles. There is a peculiar bony cyſt of unknown uſe on the internal ſurface of the ſternum, in the rana pipa.

The ſalamander has ribs, ſo ſhort that they ſeem to be the tranſverſe proceſſes of the vertebræ; they have only one point of articulation, upon which they have but little motion. Theſe rudiments of ribs are twelve in number on each ſide. This reptile has, properly ſpeaking, no ſternum, but its place is partly ſupplied by the bones of the ſhoulder, as we ſhall preſently ſee.

The ſkeleton of the chelonian reptiles exhibits to us what appears on the firſt view as a completely anomalous organization. In the bony houſe which theſe animals carry about with them, there is ſuch a deviation from the ordinary figure, connection, and poſition of the parts, compoſing the ſkeleton of other vertebral animals, that a haſty view would lead us to infer that the general model to which Nature in all her modifications of form and poſition ever adheres, has been completely loſt ſight of, and another ſubſtituted in its place. This inference would be altogether incorrect: a more accurate examination enables us to diſcover in the external bony ſhells of theſe ſingular creatures, all the oſſeous pieces which belong to the cheſt of a mammiferous animal or bird; ſo that no eſſential part is wanting in their thorax, and the ſingularity depends merely on the more or leſs complete oſſification of the whole pectoral caſe, and the peculiar forms reſulting from this circumſtance. Thus, inſtead of the anomaly, which a haſty glance leads us to anticipate, we actually diſcover, on the contrary, a new proof of the conſtancy, with which an original model is retained throughout whole claſſes of animals, even under the wideſt differences of external form, as if Nature, having fixed on one general principle of organization, would not be at the trouble of inventing others, but rather choſe, by the ſtrangeſt modifications, to accommodate the organs to new ſituations and forms. It is a new illuſtration of that principle, in conformity to which the fin of a whale contains all the bones of an upper limb of a quadruped, the wing of the bat the regular digital phalanges, the fin of a penguin or ſeal the uſual bones of the extremities of a bird or mammiferous animal, &c.

The bones of the cheſt in the tortoiſes form a more or leſs convex ſhield-like covering, which conſtitutes the upper ſurface of the animal; we call it the upper ſhell (carapace, bouclier, &c.); and a nearly flat portion adapted to its concavity below, conſtituting the inferior ſurface of the animal: this is the under ſhell (plaſtron).

The back ſhell is formed by the expanſion of eight ribs or oſſeous ſtaves, which ariſe from the joints of the vertebræ, and terminate in a border that ſurrounds the whole ſhell: theſe bones are united together by real ſutures, ſituated tranſverſely. Above, and all along the middle part of the ſhell, we obſerve a row of little oſſeous plates, almoſt ſquare, intimately connected together, and to the plates formed by the ribs, by ſynarthroſis, and equal in number to the vertebræ. Theſe plates repreſent the rings and ſpinous proceſſes of the vertebræ. The oſſeous margin is made up of a great number of pieces, (eleven on each ſide, and a ſingle one in the middle, before and behind, therefore 24 in the whole,) ſoldered together, which by their union form an edge or border with three ſurfaces, *viz.* the ſuperior, which belongs to the back ſhell; the inferior, which is joined to the breaſt-plate by a very thick leather-like ſkin; and the internal, which preſents a groove for the reception of the extremities of the ribs. Theſe pieces, which Geoffroy compares to the ſternal or cartilaginous portion of our ribs, are wanting in the ſoft tortoiſes, (trionyx, Geoff.); or at leaſt remain conſtantly cartilaginous or membranous, ſo that the middle only of the upper ſhell is ſuſtained by an oſſeous diſk.

The turtles, and the ſoft tortoiſes, are the only genera in which the ribs, confounded in the upper ſhell or carapace, are nevertheleſs diſtinct, both by a prominence very apparent on the inſide of the ſhell, and by a free unattached portion of their ends projecting beyond the edge of the ſhell. But the oſſeous diſk, compoſed of articulated pieces, and already mentioned, extends round the ribs in the turtles, receiving their ends, but is wanting in the ſoft tortoiſes. Its ſolidity is increaſed in the former by the great plates which cover it, while it remains flexible in the latter, and is covered only by a ſpecies of epidermis.

The oſſification of the intervals of the ribs, forming the carapace, is perfected gradually, and is not finiſhed until long after that of the ribs themſelves: it generally advances from the middle towards the edges. Thus, in a young turtle the ribs will be found ſeparate from each other, towards their external extremities, for half their length; while in an adult individual of the ſame ſpecies, the anterior ribs are united throughout, while the intermediate ones are ſeparated only through about one-ſixth of their length.

The carapace is always oval and pointed behind in the turtles; elliptical and gibbous in the land tortoiſes; elliptical and flatter in the freſh-water tortoiſes. Its ſurface is rough in the ſoft tortoiſes; elevated into various prominences in the chelydes and the ſerpentine, and more or leſs ſmooth in the others.

The margin of the upper ſhell aſſumes a different appearance at its anterior part; it is there a ſquare piece of bone, convex above, and concave below, which ſuſtains a ſpine for the attachment of muſcles. Its anterior edge has more the form of a creſcent (lunula); there are alſo ſome little peculiar pieces above the tail.

The breaſt-plate of the tortoiſe is its ſternum; and when deprived of the thick ſkin that covers it, exhibits, in ſome ſpecies, only one ſolid plate, formed of ſeveral pieces, united by ſynarthroſis: in others, this plate is perforated quite through, and formed of ſeveral bones, ſome of which are ſituated in the middle line between the anterior and poſterior part, while others are placed laterally, and faſtened together by the help of the former, which ſupport them. For further information concerning the oſſeous fabric of the cheſt in theſe reptiles, two memoirs in the 14th vol. of the Annales du Muſeum may be conſulted; "Sur les Tortues molles, par Geoffroy St. Hilaire;" "Sur les oſſemens Foſſiles de Tortues, par Cuvier."

In the draco volans the ribs form the ſkeleton of the wings, or thoſe expanſions of the integuments between the front and back limbs, which are ſo called. The five poſterior ribs are elongated and bent backwards for that purpoſe. Here progreſſive motion is performed by theſe ribs; but they are ſuperadded for this purpoſe, and make no part of the organs of reſpiration. The animal cannot

in truth be ſaid to fly: its lateral membranes act like a parachute, and enable it to take long leaps.

The ribs are uſually articulated to the vertebræ by means of a convex ſurface, which moves upon a ſlightly concave one formed in two of the vertebræ; ſo that the hollow receiving each rib is ſituated between two vertebræ of the back. But in the ſnake tribe the head of the rib has two ſlightly concave ſurfaces, which move upon a convex protuberance belonging to each vertebra; ſo that the rib reſts on a ſingle vertebra. The conſequence of this peculiarity is, that the ribs do not interfere with the motions of the individual vertebræ, and thus that the latter are left free to execute thoſe movements on each other, which take place ſo extenſively in the progreſſion of ſerpents. The articulations of the vertebræ to each other, and to the ribs, are repreſented of the natural ſize from the ſkeleton of a large boa, in the Philoſ. Tranſ. 1812, pt. 1. pl. 6.

We have already ſeen the ribs, inſtead of contributing to the buſineſs of reſpiration, employed for purpoſes of locomotion in the draco volans. They are ſtill more extenſively employed for the ſame purpoſe in the ſerpent tribe, in which they amount ſometimes to 250 pairs, as obſerved by ſir Everard Hume. Theſe bones, in all ſnakes, are continued to the anus, while the lungs ſeldom occupy more than one-half the cavity covered by the ribs. The hind ribs can only be employed for the purpoſe of progreſſive motion, and thus correſpond to the elongated ribs of the lateral membranes in the draco volans.

The ribs of a ſnake may be ſeen to move forwards ſucceſſively when the animal is in motion, like the feet of a caterpillar, and the ends of theſe bones can be diſtinctly felt on the palm of the hand, as the animal paſſes over it.

At the termination of each rib is a ſmall cartilage in ſhape correſponding to the rib, only tapering to the point. Thoſe of the oppoſite ribs have no connection, and when the ribs are drawn outwards by the muſcles, are ſeparated to ſome diſtance, and reſt through their whole length on the inner ſurface of the abdominal ſcuta, to which they are connected by a ſet of ſhort muſcles: they have alſo a connection with thoſe of the neighbouring ribs by a ſet of ſhort ſtraight muſcles.

When the ſnake is going to put itſelf in motion, the ribs of the oppoſite ſides are drawn apart from each other, and the ſmall cartilages at the ends of them are bent upon the upper ſurfaces of the abdominal ſcuta, upon which the ends of the ribs reſt; and as the ribs move in pairs, the ſcutum under each pair is carried along with it. This ſcutum, by its poſterior edge, lays hold of the ground, and becomes a fixed point, from whence to ſet out anew. This motion is beautifully ſeen, when a ſnake is climbing over an angle, to get upon a flat ſurface.

The coluber and boa, having larger abdominal ſcuta, which may be conſidered as hoofs or ſhoes, are the beſt fitted for this kind of progreſſive motion; there is, however, a ſimilar ſtructure of ribs and muſcles in the anguis and amphiſbæna. In the anguis the ribs are proportionally weaker, and as theſe have nothing to correſpond to the ſcuta, this mode of progreſſive motion is probably leſs neceſſary to them. See "Obſervations intended to ſhew that the progreſſive Motion of Snakes is partly performed by means of the Ribs," by ſir Everard Hume, Philoſ. Tranſact. 1812, pt. 1. pag. 183, with figures. We are alſo indebted to ſir Everard Hume, in conjunction with Dr. Ruſſel, for deſcribing more particularly a fact noticed by Blumenbach, (Comp. Anat. p. 117.), *viz.* an adaptation of certain ribs in the cobra de capello (coluber naia, L.) to the accompliſhment of a particular mechaniſm in that animal. This ſerpent is called the hooded ſnake, from a power of expanding the ſkin of the neck, which is effected by the motions of the ribs. In other ſerpents, the ribs, from the firſt vertebra to thoſe of the middle of the trunk, gradually increaſe in length; thence they gradually ſhorten or decline, to near the end of the tail, where they diſappear, or are transformed into ſhort eminences. In the naia, the cervical ribs gradually lengthen to the tenth or eleventh, after which they ſucceſſively ſhorten to the twentieth. Again increaſing in length, they are, at the middle of the trunk, nearly as long as the middle cervical ribs, and then declining as in other ſerpents, diſappear on the tail.

The firſt twenty ribs, inſtead of bending equally with the others towards the belly, go out in a lateral direction, having only a ſlight curvature, and when depreſſed lie at the ſide of the ſpine upon one another. The firſt is ſhorteſt: they lengthen to the tenth, and are again ſhortened to the twentieth; ſo that, when they are extended, they repreſent an oval figure, of which the ſpine is the middle line or long axis. In the extended ſtate of the ribs, the ſkin of the back is brought over them, forming the hood; and in their depreſſed ſtate it recedes. From the rounded form of the hood, the ſkin has the appearance of being inflated; but the moſt careful examination did not diſcover any communication between the trachea or the lungs and the cellular membrane under the ſkin. See "Remarks on the voluntary Expanſion of the Skin of the Neck in the Cobra de Capello," &c. by Pat. Ruſſel, M.D. and Everard Hume, eſq. Philoſ. Tranſ. 1804, pt. 2. pag. 346.

The exiſtence of ribs has been denied in the ſiren lacertina, and proteus anguinus: they have in truth merely very inſignificant rudiments of ribs, that might be eaſily overlooked. Theſe have nothing to do with the reſpiration of the animals, indeed they are too ſmall to anſwer any purpoſe. See the deſcription of theſe animals at the end of the preſent article.

Such rudiments of ribs are ſaid to exiſt in the genus cæcilia, among ſerpents.

Bones of the Shoulder.—In oviparous quadrupeds the glenoid cavity of the ſhoulder is partly compoſed of the ſcapula, and partly *of the clavicle.* The ſcapula, which is elongated, has no ſpine; it contracts and becomes thicker towards the neck. The clavicle is ſimple, ſhort, and flat, and united to the ſternum in the crocodile and lizards. It is broad, and almoſt ſquare, in the iguana and cameleon; in the tupinambis it is oval, and very large and long between the front and back, and has two un-oſſified parts. The frog and toad have two clavicles to each ſhoulder, attached to the two extremities of the ſternum. The ſcapula is bent, and compoſed of two articulated pieces, with the ſuperior one inclined towards the ſpine. The ſame conformation obtains in the Surinam toad. The anterior clavicles appear to correſpond to the os furciforme of birds. The clavicle, the ſternum, and the firſt piece of the ſcapula, are anchyloſed together. The ſalamanders have the ſhoulder formed in a moſt ſingular manner, the ſcapula, clavicle, and ſternum, conſiſt only of a ſingle bone, which receives the head of the humerus. The ſhoulder is almoſt all cartilaginous, but the part anſwering to the ſcapula is more diſtinct than the reſt. It inclines towards the ſpine, where it receives the muſcles by which it is moved. The clavicular part is directed towards the head; that which ſupplies the place of the ſternum turns towards the breaſt, but without uniting with the bone of the oppoſite ſide; the part on the right ſide ſlides over that on the left. This conformation allows a greater dilatation of the breaſt in reſpiration. The tortoiſe has

has alſo theſe three bones, which unite to form the glenoid cavity, and correſpond with the ſcapula, fork, and clavicle. But as their reſpective diſpoſition is very remarkable, it appears neceſſary to give a particular deſcription of them. One of the bones extends from the baſe of the rudiment of the firſt rib, to which it is fixed by a ligament, as high as the humeral cavity, where it is intimately connected with the other two. The ſecond bone may be conſidered as the continuation of the firſt, which it joins at the humeral cavity, of which it forms part. Its other extremity is attached to the breaſt-plate, and ſtrong ligaments likewiſe unite the extremity to that of the poſterior bone. Theſe two bones, thus united, are ſlightly bent outwards, ſo as to leave between them and thoſe of the oppoſite ſide, an oval ſpace, through which the œſophagus, the trachea, and ſeveral muſcles, paſs. The firſt ſeems to correſpond to the clavicle, and the ſecond to the os furciforme. Finally, the third bone of the ſhoulder is ſituated below the abdominal and thoracic viſcera, nearer the breaſt-plate. It is long, and extends from the humeral cavity, of which it forms the lower part, as far as the abdomen. It ſeems to ſupply the place of the ſcapula by the number of muſcles inſerted into it, but its ſituation is juſt the reverſe of that bone. A very ſtrong ligament unites this bone to the ſecond.

Bone of the Arm.—The humerus of the tortoiſe has a very remarkable ſhape. As in birds it is articulated at once to the ſcapula, clavicle, and os furciforme, by a large oval head, the greateſt diameter of which lies in the direction of the flatneſs of the bone. A conſiderable eminence riſes above this large head, which, by its curvature and its uſes, has ſome relation to the olecranon, a proceſs which, in this animal, the bone of the fore-arm wants. Below the head there is another eminence, leſs projecting, but more rough, which likewiſe ſerves as a point of inſertion to ſome muſcles, and ſupplies the place of the little tuberoſity. The reſt of the body of the bone is flattened and narrow towards the middle. In the crocodile, the humerus is round, but a little bent like an S in its whole length. At the extremity that joins the ſcapula, it reſembles the tibia; its head, inſtead of being round, is flat; and its tuberoſity, which is ſingle, is anteriorly in the form of a ridge, and ſomewhat inclined inwards. In the other lizards, and in frogs, the humerus exhibits nothing peculiar. Serpents having no limbs, have conſequently no humerus.

Bones of the Fore-arm.—The humerus of the crocodile terminates in two round tubercles. The hollow head of the radius turns upon the external one. Between them the round head of the ulna is ſituated, but it has neither olecranon nor ſigmoid cavity. In the upper part it is the largeſt of the two bones, but the ſmalleſt below. There is nearly the ſame conformation in the cameleon, but the bones are more elongated, and the inferior head of the radius is leſs than that of the ulna. In the frog the ſingle bone of the fore-arm is articulated by a concave head, with a large round tuberoſity on the baſe of the humerus, between its two condyles. On each ſide, where the lower part of this bone becomes larger, we obſerve a furrow, which is the only veſtige of a diſtinction into two bones. Troja has pointed out a ſingularity in the ſtructure of the bone of the fore-arm and of the leg in frogs and toads. Theſe bones conſiſt of a ſingle piece, which is ſolid in the middle, but divided at either extremity into two conical portions, having manifeſt medullary cavities. See Memoria ſopra la ſtruttura ſingolare della tibia e del cubito nelle Rane e nei Roſpi, in his Sperienze intorno alla Rigenerazione delle Oſſa. Nap. 1779, p. 250, t. 7, 8.

The two bones of the fore-arm of ſalamanders are ſituated one above the other. The ulna, which is the loweſt, and ſomewhat longeſt of the two, has no olecranon; but there is a ſort of rotula in the tendon of the extenſor muſcles. The ulnar extremity of the humerus is much enlarged. The articulate ſurface which terminates it is convex, and permits the radius and ulna to turn together in every direction. The two bones of the fore-arm in the turtle are always in a forced ſtate of pronation. The radius, which is much longer than the ulna, and fixed to it by a cartilaginous ſubſtance, is the loweſt, and extends even under the carpus. Theſe two bones much reſemble each other in the humeral extremity, being formed by a ſingle concave ſurface received upon a correſpondent pulley of the humerus. Their articulation is ſuch that it allows them to move together laterally, and a little upward and downward in the action of ſwimming.

Bones of the Hand.—The frog, the toad, the ſalamander, have three ranges in the carpus. The firſt conſiſts of two bones, one radial and one ulnar; the ſecond conſiſts of three bones, the largeſt of which bears the rudiment of a thumb with two joints; the third range has likewiſe three bones. The ſecond fingers proceed from the firſt of theſe bones; the fourth finger is articulated with the ſecond bone; the middle finger articulates with both bones; the little finger joins the third bone. The firſt range touches the third inferiorly, becauſe the ſecond is cuneiform. There is no bone without the range. In the mud tortoiſe, the firſt range is a ſingle bone, which ſeparates the radius from the ulna: the ſecond range conſiſts of two bones, and a ſmall one out of the row, ſituated on the ulnar edge: the third range conſiſts of five bones, one for each bone of the metacarpus. The ſea tortoiſe has three bones in the firſt range, the ulnar bone being the longeſt. The two anterior bones do not advance much farther. The third range conſiſts only of three bones for thoſe of the metacarpus, and one ſmall bone out of the row, ſituated upon the radial ſide.

In the crocodile, the firſt range conſiſts of two long parallel bones. It has beſides two little external bones without the range on the radial ſide. The number of the phalanges varies in theſe animals. The crocodile has the hand rounded. It has two phalanges to the thumb, three to the ſecond finger, four to the middle and fourth fingers, and only three to the little fingers.

The cameleon has three fingers on one ſide, and two on the other, which form, with the three oppoſite to them, a kind of forceps. The number of the phalanges is the ſame as in the crocodile, with the exception of the little finger, which has four. In the ſalamander the little finger is obliterated, and the thumb has only two phalanges.

The frog has only one phalanx to the thumb. The two following fingers have only two phalanges. The other two fingers have three.

The hand of the ſea tortoiſe is long, and compreſſed in the form of a fin; there are two phalanges to the thumb, three to the three ſucceeding toes, and two only to the laſt. A ſimilar conformation is obſervable in the mud tortoiſe; with this exception, that its hand is rounded.

Bones of the Pelvis.—In the turtle, that part of the os innominatum which correſponds to the pubis, is the moſt conſiderable. It proceeds from the cotyloid cavity by a thick portion, which comes forwards and widens into a thin flat lamina, divided into two parts; one is turned towards the middle line, by which the two correſponding bones are united; the other is free, and is directed to the external ſide. The portion which correſponds with the ilium is ſhort, narrow, and thick; it reſts on the ſhell, and is joined to the ſacrum; finally, the portion which is analogous to

the iſchium is turned backward and downward, and forms the real oſſeous circle of the pelvis. This conformation is ſo ſingular, that the parts of the pelvis of the turtle, when the whole is viewed out of its natural poſition, may very eaſily be miſtaken for one another; for the pubis reſembles the ilium, the iſchium the pubis, and the ilium the iſchium. There is, beſides, another very remarkable peculiarity in the pelvis of tortoiſes; the ilium, and conſequently the whole maſs of the pelvis with which that bone is united, is moveable on the vertebral column.

In the crocodile, and in the tupinambis, the diſpoſition of the pelvis has a great reſemblance to that of the tortoiſe. In the crocodile the pubis receives the ventral ribs. In the cameleon and the iguana it is narrow, and the bones of the iſchium form, by this union, a projecting creſt. In the frog, and in the Surinam and common toads, the oſſa ilii are much elongated; the pubis and the iſchium are ſhort, and united in a ſingle ſolid piece, the ſymphiſis of which forms a creſt, more or leſs round. In the ſalamander, the conformation is preciſely the ſame. The oſſa ilii are narrow, and almoſt cylindrical; and the oſſa pubis completely united with the iſchium, form only a large bony plate without any hole.

Thigh-Bone.—The femur of oviparous quadrupeds reſembles that of other animals; it has, however, a double curvature, more or leſs evident. In front it preſents a convexity towards the tibial extremity, and a concavity near the pelvis. In the tortoiſe the trochanters are well defined, but they are not to be found in the lizards and frogs. The figure of the femur is in general round, except in the Surinam toad, in which it is very flat.

Bones of the Leg.—Oviparous quadrupeds have the tibia and fibula diſtinct and ſeparated from each other throughout their whole length. Theſe two bones are nearly of the ſame magnitude in the tortoiſes and lizards. The frog has but one bone, but a furrow ſeems to indicate the union of the tibia and fibula. In theſe animals the tibia and fibula are, for the moſt part, directly articulated to the thigh-bone.

Bones of the Ankle.—The aſtragalus is articulated to the tibia, and the os calcis to the fibula in all reptiles. The tarſus of the crocodile has five bones, *viz.* an aſtragalus, an os calcis, two cuneiformia, anſwering to the two middle metatarſal bones, and one out of the range, which anſwers to the external metatarſal bone. There are four metatarſal bones. The bone ſituated without the range ſerves to ſupport the little toe in the mud tortoiſe. In the ſea tortoiſe it is very flat. The os calcis and aſtragalus are very ſmall. In frogs, the aſtragalus and os calcis are very long, and might at firſt ſight be taken for the tibia and fibula, if they did not form the third joint of the poſterior extremity. There are on the fore part, four little cuneiform, five metatarſal bones, and one in the form of a hook, which is very minute. Theſe are ſimilar in the Surinam and common toad.

Bones of the Toes.—The number of the toes varies much in reptiles; as may be ſeen from the following table.

Number of the phalanges of the toes of reptiles, excluſive of the metatarſal bones, beginning at the pollex, or internal toe.

Crocodile	2,	3,	4,	4.	
Lizard	2,	3,	4,	5,	4.
Cameleon	3,	3,	4,	4,	3.
Salamander	2,	3,	3,	3.	
Sea tortoiſe	2,	3,	3,	4,	2.
Mud tortoiſe	2,	3,	3,	3,	2.
Frog	1,	2,	2,	3,	4, 3.

The ſaurians preſent us with arrangements in their extremities, not met with in any of the mammalia. We have ſpecies poſſeſſing only fore-limbs, or only hind-limbs; others with four limbs, and one toe only on each; and other unuſual combinations in the number of toes on the fore and hind-limbs. Theſe circumſtances are noticed in thoſe lizards which approach to the form of ſerpents, and whoſe ſmall imperfect limbs ſeem more like rudiments than complete members, ſerving as intermediate links between the ſaurian and ophidian orders. See Lacépéde in the Ann. du Muſeum, ii. p. 351, with figures of a lézard monodactyle, and tetradactyle; and Daudin in his Hiſt. Nat. des Reptiles, vol. iv. in the hiſtory of the genera Seps and Chalcide. We know nothing, however, about the oſteology of theſe—we might almoſt ſay—ridiculous limbs, they are ſo obviouſly inadequate to the purpoſe of locomotion.

Of the Muſcles.

Muſcles of the Spine.—There are few ſpinal muſcles in frogs. The muſcle which is analogous to the iſchio-coccygeus is large and thin, and occupies all the ſpace compriſed between the long bone of the coccyx and the ilia. Its fibres are oblique, and it ſerves to draw the coccyx into the direction of the ſpine. That which is analogous to the lumbo-coſtalis, ariſes above the laſt by a ſort of point attached to the coccyx. It extends quite to the head, into which it is inſerted, and detaches fibres in its progreſs to each of the tranſverſe proceſſes, which form a kind of interſection upon its ſurface. The obliquus ſuperior ariſes from the head at the margin of the foramen magnum, and is inſerted into the tranſverſe proceſſes of the firſt dorſal vertebra. There is only one ſmall rectus anterior, it ariſes from the baſe of the cranium, below the foramen magnum, and is inſerted into the firſt of the tranſverſe proceſſes. The inter-tranſverſales are like the human. The ſpinal muſcles of the ſalamander much reſemble thoſe of the frog; thoſe of the tail are very ſimilar to the muſcles of fiſhes. The ſpine of the tortoiſe has no motion except in the parts belonging to the neck and tail. Thoſe of the back and loins, which are oſſified together, have no muſcles. The muſcles of the neck are very different from thoſe of man. The motions they produce are thoſe of elongation, by which the head is protruded from the ſhell; and thoſe of retraction, by which it is withdrawn, the neck being bent in the form of a Z. The firſt of the muſcles proper to the neck is attached to the under part of the anterior lateral border of the back-ſhell, and into the tranſverſe proceſs of the firſt vertebra; it raiſes the neck and draws it back. Another proceeds from the anterior and middle part of the ſhell: it is inſerted by four fleſhy lips, which are ſeparate throughout a conſiderable portion of their extent, into the articular proceſſes of the third, fourth, fifth, and ſixth vertebræ of the neck. It draws the neck back when the head is much extended, and puſhes it out when it is retracted. A muſcle alſo ariſes from the articular proceſſes of the third, fourth, and fifth vertebræ of the neck, by three fleſhy portions that afterwards unite, and terminate in two tendons; one of which is inſerted into the tranverſe proceſs of the firſt, and the other into the ſpinous proceſs of the ſecond vertebra. This muſcle bends the neck upon itſelf, making it deſcribe a curve, which is convex downwards; this motion brings the head under the ſhell. A muſcle analogous to the longus colli ariſes from the under part of the body of the ſecond dorſal vertebra, beneath the ſhell; it aſcends along the neck, and furniſhes aponeurotic ſlips to al the tranſverſe proceſſes,

as far as the ſecond vertebra, where it is inſerted. This alſo is one of the retractors of the head. There are very diſtinct inter-articulares, which by their action elevate each of the vertebræ, and conſequently extend the neck. The tranſverſo-ſpinalis is ſituated on the poſterior part of the neck: it ariſes from all the ſuperior tranſverſe proceſſes, and is inſerted into all the ſpinous proceſſes as far as the ſixth. Finally, a ſhort muſcle proceeds from the upper part of the firſt dorſal vertebra below the ſhell, and is inſerted into the articular proceſſes of the ſixth and ſeventh cervical vertebræ. This muſcle is peculiar to the tortoiſe, and begins the extenſion of the neck when the head is concealed within the ſhell.

Muſcles of the Ribs, Abdomen, &c.—In the frog, which wants ribs, and the tortoiſe, where they are immoveable, the muſcles which uſually have their inſertions in them, are in thoſe animals extended to other parts. Thus in the tortoiſe, whoſe breaſt-plate occupies the place of the abdominal muſcles, they are inſerted into the pelvis, which they move. With reſpect to thoſe animals, one very remarkable obſervation may, in general, be made. It appears that the very ſingular ſhape of the muſcles and bones depend upon each other. Indeed, as the muſcles are not placed upon the bones, they have not, if we may be allowed the expreſſion, faſhioned them; and the want of motion in the bones, which has given an unnatural figure to the trunk, has alſo given to the muſcles other forms and other uſes. The abdominal muſcles of the frog preſent nothing peculiar, except that the ſkin does not adhere to their ſurfaces, and that inſtead of being inſerted into the ribs, they are faſtened to the ſternum by a ſtrong aponeuroſis. The ſame obſervations may be made with reſpect to the ſalamanders.

We have deſcribed, in the oſteology, the adaptation of the ribs of ſerpents to the purpoſe of progreſſive motion; and now proceed to point out the muſcles by which they are moved forwards or backwards, and connected to the abdominal ſcuta. The ribs are brought forwards by five ſets of muſcles placed on the outſide of the cheſt, and paſſing obliquely from above, downwards, outwards, and backwards. 1. One from the tranſverſe proceſs of each vertebra to the rib behind it. 2. The next ſet ariſes from the ribs, at a ſhort diſtance from the ſpine, paſſes over two ribs, ſending a ſlip to each, and ends in the third. The third ariſes from the poſterior edge of each rib, paſſes over two ribs, and is inſerted into the third rib behind it. The fourth ſet paſſes over one rib and is inſerted in the ſecond. The fifth goes from rib to rib.

The muſcles carrying the ribs backwards are found on the inſide of the cheſt, and ſlant from the ſpine forwards and outwards. A ſtrong ſet ariſes from the anterior ſurface of the vertebra, goes over four ribs, to be inſerted into the fifth about its middle. The ſerrated portions of a ſtrong flat muſcle, forming the muſcular covering of the abdomen, ariſe from this part (the middle of the internal ſurface) of each rib. The right and left muſcles unite in a beautiful middle tendon. Thus it is obvious, that the inferior half of each rib (below the origin of the ſerrated portion juſt deſcribed) is external to the abdominal muſcle, and conſequently free for the purpoſe of progreſſive motion.

The ends of the ribs are connected to the abdominal ſcuta by a ſet of ſhort muſcles: they are alſo connected together by ſhort and ſtraight muſcles. Another ſet goes from the heads of the ribs obliquely backwards to be fixed in the ſkin at the edge of each ſcutum. See ſir E. Hume's paper quoted in the oſteology; and particularly plates 4 and 5 from Mr. Clift's drawings, in which the parts are repreſented.

There is a complicated muſcular apparatus for extending and retracting the ribs, and carrying the ſkin forwards and backwards in the cobra de capello. The ribs are raiſed or carried forwards by four ſets of muſcles, all ariſing from and inſerted in theſe bones, and directed obliquely from above, downwards and outwards.

The ſkin of the back is brought forwards on the neck by a large ſet of very long muſcles, ariſing ſucceſſively from each of the firſt twenty ribs, by a tendon, which ſoon becomes fleſhy. The longeſt is about two inches. They go backwards to be inſerted into the ſkin, which they can bring forwards to a great extent when the ribs have been firſt extended.

The muſcles which carry the ribs back again lie on the inſide of the cheſt under the ſpine. One ſet goes from the vertebræ of the neck to the lower edges of the ribs: but they paſs obliquely upwards and outwards over three ribs, to be inſerted into the fourth, thus acquiring a length of fibre, by which the range of motion produced is much increaſed. The ſecond ſet goes from the ends of the ribs forwards to the ſkin, which they will draw back. The third ſet from the root of one ſcutum to the ſcutum immediately above it, ſo as to bring it down upon the other. Sir E. Hume's and Dr. Ruſſel's paper, and particularly the engravings from Mr. Clift's drawings. Phil. Tranſ. 1804, pt. 2.

Muſcles of the Head.—The muſcles of the head of the tortoiſe cannot be deſcribed under names ſimilar to thoſe of mammiferous animals and birds, becauſe the ſhell affords inſertion to the greater number of them. We will, therefore, only diſtinguiſh them by the points of attachment. Thus, on viewing the back part of the neck, we remark, 1ſt, at the anterior part of the back-ſhell, near the angle of the lunula, a broad muſcle, which extends to the lateral and poſterior parts of the head, into which it is inſerted. It pulls the head backward. 2. Beneath, and from the middle of the anterior lunula of the back-ſhell, there ariſes another muſcle, which is thin and round, and which, in ſeparating from that of the oppoſite ſide, forms an angle like the letter V: it is inſerted on the outſide of the preceding muſcle, and has the ſame uſe. 3. A muſcle analogous to the ſplenius capitis riſes from the ſpinous proceſſes of the fourth and fifth cervical vertebræ, by diſtinct ſlips, and is inſerted into the occipital arch. Its uſe is to raiſe the head. 4. A muſcle analogous to the rectus major anticus riſes from the inferior tubercles of the four vertebræ next to the atlas, and is inſerted, fleſhy and thick, into the depreſſion of the cuneiform proceſs below the condyle. 5. The trachelo-maſtoideus riſes from the inferior tubercles of the ſecond and third cervical vertebræ, by two thin aponeurotic tendons; it is inſerted, by a very thick and entirely fleſhy portion, into the protuberance that anſwers to the maſtoid proceſs. Its uſe is to bend the head laterally. 6. Laſtly, at the ſuperior part of the cervical ſpine there is a ſhort muſcle, which proceeds from the inferior part of the foramen, formed by the temporal foſſa, and is inſerted into the ſpinous proceſſes of the firſt, ſecond, and third vertebræ of the neck. On viewing the neck in front, we obſerve the muſcle analogous to the ſterno-cleido-maſtoideus attached to the ſtrong aponeuroſes that ſurround the humerus at its articulation with the ſcapula. The lower part of it, for one-third of its length, can only be ſeen, the remainder being concealed by a muſcle compoſed of tranſverſe fibres, which ſupplies the place of the mylo-hyoideus, and platiſma-myoides. It is inſerted into a proceſs correſponding to the maſtoid. Its uſe is to

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draw the head inwardly, and to produce a ſmall elevation of the ſhoulders. The longus capitis ariſes from the third vertebra of the back, and is inſerted by a ſlender tendon into the cuneiform proceſs of the occiput. The frogs have very few of the muſcles of the head: moſt of thoſe which are inſerted in it are employed in moving the ſuperior extremities, or are proper to the vertebral column. The muſcle analogous to the obliquus ſuperior ariſes from the firſt tranſverſe proceſſes of the ſpine, and is inſerted into the ſuperior part of the occiput: its direction is oblique from without inwards. That which is analogous to the rectus capitis anticus minor, ariſes from the tranſverſe proceſs of the firſt vertebra, and is inſerted into the baſis of the cranium below the foramen magnum. Theſe are the only two muſcles proper to the head in frogs: they are ſimilar in the land ſalamander.

Muſcles of the Shoulders.—In the frog (which has no ribs) the ſerratus major has an extraordinary ſhape, which appears to be occaſioned in part by the want of the cervical vertebræ: it forms three diſtinct muſcles. The firſt ariſes from the occiput, near to the foramen magnum. It divides into two bellies, which are inſerted into the ſuperior ſpinal angle of the ſcapula; one on the internal, and the other on the external ſide. The ſecond proceeds from the ſecond tranſverſe proceſs, and paſſes under the dorſal portion of the ſcapula, towards its ſpinal edge. The third proceeds from the third tranſverſe proceſs, and paſſes underneath the preceding, keeping ſtill nearer to the edge. There is beſides another muſcle proper to the ſcapula, ſituated upon its internal ſurface, between the two conſtituent parts, which make it appear broken. It appears to draw theſe two parts cloſer together, and by its contraction renders the angle they form with each other more acute. There is no muſcle analogous to the pectoralis minor. The place of the levator, or angularis ſcapulæ, is ſupplied by a very conſiderable muſcle which riſes from the baſe of the occiput; it becomes perceptibly ſmaller as it approaches the ſhoulders, and is inſerted into the poſterior edge of the cartilaginous part of the ſcapula. The omo-hyoideus is long and thin; it comes from the great inferior horn of the os hyoides, and is inſerted under the neck of the ſcapula. The trapezius is wanting. The muſcle analogous to the rhomboides is very thin. It ariſes from the dorſal proceſſes, and is inſerted into the ſpinal edge of the ſcapula. There is no ſubclavius muſcle. The ſterno-maſtoideus has only one belly, which extends obliquely from the poſterior part of the head, behind the ears, to the neck of the oſſeous part of the ſcapula. Its action is evidently that of pulling the ſhoulder towards the head, and raiſing it up. We ſhall deſcribe the muſcles of the tortoiſe ſeparately, as they differ conſiderably from thoſe of other red-blooded animals. They are only three in number. One of them, though very unlike the trapezius, is ſimilar in its uſe; it riſes from the lower ſurface of the back-ſhell among the ribs, from the ſecond to the fifth. It is very thin, and paſſes to the external margin of the third bone of the ſhoulder, which ſeems to correſpond with the ſcapula. A muſcle analogous to the levator ſcapulæ, is inſerted into the curve formed by the joint of the two firſt bones of the ſhoulder. It ariſes by ſeven fleſhy heads from the tranſverſe proceſſes of the ſeven vertebræ of the neck. Another little long muſcle ariſes from the inner ſurface of the back-ſhell near the ſternal extremity of the firſt rib, and is inſerted into the dorſal extremity of the firſt bone of the ſhoulder. It is perhaps analogous to the coſto-clavius.

Muſcles of the Arm.—The pectoralis major of the frog is compoſed of two portions, placed one above the other. They produce two tendons which are inſerted on each ſide of the humeral groove. The latiſſimus dorſi ariſes from the inferior part of the back, where it is thin. It becomes thicker, and is attached to the broad part of the ſcapula, which it entirely covers. It is inſerted, by a ſtrong tendon, into the internal ſurface of the humerus, above one-third of its length from its ſuperior end. In the frog there is neither the ſupra nor the infra-ſpinatus. The ſubſcapularis or coraco-brachalis, (for the muſcle of which we now ſpeak ſupplies the place of both,) ariſes from the internal ſurface of the ſcapula, at its junction with the clavicle, and is inſerted into the interior part of the humerus about one-third from the head. The deltoid is formed of three portions. The firſt, which is the longeſt, and very ſlender, proceeds from the anterior part of the ſternum. The ſecond ariſes from the union of the clavicle with the ſcapula, at the internal ſurface, runs over the bone above the joint, then ſends a thin tendon to the firſt in its paſſage, and is partly inſerted in the linea aſpera, and partly in the inferior portion of the humerus. The third is diſtinct; it riſes partly from both the ſcapula and clavicle, and is inſerted into the ſcapular extremity of the humerus. The teres major and teres minor are wanting. Beſides theſe muſcles, in which we diſcover an analogy to thoſe of mammiferous animals, there is one which ariſes from the ſecond tranſverſe branch of the ſternum, and is inſerted into the inner edge of the groove of the humerus by a broad tendon. It may be regarded as an aſſiſtant to the pectoralis major. This conformation appears to prevail in the ſalamander.

If the tortoiſe has fewer muſcles proper to the ſhoulder than common, it has an extraordinary number inſerted into the humerus. That which correſponds to the pectoralis major is compoſed of five portions. Two are ſuperficial; one ariſes from the edge of the anterior part of the breaſt-plate, and proceeds to its inſertion in the leſſer tubercle of the humerus. The other is much more extenſive: it riſes from a great part of the internal ſurface of the breaſt-plate, and is alſo inſerted by a flat tendon in the leſſer tubercle of the humerus: but it is prolonged by a fan-like aponeuroſis, which extends over the inferior ſurface of the arm, and even of the fore-arm. One of the three deeper portions of the pectoralis major ariſes from the greater part of the ſecond bone of the ſhoulder, and is inſerted into the humerus, below its ſcapular articulation; another ariſes from the expanſion of the interoſſeous ligament, which unites the ſecond bone of the ſhoulder to the third, and proceeds to join its tendon intimately with that of the preceding portion. Laſtly, the third, which is the moſt deep-ſeated of all, ariſes from the ſuperior ſurface of the third bone of the ſhoulder, or that which is next the back-ſhell. Its tendon is conjoined with thoſe of the preceding. The muſcle analogous to the deltoides is alſo compoſed of two portions; one ariſes from a ridge on the anterior part of the breaſt-plate; the other, which is its acceſſory, is placed more deeply, and united to its correſponding muſcle. They are inſerted by one common tendon into the leſſer tubercle of the humerus, which they draw towards the neck in the action of ſwimming. There is another muſcle much deeper ſeated, which ſeems likewiſe an aſſiſtant to the deltoides. It riſes from the dorſal extremity, and all the internal edge of that bone of the ſhoulder which correſponds with the clavicle, and proceeds to be inſerted into the humerus below the leſſer tuberoſity. On the internal ſurface of the humerus, we find a muſcle riſing from the looſe extremity of the ſternal face of the third bone of the ſhoulder: it is inſerted in the humerus, about one-third from its lower end, by a thin tendon. It bears ſome relation to the ſterno-radialis of the frog, and performs the ſame office.

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The levator brachii is a very thick muſcle, which ariſes from the third bone of the ſhoulder, the exterior edge of which it ſurrounds, and is inſerted into the proceſs of the humerus reſembling the olecranon, which it pulls upward and outward. A muſcle analogous to the teres major ariſes from the neck of the third bone of the ſhoulder, externally, and is inſerted into the humerus between the two tuberoſities. It pulls the humerus backward. Another muſcle, which ſeems a ſubſtitute for the latiſſimus dorſi, riſes from the interior part of the back-ſhell, to which it is attached obliquely, to the interval between the two firſt ribs. It is inſerted into the body of the humerus behind the greater tubercle, by a flat tendon. It pulls the humerus towards the upper ſhell, when the animal ſtands upon all its four feet. A muſcle, the uſe of which ſeems the ſame as that of the levator brachii, riſes from the whole internal ſurface of that bone of the ſhoulder which anſwers to the clavicle, and is inſerted into the whole length of the olecraniform proceſs, or great tuberoſity of the humerus. It is very fleſhy, and appears to be formed of two portions. Finally, the muſcle analogous to the ſcapulo-radialis, or biceps flexor cubiti, ariſes from the anterior border of the humeral cavity, and is inſerted into the external and ſuperior ſurfaces of the humerus by a ſmall tendon, which reaches as far as the baſe of the radius. It extends the member, and brings it toward the head.

Muſcles of the Fore-arm.—The frog has, properly ſpeaking, no biceps; its place is ſupplied by another, and much ſtronger muſcle, ſituated on the breaſt, under the pectoralis major, with which it has the ſame inſertions. At the articulation of the humerus it ſends out a ſtrong tendon, which paſſes along the groove of the humerus, and through a tendinous ring, formed by the two parts of the pectoralis major, under the deltoides. It is inſerted into the humeral extremity of the radius, and may be named ſterno-radialis. There is no brachialis internus. The triceps is compoſed of three parts, nearly as in man, but they are proportionally larger. There is but one ſupinator, which ariſes from the external condyle, and is inſerted into the carpus. There is alſo but one pronator, which riſes from the internal condyle, and is inſerted into the carpus. In the turtle, theſe muſcles are almoſt entirely aponeurotic, and produce but very little motion, the place of the member being ſupplied by a fin, as in the cetacea. In general, the muſcles of the humerus produce the motions of the fore-arm.

Muſcles of the Hand and Fingers.—In the ſea tortoiſes, which have the carpus compreſſed and fitted for ſwimming, the muſcles are only ſimple bands of aponeurotic fibres, which ſtrengthen the ſeveral articulations. The muſcles of the hand of the frog and ſalamander are very ſimilar to thoſe of man. Thoſe of the thumb are wanting, except the extenſor, which comes from the external condyle, and is inſerted into the laſt phalanges. The other muſcles vary very little.

Muſcles of the Pelvis.—In the tortoiſe, the muſcle analogous to the quadratus lumborum expands under the back-ſhell, between the laſt anterior ribs; it ariſes from the ilium, towards the articulation of that bone with the os ſacrum, which in this animal is moveable. This mobility of the pelvis is aſſiſted by a muſcle analogous to the rectus abdominis, which, as we have obſerved, inſtead of extending under the belly, is attached under the poſterior extremity of the breaſt-plate by two fleſhy portions, the one anterior, the other poſterior, which are both inſerted in the anterior margin of the external branch of the pubis. There is no pſoas parvus in frogs. The quadratus lumborum extends from the long tranſverſe proceſs of the third vertebra, to the origin of the long bone of the pelvis, which is analogous to the ilium. It is inſerted in this bone, which it raiſes towards the head; their ilium being moveable, like that of the tortoiſe.

Muſcles of the Thigh.—In the frog there is only one glutæus, which is in the place of the medius. It ariſes from the elongation which ſupplies the place of the os ilium, and is inſerted below the head of the femur. The pyriformis comes ſtraight from the point of the coccyx, and is inſerted about one-third from the top of the os femoris. The gemini and the obturator internus are wanting. The quadratus femoris is long. It ariſes from the poſterior ſymphiſis of the iſchium, and is inſerted into the inner ſide of the thigh-bone, about one-third from the head. They have neither the pſoas magnus nor parvus. The iliacus is proportionally elongated. The pectineus deſcends to the middle of the thigh-bone. The three adductors have the ſame origins and inſertions as in man. The obturator externus is to be found, though there is no foramen ovale. It ariſes from the ſymphiſis pubis, and its fibres are attached to the capſular ligament. In the tortoiſe, the muſcles of the thigh produce motions proper to ſwimming; that is to ſay, the abduction, the adduction, depreſſion, and elevation of the thigh. The muſcle analogous to the adductor longus ariſes from the ſymphiſis pubis, and is inſerted into the internal part of the thigh-bone, about one-third from its tibial extremity. Another muſcle, which cannot be eaſily compared to any in man, ariſes from the interior of the ſacrum, and is inſerted into the little trochanters. It is another adductor femoris. A muſcle, compoſed of different radiated faſciculi, ariſes from the broad inferior ſurface of the os pubis, and forms a thick tendon inſerted into the little trochanter. It occupies the place, and anſwers the purpoſes, of the pſoas and iliacus. That which is analogous to the adductor brevis ariſes from the ſymphiſis of the bones of the iſchium, and the interoſſeous ligament of the pubis. It is inſerted into the os femoris, below the little trochanter. The muſcle anſwering to the glutæus maximus ariſes from the ſpine, oppoſite to the laſt rib, and is inſerted into the thigh-bone, below the great trochanter. The muſcles analogous to the glutæus medius and minimus can hardly be diſtinguiſhed from each other. They riſe from the internal ſurface of the os pubis, and are inſerted into the great trochanter. That which reſembles the obturator internus ariſes from the internal ſurface of the ilium, and the ſuperior edge of the cotyloid cavity, and is inſerted into the great trochanter.

Muſcles of the Leg.—The frog has the thighs round, like thoſe of a man, and the muſcles of the leg are very conſpicuous. The triceps femoris is formed only of two very diſtinct portions. The vaſtus externus and cruralis are manifeſtly but one. There is no rectus anterior. The biceps flexor cruris has only one belly. It ariſes from the poſterior and internal part of the ilium, and is inſerted into the exterior and anterior ſurface of the tibia, for there is no fibula. The ſemi-membranoſus is like the human; but the ſemi-tendinoſus is compoſed of two bellies, one of which riſes from the ſymphiſis pubis, and the other from that of the iſchium. The ſartorius is ſituated exactly in the front of the thigh, without any obliquity. There is nothing remarkable in the gracilis. There is no diſtinct poplitæus. Some differences occur in the muſcles of the leg of the tortoiſe. Theſe have a relation to the faculty of ſwimming, for which its extremities are fitted. The muſcle which takes the place of the ſemi-membranoſus ariſes from the interoſſeous ligament of the pelvis, and proceeds to form a ſtrong aponeuroſis at the inferior part of the leg. That which correſponds to the ſemi-tendinoſus ariſes alſo from the interoſſeous liga-

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ment; it paſſes under the ham, and is inſerted into the tibia, which it bends. That which is analogous to the ſartorius ariſes from the os pubis, near the interoſſeous ligament, and paſſes over the knee, to be inſerted into the tibia, which it extends. A muſcle compoſed of two fleſhy portions, both of which ariſe from the lateral parts of the ſacrum, is inſerted below the head of the tibia, and bends the leg. In its action, it much reſembles the biceps, from which, however, it differs with reſpect to its attachments. Another muſcle, reſembling the faſcia lata, and very thin in its fleſhy part, ariſes from the ſides of the coccyx. It paſſes under the ſkin of the fin, to its inſertion, almoſt oppoſite to the heel. It bends the leg upon the thigh, and extends the foot upon the leg. The muſcle analogous to the biceps ariſes from the ſacrum and ilium. It goes to the external ſurface of the leg, where it is inſerted into the fibula. The extenſor of the leg preſents nothing particular. The muſcle analogous to the rectus anterior ariſes from the internal ſurface of the pubis, and joins the common tendons of the extenſors.

Muſcles of the Ankle.—In the frog, the gaſtrocnemius has only one belly; it has, however, a ſmall tendon, by which it is inſerted into the outward ſide of the head of the tibia. Its tendon runs under the heel, and there ſliding over a ſeſamoid bone, expands itſelf under the foot, to form the plantar faſcia. There is neither ſoleus nor plantaris. The tibialis anticus riſes by a ſtrong tendon from the lower part of the os femoris. About the middle of the tibia it divides into two bellies, one internal, the other external. The tendon of the firſt is inſerted into the tibial baſe of the long bone of the tarſus, and that of the ſecond into the ſame bone, a little more outwardly. An aſſiſtant to this muſcle ariſes from the middle and anterior part of the tibia, and proceeds to the internal ſide of the baſe of the long bone of the tarſus. The tibialis poſticus reſembles the human, but it is only inſerted into one bone of the tarſus, *viz.* that which is long, and ſituated at the inner ſide. There is but one muſcle, to which the term peroneus can apply. It ariſes by a ſlender tendon, from the external condyle of the thigh, and is inſerted into the baſe of the tibia, on the outſide, by two tendinous portions, one of which extends to the bone of the tarſus. It extends the leg with reſpect to the thigh, or, more properly, the thigh with reſpect to the leg. Beſides theſe muſcles, which extend from the leg to the foot, there is another which ariſes from the metatarſal extremity of the tibia, at its internal edge, paſſes between the two bellies of the tibialis anticus, and proceeds very obliquely to its inſertion, at the digital extremity of the long bone of the tarſus, on its inner ſide. In the ſea tortoiſe, the muſcles of the feet are ſupplied by aponeurotic fibres, ſomewhat fleſhy, which ſerve only to ſtrengthen the articulations, and keep the fins properly extended.

Muſcles of the Toes.—There is no extenſor longus digitorum in the frog; neither is there any flexor proprius pollicis. The extenſor brevis digitorum is very diſtinct, it ariſes from the whole length of the long external bone of the tarſus, and extends obliquely to all the four toes, the laſt excepted. It is inſerted into the laſt phalanges. There are ſuperior and inferior interoſſeous muſcles, which are very apparent, to the number of ten. Their direction is very oblique. The flexor communis digitorum is ſituated under the long bone of the tarſus, on the inner ſide, and is covered by the aponeuroſis of the gaſtrocnemius. When it reaches the little bones of the tarſus it divides into five tendons, which receive, at their inner ſide, aſſiſtant fleſhy fibres, apparently proceeding from a muſcle ſituated below the long bone of the tarſus, on the inner ſide. It may perhaps repreſent the flexor longus. In the ſea tortoiſe all theſe muſcles have their places ſupplied by bundles of aponeurotic fibres.

On the Support of the Body, and its Motions in Progreſſion.—*Standing* is an attitude common to all animals, but the circumſtances attending it differ very conſiderably. In moſt of the oviparous quadrupeds, the knees and elbows are directed outwards as they ſtand, and even during their various progreſſive motions. The poſterior members, articulated more in proportion at the ſides of the body, are ſo bent, that the belly deſcends to the ground, and moves along it.

Turtles reſt on their plaſtron, and on their four flattened, elongated, and fin-like members. They may be compared to ſeals in their mode of executing movements. They employ their members, either in ſwimming, or in walking on the ſea-ſhore, or in digging holes in the ſand to receive their eggs.

In tortoiſes, ſtanding is nearly the ſame as moſt in other oviparous quadrupeds; and the direction of their body is horizontal. Batracians, and frogs in particular, generally have their body, when at reſt, in an oblique elevation; the arms ſuſtaining the front part, while the back remains on the ground. The formation of the poſterior limbs does not render them adapted to raiſe the body in a vertical direction, but merely to puſh it forwards.

Serpents, in a ſtate of repoſe, coil up their body in ſeveral circles, either riſing one above the other, or arranged one within the other; and the head is elevated above this coil. Thoſe which inhabit trees are twiſted round the branches. The chalcides and biped lizards may be compared to ſerpents when at reſt, for they are coiled up, and their limbs ſerve merely to prevent the body from rolling.

Walking exhibits different modifications, according to the number and form of the limbs, and the relative ſize of the fore and hind-feet. Where they are of equal length, the animals move with great velocity: hence the names of certain ſpecies, as lacerta agilis and velox. When, however, the limbs are too ſmall and weak for the body, the movements are ſlower, as in the crocodile, the chalcides, and the toad.

The feet of the cameleon, and its prehenſile tail, make it a better climber than moſt reptiles.

The limbs being all of nearly equal length in the ſcinks, they cannot leap well: while the iguanas and tupinambes exhibit conſiderable agility. The frogs are the great jumpers, from the great length and ſtrength of the hind limbs. But they can hardly walk; moving the front legs only with facility, and being obliged almoſt to drag the hind ones after them.

Serpents can leap or project their bodies by the ſudden extenſion of ſeveral articulations: they form ſeveral curves with their body, and then ſuddenly ſtraighten them, either in whole or in part, according to the leap which they may wiſh to make.

Creeping, properly ſo called, belongs only to ſerpents, and conſiſts of a projection of the body backwards or forwards, produced by the alternate motion of one or ſeveral of the lower parts againſt the ground. The following modifications are exhibited in different inſtances. 1. Creeping by vertical undulations. 2. By horizontal undulations. 3. By two or three undulations of the poſterior third part of the body, while the two anterior thirds are elevated vertically. 4. A ſliding kind of crawling, by ſmall undulations formed by the alternate approximation and ſeparation of rows of ſcales placed tranſverſely under the body.

5. The

5. The ſame kind of motion, produced by the alternate formation and diſappearance of folds in the ſkin of the ſides. 6. Without any undulation, merely by the alternate approximation and ſeparation of rings of the body.

The repulſive motions, by which reptiles move their bodies forwards in water, are nearly the ſame as they employ in jumping; but they muſt be much quicker. To riſe in the water, they muſt ſtrike back the water below and behind them, and diminiſh the breadth of their body, as much as poſſible, by carrying their ſwimming organs backwards after each ſtroke. Thus we ſee the frog, after ſtriking, extend its long hind legs, ſo as to offer no reſiſtance to the paſſage of the body through the liquid. The act of ſwimming offers the following modifications. 1. External ſwimming (on the ſurface of the water, breathing air) by vertical undulations, without ſwimming organs. The ſerpents. 2. The ſame by lateral undulations, aſſiſted by the feet. Iguanas, lizards, &c. 3. Swimming under the ſurface, breathing externally; by four palmated feet, and without tail. Hyla palmata (Rana maxima, Linn.) 4. The ſame with four legs and no tail. Frogs properly ſo called. 5. The ſame with four feet, an elongated body, and depreſſed tail. Crocodiles, ſalamanders. 6. The ſame by means of four fin-like ſcaly members, and no tail. 7. Swimming under water, breathing by means of branchiæ.

The dragons are the only reptiles capable of flying. Their flight is nearly the ſame with that of the polatouche, or flying ſquirrel. Daudin, Hiſt. Nat. des Rept. t. 1. p. 256.

The Brain.—The brain of reptiles does not fill more than one-half of their very ſmall cranium; hence its relative ſize to that of the body is very inconſiderable. Its proportion to the body is ſaid to be, in the tortoiſe $\frac{1}{22\frac{1}{10}}$, in the turtle $\frac{1}{50\frac{1}{8\,5}}$, in the coluber natrix $\frac{1}{79\frac{1}{2}}$, in the frog $\frac{1}{17\frac{1}{19}}$. Blumenbach juſtly obſerves, that anatomiſts have hitherto beſtowed but little labour on the brains of the amphibia. The dura mater forms no proceſſes in this order; the interval between it and the pia mater is filled with fluid; the brain is ſmall and ſimple, and conſiſts of five roundiſh eminences. Of theſe, the ſingle one, placed at the front of the medulla ſpinalis, is clearly the cerebellum, as in all animals which have a nervous ſyſtem. Whether the four others are to be regarded as the two hemiſpheres, and the thalami nervorum opticorum, is more doubtful. According to Blumenbach, the cerebellum does not exhibit the arbor vitæ.

All the parts of the brain of reptiles are ſmooth, and without circumvolutions. The optic thalami are ſituated behind the hemiſpheres, but are not covered by them. They contain each, as in birds, a cavity which communicates with the third ventricle. At the extremities of this ventricle, we obſerve the anterior and poſterior commiſſure, but there is no ſoft commiſſure, nor tubercula quadrigemina.

In the tortoiſe the hemiſpheres form an oval. Their anterior part is ſeparated from the poſterior by a ſulcus, and repreſents a kind of bulb, which ſerves as a root to the olfactory nerves. The ſize of this bulb is about equal to one-third of the hemiſphere. The interior of the hemiſphere is, as uſual, excavated by a ventricle, and contains a ſubſtance analogous to the corpus ſtriatum, and which pretty much reſembles in its form that of birds.

The optic thalami are not larger than the bulbs of the olfactory nerves. Their form is nearly round. They extend downward and forward, under the hemiſpheres, to produce the optic nerve. The valve of the cerebrum is ſituated between them and the cerebellum. No tubercle is either placed above it or before it, and it gives origin, as uſual, to the fourth pair of nerves.

Before the optic thalami, and under the poſterior part of the hemiſpheres, there is a tubercle which correſponds to that we have remarked in birds.

The cerebellum is nearly hemiſpherical. The fourth ventricle penetrates a conſiderable way into its ſubſtance.

In the frog the hemiſpheres are longer and narrower. The optic thalami are larger in proportion to the hemiſpheres. Their ventricle is very diſtinct. It is the contrary in ſalamanders, which have the optic thalami very ſmall, and the hemiſpheres almoſt cylindrical.

The cerebellum of theſe two kinds of reptiles is flat, triangular, and lies poſteriorly on the medulla oblongata.

In the ſerpents the two hemiſpheres form together a maſs which is broader than long. The optic thalami are almoſt round, and one-half leſs than the hemiſpheres, behind which they are ſituated. The olfactory nerve has no apparent bulb. The cerebellum is exceedingly ſmall, flat, and in the form of a portion of a circle.

In all theſe animals the inferior ſurface of the brain is nearly ſmooth. The optic thalami make no projection downward, and the pons Varolii does not exiſt.

Cuvier aſſigns, as the diſtinguiſhing character of the brain in reptiles, the poſition of the optic thalami behind the hemiſpheres. And he ſtates the following as the points in which reptiles, fiſhes, and birds, differ from the mammalia. The want of corpus calloſum, fornix, and their dependencies. Some tubercles, more or fewer, between the corpora ſtriata and the optic thalami. The thalami containing ventricles, and being diſtinct from the hemiſpheres. The abſence of any tubercle between the thalami and the cerebellum, as well as the abſence of the pons Varolii. Reptiles and fiſhes are diſtinguiſhed from the mammalia and birds by the want of the arbor vitæ.

The brain of the tortoiſe has been delineated by Caldeſi, oſſervazioni intorno alle Tartarughe, tab. 2. fig. 5: that of the frog by Ludwig, de cinerea cerebri ſubſtantia; by Vicq d'Azyr in the Mem. d'Acad. des Sciences, 1783; and by Ebel, in his Obſervat. Neurol. ex Anat. Compar.; and that of the viper, by Vicq d'Azyr.

Origins of the Nerves.—The olfactory nerves ariſe, as in birds, from the anterior extremity of the hemiſpheres. The optic nerves ſeem to derive their origin from a common eminence, ſituated under the middle of the hemiſphere. The other nerves exhibit no particularities as to their origin.

Diſtribution of the Nerves.—The *olfactory* nerve proceeds to the noſtrils in this claſs nearly in the ſame manner as in birds; but it is longer. The canal which receives it is partly oſſeous and partly cartilaginous. The two canals have only one common aperture within the cranium. The olfactory nerves of reptiles are generally much more ſolid than thoſe of the preceding claſſes.

The two *optic* nerves are joined together, as in the mammalia. There is nothing worthy of remark about the third, fourth, and ſixth pairs.

Reptiles have the three branches of the *fifth pair.* In the ſea tortoiſes the ophthalmic paſſes, ſome way, in the dura mater before it enters the orbit. It tranſmits filaments to the muſcles of the globe of the eye, and particularly to the two lachrymal glands. The ſuperior maxillary branch is the largeſt of the three. It is united to the inferior branch at its origin, but when it reaches the interior of the orbit, it ſeparates from it to take another direction. It paſſes along the floor of the orbit, deſcribing a very marked curvature, the convexity of which is external. A very great number of filaments proceed from the concave or internal

ſide, which are loſt in the lachrymal gland. The trunk is afterwards divided into two branches:—one internal, which correſponds to the ſpheno-palatine and ſub-orbitar nerve. It furniſhes filaments to the palate and to the noſe; and when arrived at the anterior part of the orbit, it proceeds outwardly and ſpreads upon the face. The other branch of the principal trunk is external; it paſſes alſo upon the floor of the orbit, to which it gives many filaments, and at length iſſuing from the inferior part of the orbit, it expands upon the face, anaſtomoſing with the other facial nerves.

The inferior maxillary branch proceeds almoſt vertically downward to the poſterior part of the orbit, before the petrous and articular proceſs of the os temporum. In its courſe towards the lower jaw, it paſſes between the temporal and pterygoid muſcles, to which it ſends ſeveral filaments. Having arrived at the lower jaw, before the articular ſurface, it enters the oblong aperture, and divides in the ſubſtance of the bone. It forms ſeveral branches on the inner part of the jaw, which are loſt in the muſcles of the tongue, and on the outſide ſome others which ramify under the ſkin.

The *facial* nerve exiſts in birds and reptiles, but its ſize is ſmall, becauſe theſe animals have no lips, and becauſe their mouth, as well as a great part of their face, is covered with a horny or ſcaly ſubſtance, in conſequence of which theſe parts have but little motion or ſenſibility. We find, however, ſome of the branches: they are not indeed eaſily followed in diſſection, but their trunk always exiſts.

The *auditory* is united to the facial nerve as in the mammalia, and paſſes into a meatus auditorius, whence its branches go into the ear. They will be deſcribed in the account of the ear.

We have nothing remarkable to ſtate reſpecting the *par vagum* or eighth pair of nerves in reptiles. We obſerve evidently that it is diſtributed to the lungs, the heart, the œſophagus, and ſtomach, and that it forms plexuſes on theſe organs, in the ſame manner as the great ſympathetic nerve produces them round all the arteries of the trunk. On leaving the cranium, the par vagum forms decuſſations with the lingual and gloſſo-pharyngeal nerves; they afterwards ſeparate from each other: the gloſſo-pharyngeus is poſterior, the par vagum in the middle, and the lingual anterior. The par vagum does not always come out of the cranium by a ſingle hole; it is formed of two or three filaments, which afterwards rejoin, upon receiving a communicating filament from the gloſſo-pharyngeus, and one farther down from the lingual; the nerve then augments ſomewhat in diameter, and deſcends into the breaſt.

We have nothing to remark concerning the gloſſo-pharyngeal and hypogloſſal nerves.

Tortoiſes have eight pair of *cervical nerves*, which are diſtributed nearly in the ſame manner as in mammalia. The three laſt pairs join in forming the brachial plexus. The green lizard has four pair of cervical nerves, but only the two laſt enter into the compoſition of the plexus. In ſalamanders and frogs the cervical nerves cannot be properly diſtinguiſhed from the dorſal, as the animals have no ribs. A pair comes out between the firſt and ſecond vertebræ, which is ſent to the muſcles of the inferior part of the neck, and under the ſkin that covers them. Theſe nerves alſo afford ſome filaments to the ſhoulder. From this diſtribution they may be regarded as real cervical nerves. In frogs only two pairs enter into the compoſition of the plexus. In the ſalamander there are diſtinctly four.

We refer to the tables which indicate the number of the vertebræ in reptiles, in order to ſhew the number of nerves which iſſue from their foramina. The diſtribution of theſe nerves is the ſame as in other animals, and to point it out would be only repeating what we have already deſcribed in man.

Nerves of the front Limbs.—In the tortoiſe the three laſt pairs of cervical nerves, and the firſt of the dorſal, proceed to the thoracic member, where they form a plexus in the following manner: the fifth cervical paſſes behind the other four pairs, croſſes them in their courſe, and unites with them in its paſſage. It then turns round the ſcapula, which in this animal is articulated with the firſt dorſal vertebra. We ſhall return to the deſcription of this nerve. The ſixth cervical pair proceeds directly along the ſcapula on its internal ſurface: it is croſſed poſteriorly by the fifth, and towards the lower third of the ſcapula receives the ſeventh cervical pair. The ſeventh is ſlender, croſſed by the fifth and the firſt dorſal pair, and united with the ſixth, in the manner we have pointed out. The firſt dorſal pair partly joins the ſeventh cervical, almoſt at the point where it comes out of the vertebral canal; it is then ſent to the muſcles of the ſhoulder.

We ſhall now purſue each of the cords we have mentioned to their termination.

The large nerve produced by the fifth cervical pair, having arrived behind and near the true articulation of the ſcapula with the ſpine, divides into three branches; one, which is but a filament, appears to be diſtributed to the articular capſule; a ſecond, which is very flat, and from the ſides of which a vaſt number of leſſer branches extend to the muſcles of the ſkin, appears to take the place of the muſculo-cutaneus; the third branch, which accompanies the muſcles of the ſcapula under the ſkin, deſcends to the humerus, without producing any remarkable branches. At this place, however, it ſends off ſeveral ramifications to the extenſor muſcles of the fore-arm. The trunk continues its direction forward, expands and loſes itſelf under the ſkin, and may be followed as far as the hand: it may, perhaps, be regarded as ſupplying the place of the ulnar nerve.

The ſixth pair of cervical nerves having, as we have ſhewn, aſſiſted in forming the brachial plexus, paſſes along the internal ſurface of the ſcapula; about the lower third of that bone it receives the ſeventh pair; the nerve then becomes thicker, but ſoon after divides into two branches; one, which is ſlender, paſſes into the groove, between the furca and the clavicle, and then ſpreads over the articular capſule of the humerus, after furniſhing numerous filaments to the muſcles which ſurround it; the nerve may be regarded as analogous to the articular in man. The trunk of the nerve, which evidently ſupplies the place of the median, upon reaching the articulation of the humerus with the ſcapula, tranſmits filaments to the adjoining muſcles. On arriving at the palmar ſurface of the fore-arm, it divides into three portions, two of which are on the ulnar ſide, and ſink deeply into the muſcles; the third, which is much larger, follows the radial ſide of the fore-arm, and at the baſe of the thumb proceeds to the palm of the hand, and detaches filaments to each of the fingers.

The ſeventh cervical pair unites, as we have ſtated, to the ſixth, at the poſterior part of the ſcapula, to form the median and articular nerves. We have, therefore, no occaſion to return to its deſcription. The firſt dorſal pair is loſt in the muſcles of the ſhoulder, and is not continued throughout the arm.

The brachial plexus of the lizard differs a little from that of the tortoiſe; it is formed by two dorſal, and the two laſt cervical pairs: the firſt of the cervical furniſhes only one of its branches to the plexus; the other going to the neck.

In

In the frog, the nerves, which are to be diſtributed to the arm, proceed from a very thick cord, which comes from between the ſecond and third vertebræ: this makes the largeſt nerve in the whole body; it is ſoon after joined by a filament from the ſucceeding pair, with which it intimately unites; this cord proceeds towards the axilla; it ſends off a branch, which paſſes above the ſhoulder, and is loſt in the muſcles of that part. The trunk continues its courſe to the arm, and very ſoon forms two principal branches, and beſides theſe, it alſo ſends ſome filaments to the extenſors of the fore-arm, and the articular capſule of the head of the humerus.

Of theſe two nervous cords, one is directed forward upon the humerus, and repreſents the median nerve; it detaches ſome filaments to the muſcles of the ſkin. Arrived at the fold of the fore-arm, the nerve plunges amongſt the muſcles, along with the tendon of the ſterno-radialis, which ſupplies the place of the biceps; it afterwards divides into two branches, placed one above the other: the moſt ſlender is ſituated between the flexor muſcles of the fingers; the larger upon the furrow, which indicates the union of the two bones of the fore-arm; they paſs under the ligaments of the carpus; having reached the palm, the ſuperficial branch is loſt in the ſkin, which covers that part, and the deep-ſeated is diſtributed to each of the fingers, nearly as in man. It alſo furniſhes ſome filaments to the muſcles of the hand.

The other cord repreſents the radial nerve; it turns round the humerus, and furniſhes, in the firſt place, ſome branches to the extenſor cubiti; continuing to deſcend round the humerus, it arrives before the articulation with the bone of the fore-arm: it is afterwards divided; one of the branches is loſt under the ſkin, the other paſſes under the back of the hand, and terminates on the convexity of the fingers. From this deſcription it will appear, that the nerves of the arm in frogs very much reſemble thoſe of the wing in birds.

In the ſalamander, the nerves of the arm are diſtributed as in the frog, but the brachial plexus is formed by two cervical, and two dorſal pairs, if we may regard as dorſal vertebræ, thoſe which ſuſtain rudiments of the ribs.

There are no brachial nerves in ſerpents.

Nerves of the hind Limbs.—In lizards, there is only a ſmall nervous filament, which proceeds from the femoral nerve, and ſupplies the place of the obturator. The femoral nerve is itſelf formed of the two laſt lumbar pairs, and paſſes above the bones of the pelvis to be diſtributed in the muſcles of the anterior part of the thigh. The ſciatic nerve is produced by the three pairs of nerves, which follow, and which alſo receive a filament from the laſt lumbar pair; the only cord they form proceeds along the inſide of the thigh, ſubdividing in the muſcles, and extending to the toes.

The diſtribution of the nerves in the abdominal member is nearly the ſame in the ſalamander; there are no differences, except in the manner in which the plexus is formed. The femoral is produced by a ſingle lumbar pair, which tranſmits a branch to the ſciatic plexus, formed by the two ſucceeding pairs.

In the frog, three pairs of nerves enter into the compoſition of the femoral plexus, before which they run the whole length of the oſſa ilii, which are very long: when arrived at the thigh, the plexus ſends off a nerve, which correſponds to the anterior femoral; it is diſtributed in radiated filaments to the fore part of the thigh. The reſt of the plexus proceeds into the pelvis, and forms a large cord, which paſſes to the poſterior part of the thigh, and may be regarded as the ſciatic nerve. A great number of filaments are afterwards detached from it to the muſcles: about the middle and poſterior part it divides into two branches, which paſs under the ham, and repreſent the two popliteal nerves, the external and internal: theſe are afterwards diſtributed to the foot of the poſterior leg, nearly in the ſame manner as to the human foot.

Great Sympathetic Nerve.—There is no deſcription of the diſtribution of this nerve in reptiles, except in the mud tortoiſe; in which animal it was diſſected by Cuvier. It is only diſtinct in the interior of the back-ſhell; it has a diſpoſition analogous to that of the cervical ganglion. The pneumo-gaſtric nerve, however, adheres ſo cloſely to it, that they cannot be ſeparated: we did not perceive any filament on the neck, which could be regarded as the trunk of the nerve.

On the peritoneum, and on the bodies of the vertebræ, there appear very diſtinct nervous ganglia, which are manifeſtly produced by the great ſympathetic.

The ganglia are exactly ſimilar to thoſe of birds. There are two ſuperior and two inferior filaments, which paſs under the tranſverſe proceſs of the vertebra, that is united to the back-ſhell: from the internal edge of each ganglion, a ſplanchnic nerve proceeds, which forms a plexus round each of the arteries produced by the aorta; one is alſo ſent to aſſiſt in forming the pulmonary plexus.

This nerve may be very eaſily traced to the internal parts of the firſt vertebra of the tail.

Phyſiology of the Nervous Syſtem.—The obvious differences of ſtructure between the warm-blooded animals and reptiles, in this ſyſtem; the exceedingly ſmall brain and large nerves of the latter, contraſted with the ſlender nerves and large encephalon of the former, lead us to expect no leſs ſtriking differences in their economy, than thoſe which we actually diſcover. Are we to explain by this difference the little influence that the brain exerciſes over the other functions, and the great individual and independent vitality, if we may uſe the expreſſion, of the parts, which appear in ſo many inſtances in the amphibia? The ſevereſt injuries, which in man or the warm-blooded animals would excite a ſympathetic diſturbance of every function, highly dangerous, and in moſt caſes fatal, are borne with little apparent ſuffering, and reſtored with facility. (See the facts adduced in the phyſiology of the circulating ſyſtem, to prove the tenacity of life in this claſs.) Can we explain in the ſame way the reproductive powers of this claſs? Blumenbach ſeems to conſider the explanation ſufficient. "The extraordinary ſtrength," ſays he, "of the reproductive power in ſeveral amphibia, and the aſtoniſhing facility with which the proceſs is carried on, muſt be explained, if I miſtake not, from the great magnitude of their nerves, and the diminutive proportion of their brain. The former parts are in conſequence leſs dependent on the latter; hence the whole machine has leſs powers of motion and diſplays leſs ſympathy: the mode of exiſtence is more ſimple, and approaches more nearly to that of the vegetable world, than in the warm-blooded claſſes: but, on the contrary, the parts poſſeſs a greater individual independent vitality. Since, in conſequence of this latter endowment, ſtimuli, which operate on one part, or one ſyſtem, do not immediately affect the whole frame by ſympathy, as in warm-blooded animals, we are enabled to explain the peculiar tenacity of life, which is diſplayed under various circumſtances in this claſs; *viz.* frogs continue to jump about after their heart has been torn out; and tortoiſes have lived for months after the removal of the whole brain from the cranium. The long continued power of motion in parts

which have been cut off from the body, as in the tail of the water newt, and in fragments of the blindworm, may be explained upon the ſame principles." Handbuch der Naturgeſchichte, ed. 6. § 98. p. 221.

The cloſe connection between the brain, heart, and lungs in warm-blooded animals, in conſequence of which the ceſſation of action in one very ſpeedily ſtops the others, and conſequently brings on general death, has been fully explained in various articles of this Dictionary; *viz.* Death, Heart, Lungs, Nervous *Syſtem*.

Obſervations and experiments have not yet been ſufficiently multiplied, to enable us to underſtand all the minutiæ connected with this ſubject. But obvious phenomena, which we have already alluded to, ſhew us a vaſt difference in this reſpect between mammalia and reptiles. The interruption of reſpiration, which is fatal in two or three minutes in the human ſubject, does not ſtop the action of the heart and brain until after ſome hours in reptiles. The removal of the heart, or of all the blood from the circulating ſyſtem, does not prevent the action of the brain, and thus prove fatal, until after ſome hours. And, laſtly, the removal of the whole brain, or decapitation, which, by interrupting the action of the muſcles employed in breathing, is almoſt ſuddenly fatal in warm-blooded animals, does not very greatly affect reptiles. At leaſt, they only ſeem to die from inanition after the operation. Hence breathing cannot be under the immediate influence of the brain in theſe animals, for its interruption is fatal in a few hours. Le Gallois aſſerts that death follows much more quickly, when decapitation is effected below the occipital foramen, than above it, becauſe in the latter caſe the part of the brain is left, which he has aſſerted to be neceſſary to reſpiration; *viz.* the origin of the eighth pair. (See his Expériences ſur le Principe de la Vie, p. 42.) He does not, however, afford us the materials of drawing any accurate compariſon, and he allows, that when decapitation is performed in the firſt vertebra of the neck, the animal ſurvives the operation much longer than it can ſurvive the interruption of reſpiration. He ſays, that ſalamanders live three or four months, and ſeem to die only from inanition, when decapitation has been performed above the foramen magnum.

To the ſmall influence of the brain upon the nerves, Blumenbach is inclined to refer, in ſome degree, the low temperature of reptiles. Although he conſiders it now as certain, that the lungs are the ſource, and the oxygenous part of the atmoſphere the material, whence the heat of living animals is derived, he aſcribes to the action of the nervous ſyſtem a conſiderable influence in exciting and ſupporting the evolution of animal heat. Specimen, p. 22.

The brain ſeems to exerciſe as complete and prompt a dominion over the voluntary muſcles in theſe, as in warm-blooded animals. Their motions are equally lively, and the force of contraction does not ſeem at all inferior.

We know of very few facts that throw light on the intellectual faculties of reptiles. Yet there is ſufficient evidence of their poſſeſſing memory and a capability of inſtruction. The frog and tree-frog can be taught to feed from the hand; and acquire a ſlight attachment to their maſter. (Daudin, v. 8. p. 88.) The rattleſnake, the hooded-ſnake (col. naia), the boæ, and the coluber natrix in Europe (at leaſt commonly in Germany), are taught to dance, and exhibit various motions at command. (Kæmpfer, Amœnitates Exoticæ, p. 565.) In the hiſtorical accounts of the religion of ancient Egypt, we learn that the prieſts of Memphis bred up crocodiles in their temples, and ſucceeded ſo far in depriving them of their ferocity, as to employ them in religious ceremonies. Beſides the accounts of Herodotus, Strabo, &c. on this ſubject, we have the authority of a reſpectable eye-witneſs concerning very ſurpriſing ſucceſs in taming a crocodile; ſee J. Greaves's Miſcellaneous Works, p. 525: and for the like ſucceſs in the common toad, ſee Blumenbach, Specimen, &c. p. 27. We know not on what grounds the ſerpent gained his character for wiſdom, intelligence, foreſight; why he was ſelected as an emblem for the goddeſs of prudence, or choſen by the Epidaurians as the repreſentative of Eſculapius.

Of the artificial inſtincts, which are ſo frequent in the mammalia and birds, not even a trace is to be met with in the whole claſs of reptiles.

There is no *regular ſleep*, or intermiſſion of activity, in the organs of ſenſation and voluntary motion, recurring at ſtated intervals, in reptiles: unleſs, perhaps, in the turtles, of whom it has been reported by ſome.

Winter ſleep, on the contrary, ſeems to prevail through the whole claſs. Herodotus obſerved this of the Nilotic crocodile, which, he ſays, paſſes four months of the winter without eating. Cateſby has remarked it of the crocodile of Carolina; and Lacoudrenier reports, that thoſe of Louiſiana betake themſelves to the muddy marſhes when the cold comes on, and remain ſo torpid, that they may be cut without ſhewing ſigns of ſenſibility. But the warm days of winter re-animate them. Journal de Phyſique 1782, t. 20. p. 333.

No animals, except inſects, are ſo ſenſible to heat as reptiles. The warmth of the ſun ſeems to give them new life: as it increaſes, their vivacity and agility are augmented. Cold, on the contrary, benumbs them, and would be actually deſtructive, if they did not withdraw from its pernicious influence. They retire into the crevices of walls or rocks, the hollows of old trees, holes in the earth, or the bottoms of ponds, &c. to await the return of the genial ſeaſon. The phenomena of this winter ſleep are the ſame in reptiles, as in warm-blooded animals. The ſuſpenſion of the actions of the nervous ſyſtem is followed by an univerſal torpor of the other functions. As the brain and the organs of voluntary motion become inactive, the circulation languiſhes, reſpiration is barely continued, and vital temperature is reduced to the loweſt degree.

Spallanzani found that when the temperature was reduced to $1\frac{1}{2}^{\circ}$ below zero, the heart of a ſerpent beat only twice in a minute, and reſpiration was ſuſpended. (Rapports de l'air avec les etres organiſés, t. 1. p. 230.) In a temperature of 7°, the heart ſoon recovered its action, and beat ten or twelve times in a minute: in ſtill higher temperatures, the pulſations were 28 or 30 *per* minute. (Ibid.) In the lethargic ſtate, theſe animals changed the air very little. Frogs became equally lethargic in reduced temperatures; the heart beating very ſlowly, and the air being ſlightly changed. Ibid. p. 470.

Cold appears to be the immediate cauſe of this winter torpor; hence both reptiles and warm-blooded animals may be preſerved in ſituations artificially warmed throughout the period of their winter ſleep, without becoming torpid; but if the torpidity has commenced, they cannot be artificially awakened without danger. It is well known that the ſalamander, the water-newt, the tree-frog, and the alpine marmot, may be kept awake through the winter in a room warmed by a ſtove. Gleditſch witneſſed the fatal effects of violent excitement in the winter ſleep in the frog (Mem. de l'Acad. de Berlin, 1762, p. 17.): it has been obſerved alſo in the marmot, the dormouſe, and the ſwallow.

It may be remarked further, of warm-blooded animals, as well as reptiles, that ſome ſpecies aſſemble together, and are gregarious in their torpidity, while others are ſolitary.

The

The bat, ſwallow, frog, and ſalamander, exemplify the former.

Organs of the Senſes.

Organ of Viſion.—Reptiles, like all vertebral animals, have two moveable eyes occupying the cavities of the head called orbits, and poſſeſſing in their ſtructure the ſame eſſential parts as in man. Their ſtructure has not been much inveſtigated: there is ſome information in a memoir of Petit, in the Acad. des Sciences, 1737; and an account of the tortoiſes in Caldeſi.

They occupy the ſides of the head, except in the crocodile, where they are placed above, between the cranium and jaw.

In the proteus they are covered by the integuments, and thus concealed until the latter are removed: this animal is, therefore, like the zemni or mus typhlus among mammalia, and conſequently blind. All other reptiles have the ſenſe of ſight, and ſome poſſeſs even large and prominent eyes.

The tortoiſe has, at the anterior part of the ſclerotica, ſimilar oſſeous laminæ to thoſe of birds. They are incloſed in that membrane, without being continued into its ſubſtance, and may be eaſily ſeparated from it. There are ſimilar laminæ in the cameleon and ſeveral other lizards, but they do not form the anterior diſk, they merely ſurround the lateral part. Daudin has found this ſtructure in the common iguana and the great tupinambis of America.

"In the tortoiſe," ſays Cuvier, "the ciliary proceſſes project ſo very little, that we could ſcarcely recognize them, were it not for the elegant impreſſion they leave on the vitreous body; but in the crocodile theſe proceſſes are very beautiful, and very conſpicuous: they are each terminated by a nearly right angle. I have obſerved theſe proceſſes in the form of elongated threads in a large foreign tree-frog; there are alſo ſuch, though not diſtinct, in the toad. I have not obſerved them in the common lizards, nor in the ſerpents.

"The iris of reptiles reſembles that of fiſhes in its golden colours; ſometimes it is red or browniſh. The veſſels are more viſible than in fiſh; they form a beautiful net-work on the iris of the crocodile.

"The figure of the pupil varies; in the crocodile it is vertically oblong, as in the cat: in frogs rhomboidal. The tortoiſe, cameleon, and common lizards, have it round; the gecko rhomboidal.

"The optic nerve in all reptiles paſſes through the membranes of the eye directly, and by a round hole, as in quadrupeds; it forms internally a ſmall tubercle, from the edges of which the retina proceeds.

"The cryſtalline is more ſpherical in the turtle and frog, than in the mammalia: the ratio of its axis to its diameter is in the former 7 to 9, in the latter 7 to 8: theſe proportions are nearly thoſe which it has in fiſhes."

Muſcles of the Globe.—There are ſix in the tortoiſe, diſpoſed like thoſe of fiſhes: and beſides, four ſmall ones, which cloſely embrace the optic nerve, and ſpread over the convex portion of the ſclerotic, after being interrupted by the muſcle of the third eye-lid. The ſame ſtructure is found in the crocodile.

In frogs and toads there is a great funnel-like muſcle, which embraces the optic nerve, and is divided into three portions; its inferior fibres advance more towards the edge of the eye than the ſuperior. There is only a ſingle ſtraight muſcle on the inferior part, and conſequently only a ſingle depreſſor. There is one very ſhort oblique muſcle attached to the anterior part of the orbit, and inſerted directly into the adjoining part of the globe. The muſcle of the third eye-lid is ſo cloſe to the inferior part of the ſuſpenſory muſcle, that it becomes ſtretched when the latter ſwells; which accounts for the elevation of the third eye-lid when the eye is lowered.

Blumenbach remarks, that no inſtance of the leucæthiopic formation, or deficiency of the colouring matter of the choroid coat and iris, has ever been ſeen in reptiles; although it is ſo common in the two warm-blooded claſſes, and in the human ſubject. Specimen, p. 27.

Many reptiles ſhun the light, lying hid by day, and coming out to ſeek their food at night. Others appear very fond of light, whether that of the ſun, as the green lizard and green frog; or of artificial flame, like that of a candle, as the tree-frog.

It ſeems peculiar to the cameleon to have the power of moving the two eyes at the ſame time in different directions; ſo that he is not neceſſarily obliged, like other animals, to bring the two optic axes into the ſame direction.

Eye-lids.—Reptiles vary ſingularly with reſpect to the number and diſpoſition of their eye-lids: ſerpents have none; crocodiles and tortoiſes have three, and the third is vertical, as in birds: there are alſo three in frogs, but the third is horizontal like the other two. The third eye-lid is the part called membrana nictitans.

The crocodiles are remarkable for having bone in the upper eye-lid: in general there is only a ſingle bit near the anterior angle; but in the crocodilus palpebroſus the whole eye-lid is occupied by a plate divided into three pieces. See Cuvier in Annales du Muſeum, v. 10.

The horizontal eye-lids of crocodiles and tortoiſes cloſe exactly; they have each an enlargement at their edge, but no cilia; the third eye-lid is ſemi-tranſparent; it moves from behind forwards, and may cover the whole eye; it has only one muſcle, which is analogous to the pyramidalis of birds: it is fixed in the ſame manner to the poſterior part of the globe inferiorly. After having turned round the optic nerve, it repaſſes under the eye to ſend its tendon to that eye-lid; but there are neither the muſculus quadratus, nor its ſheath, as in birds.

In the other lizards there are alſo very remarkable varieties. The common lizards have, for eye-lids, a kind of circular veil extended before the orbit, and perforated by a horizontal fiſſure, which is capable of being cloſed by a ſphincter muſcle, and opened by a levator and depreſſor; its inferior part has a ſmooth round cartilaginous diſk, as in birds; there is, beſides, a ſmall internal eye-lid, but it has no proper muſcle; it is entirely wanting in the cameleon, in which animal alſo the ſlit of the eye-lids is ſo ſmall, that the pupil can ſcarcely be obſerved through it. The gecko has no moveable eye-lid; its eye is protected by a ſlight margin of the ſkin, as in ſerpents. A ſimilar diſpoſition ſeems to prevail in the ſcink.

Blumenbach has examined more particularly the ſtructure of the part which covers the front of the eye in ſerpents. "Theſe animals," he obſerves, "are commonly ſaid to throw off the external layer of the cornea with the reſt of their epidermis when they change their ſkin. On examining this matter more minutely in the coluber natrix, I find that that part of the epidermis, which is perfectly tranſparent and ſtretched before the eye, is not actually connected to the cornea, but ſeparated from it by a ſmall quantity of water. It is immoveable, ſo that the globe moves behind it, as behind a window." Specimen, &c. p. 26.

In frogs and toads the ſuperior eye-lid is only a projection of the ſkin, and almoſt immoveable; the inferior is more moveable, and has a ſwoln edge; but the third, which moves from below upward, is moſt employed by theſe animals:

mals: it is very tranſparent; it has one muſcle ſituated tranſverſely, behind the globe, which forms a thin tendon on each ſide of the eye, to be inſerted into the free edge of the third eye-lid.

The ſalamanders have only two eye-lids, which are horizontal, fleſhy, and little moveable; it appears that they may entirely cover the eye.

Reptiles vary as much with reſpect to their lachrymal glands as to their eye-lids.

The ſea tortoiſes have a very conſiderable gland at the poſterior angle; it is reddiſh, granulated, divided into lobes, and extends under the arch which covers the temple.

In the freſh-water tortoiſes we find two ſmall blackiſh glands, which alſo exiſt in toads and frogs; but their excretory ducts have not yet been accurately obſerved.

Serpents, like fiſhes, have no gland in the eye; they have, however, a peculiar ſtructure near the eye, the office of which is not very obvious; the following account of it is given by ſir Everard Hume.

"An oval cavity is placed at the inner angle of the eye in ſome ſerpents, the opening into which is within the inner angle of the eye-lid, and directed towards the cornea. In this opening there are two rows of projections, which appear to form an orifice capable of dilatation and contraction. Theſe cavities are lined with cuticle, which is ſhed with the reſt of that integument. From the ſituation of theſe oval cavities, they muſt be conſidered as reſervoirs for a fluid, which is occaſionally to be ſpread over the cornea; and they may be filled by the falling of the dew, or the moiſture ſhaken off from the graſs, through which the ſnake paſſes." Phil. Tranſ. 1804, p. 75. with a figure.

Organ of Hearing.—Such an organ is poſſeſſed by all reptiles. Its conſtruction varies conſiderably in the different orders and genera: theſe varieties affecting the external or acceſſory parts, as the tympanum, officula, &c. more than the eſſential portion of the organ, its membranous labyrinth, on which the auditory nerve is expanded. No reptile has any external ear; and the crocodile affords the only example of a kind of external meatus. Frogs, teſtudines, and moſt of the lizard kind, have a tympanum and Euſtachian tube; but theſe parts are wanting in the ſalamander, and moſt of the ſerpents. The ear of the turtle, tortoiſe, frog, lizards, and ſerpents, are deſcribed and delineated by Brunelli in the Comment. Inſtit. Bonon. v. 7. Comparetti has exhibited figures of the ſame ſubjects in his Obſervationes Anatomicæ de aure interna comparata, Patav. 1789, 4to. Scarpa has given moſt beautiful engravings of the ear in the turtle, crocodile, green lizard, ſalamander, viper, and blind-worm, in his Diſquiſitiones de Auditu et Olfactu.

The Labyrinth.—The membranous labyrinth of the ear, in reptiles, is, in general, compoſed, as in fiſhes, of three canals and a ſac; but there are ſome ſpecies which have an additional part.

In the ſalamanders, whoſe ear, like that of fiſhes, conſiſts of the labyrinth only, the three canals are ſituated above the ſac; they are depreſſed ſuperiorly, and form together a triangle which is almoſt equilateral; each has its ampulla, and the ſac contains a body of the conſiſtence of ſtarch, as in the rays and ſharks.

Frogs and toads differ very little from ſalamanders, with reſpect to the membranous labyrinth; they have the ſame parts in the ſame poſition, and their ſac alſo contains one amylaceous ſubſtance: their three canals form nearly a complete circle, by their junction with the ſac.

Crocodiles and lizards have alſo three canals, but they are larger, and each approaches nearer to a perfect circular form: the ſac is ſituated proportionally more within the head; its membranous parietes are furniſhed with ſeveral blood-veſſels, which are particularly conſpicuous in the crocodile. The ſolid parts it contains are three in number, and they are ſmaller, and even ſofter, than thoſe of the chondropterygious fiſhes. Laſtly, their labyrinth is rendered remarkable by having an additional part to thoſe we have already deſcribed: this is the firſt veſtige of the cochlea; it is the production of the ſac, in the form of a cone ſlightly arched; it is directed, under the cranium, towards the middle line, and is divided into compartments, or rather canals, by a double cartilaginous ſeptum; one apartment communicates with the ſac; the other, which is a continuation of the firſt, reflected on itſelf, terminates at a very ſmall hole, which is cloſed by a membrane that ſeparates it from the cavity of the tympanum.

This organ is preciſely ſimilar to that which is found in all birds. Comparetti was the firſt who deſcribed it in lizards. It is very large in the crocodile, and may be eaſily prepared from young ſubjects.

It is more difficult to find this in the cameleon and the marbled lizard. A veſtige of it may be obſerved in the ſerpents. The production which may be compared to this trumpet, or rudiment of the cochlea in the tortoiſe, is very ſimilar to the part we named the ſac, ſtrictly ſo called, in fiſhes; and this reſemblance conſiſts not only in its form, but in the ſmall amylaceous ſubſtances it contains: this ſeems to leave no doubt of the analogy between the ſac and the cochlea in man, or of that between the part we call the ſinus, and the veſtibule. We muſt, therefore, judge of the perfection of the labyrinths of theſe different ears, by the degree in which the cochlea is developed.

Tortoiſes and ſerpents have the ſemi-circular canals, like other reptiles. In the tortoiſe they are proportionally very ſhort.

The *oſſeous labyrinth* of reptiles reſembles that of the chondropterygii; that is to ſay, it envelopes the whole of the membranous labyrinth, but in a manner more or leſs cloſely.

In the tortoiſe, the ſeptum, which ſeparates the veſtibule from the cranium, is not oſſified; it remains partly membranous. The membranous ſemi-circular canals are much ſmaller than the bony cavities containing them.

In the crocodile and other lizards, the oſſeous labyrinth cloſely embraces the membranous, or completely covers it by a thin and hard lamina.

Cavity of the Tympanum and its Appendages.—Among reptiles, the ſalamander has the labyrinth completely incloſed within the cranium, and deprived of all external communication, as in the fiſhes that have fixed branchiæ. But the other genera of the ſame order have all a feneſtra, called *oval*, ſupporting an oſſeous plate, analogous to the bone called ſtapes in man. The lizard genus has another aperture, cloſed only by a membrane, and called feneſtra rotunda.

The barrel, or cavity of the tympanum, cannot be ſaid to exiſt in ſerpents: the ſtalk of the plate, filling the feneſtra ovalis, is ſurrounded by the fleſh, and its extremity touches the ſkin, near the articulation of the lower jaw.

In toads and frogs, the whole of its poſterior part is membranous; it communicates immediately with the back of the mouth, by a large hole, which may be ſeen on opening the mouth of the animal. It is very ſmall, and almoſt entirely membranous in the pipa, in which the labyrinth is connected with the feneſtra ovalis by only a very long canal.

It is alſo membranous poſteriorly and inferiorly in the common lizards, and in the cameleon: it communicates with the bottom of the palate by a ſhort wide canal.

The

The barrel of the crocodile may be divided into two parts: one external, which is very wide, and clofed on the outfide by the membrane of the tympanum, and the fkin, but entirely furrounded by the bones; and one internal, which is feparated from the former by a contraction, and which communicates with the two feneftræ, and with fome cavities analogous to the maftoid cells of man, but much larger. One of thefe cavities is placed between the femi-circular canals, and the other is directed backward and outward. The barrel is fituated towards the fuperior part of the cranium.

The cavity of the tympanum in the tortoife is placed more laterally: it is not fo wide externally; and the contraction, which feparates the external part from the internal, is lefs confpicuous, becaufe the projection, which it forms, is rounded, and not acute, as in the crocodile. The internal portion is prolonged backward, in the form of a large round cell: in the bottom of the cavity, oppofite to the membrane of the tympanum, there is a narrow canal, in which the officulum is funk, and which communicates with the feneftra ovalis. The Euftachian tube is a canal of a moderate length, which proceeds downward, and a little backward, and terminates in the palate, behind and within the articulation of the jaw.

The Membrana Tympani and its offeous Frame.—Animals which want the barrel of the tympanum, as fifhes, falamanders, &c. have no membrana tympani. That membrane is alfo wanting in feveral reptiles that have a barrel, as the cameleon: the fkin paffes over the external aperture of their ear, without undergoing any change, either in its thickneſs or its ſtructure; and the exiſtence of the organ of hearing can only be afcertained by diffection. On removing the fkin, and fome portions of the mufcles, we find, in fome fpecies, and particularly in the flow-worm (anguis fragilis), a kind of membranous expanfion.

In the tortoife, the large external aperture of the barrel is clofed by a very thick cartilaginous plate, which is itfelf covered by a fcaly fkin, perfectly fimilar to that of the reft of the head.

In frogs and toads, the membrana tympani is on a level with the head, and the fkin that covers it becoming finer, it is rendered perceptible by an oval fpot, which is fmoother than the reft of the head, and ufually of a particular colour.

In common lizards, the membrana tympani is alfo level with the head, but very thin, fmooth, and tranfparent; for at that part the fkin becomes as fmooth and fine as the cornea of the eye.

In the crocodile, it is of the fame nature, but more funk into the head, and covered by two fleſhy lips, which fupply the place of the external ear.

In lizards, though the point of the cone formed by the membrana tympani projects lefs than in birds, it is alfo directed outward, as in them. The membrane is nearly plane in frogs and tortoifes.

The membrana tympani is on a level with the adjacent parts of the head, and conſequently is nearly vertical in all animals in which its fituation is fuperficial; but in thofe which have it funk, its inclination, whether conſidered with relation to the head itfelf, or to the external meatus, varies conſiderably.

It inclines obliquely upward, and to one fide, in the crocodile.

The offeous frame, to which the membrane is attached, is not marked by any prominent edge: it is interrupted poſteriorly. Its great axis is vertical in the tortoife and the common lizards, and its anterior arch is more convex. In the crocodile, it is a regular oval, the great axis of which is directed obliquely backward.

Officula Auditus.—The frog and the toad have two officula in the ear: one fupplies the place of the malleus and the incus; it is attached to the membrana tympani by a ſlender branch, which forms an acute angle with the part that paſſes into the barrel: that part has the ſhape of a club; its internal extremity is the thickeſt, and articulates by a double ſurface to the ſecond officulum, which correſponds to the ſtapes. The latter has a ſemi-elliptic form, and is applied to the feneſtra ovalis by its plane ſurface: both theſe bodies, which are offeous in other animals, are cartilaginous in the frog and toad.

Lizards and tortoiſes reſemble birds, in having a ſingle officulum with a thin hard ſtalk, and an oval or triangular plate (columella). It is attached to the membrane of the tympanum in lizards, and particularly in the crocodile, by a cartilaginous branch; but in the tortoiſe, its outward extremity is directly implanted in the cartilaginous maſs, which correſponds to the membrana tympani itſelf.

In the crocodile, the plate is an elongated ellipſis, the great axis of which is ſituated longitudinally.

In the tortoiſe, the bone is enlarged in the form of a trumpet, and is applied to the feneſtra by a regularly oval and concave ſurface.

Serpents have an officulum, but no membrana tympani. Its external extremity touches the bone that ſupports the lower jaw: it is ſurrounded by the fleſh, and is applied to the feneſtra by a concave plate, the edges of which are irregular.

In the cameleon, the plate alſo repreſents the wide end of a trumpet; its ſtalk becomes cartilaginous, and is loſt in the fleſh.

The feneſtra veſtibularis of ſalamanders is cloſed only by a ſmall cartilaginous operculum, which has no ſtalk, and is concealed by the fleſh.

Muſcles of the Officula.—Little is known about theſe in reptiles. It appears that ſerpents, cameleons, and ſalamanders, are entirely deſtitute of them, and that they are very indiſtinct in the teſtudines. Comparetti has made ſome reſearches on this ſubject, but without any clear or ſatisfactory reſults.

External Meatus, &c.—All parts of the ear, external to the membrana tympani, are wanting in reptiles. In the crocodile only is there any appearance of an external meatus, the ſkin forming a kind of lip or operculum above the membrana tympani: the latter is entirely concealed, except when this covering is removed. This muſt be the part mentioned by Herodotus as the external ear of the crocodile, to which the Egyptians attached rings.

Diſtribution of the Nerves.—In reptiles and fiſhes, but eſpecially in the latter, we can obſerve, ſtill better than in warm-blooded animals, the conſtancy with which the branches of the auditory nerve proceed to the ampullæ of the ſemi-circular canals. In reptiles it divides before it paſſes into the offeous labyrinth, which it enters by ſeveral holes.

Organ of Touch and Integuments.—It does not ſeem clear that reptiles poſſeſs the ſenſe of touch, that is, the power of recogniſing, by any parts of their ſkin, the figure, hardneſs or ſoftneſs, roughneſs or ſmoothneſs, of bodies. To the impreſſions of heat and cold, there is no doubt of their being ſenſible.

In no claſs do we obſerve ſo much variety in the nature of the integuments; the ſkin is different in almoſt every ſpecies. In many the ſtructure is ſo ſingular, that if we judged by this alone, we ſhould form them into ſeparate claſſes. What

a contraſt does the ſhell or bony caſe of the tortoiſe form to the ſmooth ſkin of the tree-frog; how different are the annulated ſkin of the amphiſbæna, the ſcaly covering of other ſerpents, and the integuments of the toad, rough and tuberculated.

Epidermis.—When we examine what parts of the body are covered with ſkin in the tortoiſe and turtle, we can recognize it at firſt ſight only on the head, neck, limbs, and tail; the other parts exhibit to us merely an oſſeous box or exterior ſkeleton, incloſing the body. But, if we examine more attentively, we ſhall find this ſkeleton covered by an extremely thin epidermis, which may be detached in tranſparent laminæ, ſimilar, in figure, to the horny plates, and varying in its conſiſtence in the different ſpecies. It reſembles a ſmooth and tranſparent parchment in the teſtudo centrata of Boſc (Daudin, t. ii. p. 153.) The epidermis covering other parts of theſe animals is a ſmooth thin layer, not eſſentially different from that of the frog and ſalamander, and detached in ſhreds ſeveral times in the year.

The epidermis of the ſalamander and frog is a ſoft thin membrane, covered with a mucous ſecretion; which anſwers a particular uſe in ſome kinds, as the rana calamita, enabled by its aſſiſtance to adhere to the ſmootheſt bodies. This ſecretion, a ſimple and innocent mucus, is very different from another, which is found in many reptiles, poſſeſſing extremely powerful ſenſible properties; the latter is deſcribed under the head of peculiar ſecretions, in the latter part of this article.

The thin tranſparent cuticle of the frog, ſalamander, and newt, is very frequently changed, being detached in large portions. Blumenbach ſtates that this change takes place in the ſummer months at leaſt once a week. Specimen, p. 26.

The epidermis of lizards covers all their ſcales, and is detached in ſmall dried portions, or in larger pieces. It forms alſo a thin continuous ſtratum in ſerpents, enveloping the whole ſurface, and ſpread over every ſcale and plate. It is detached annually, at a certain ſeaſon, in a ſingle piece, like a ſheath. The caſt ſkin (ſlough, exuviæ) is turned inſide out, ſo that its exterior ſurface is the part previouſly in contact with the true ſkin. The animal eſcapes at the mouth, which is the only opening by which it can get out of the ſheath. The part correſponding to the jaws is firſt detached, and turned back, ſo as to expoſe to us the ſnout, covered by a new ſkin. As the head paſſes out of its ſheath, the latter goes backwards in the ſame proportion towards the tail, and is thus at laſt completely inverted. The tranſparent piece correſponding to the eye (ſee an account of the eye) has its concavity outwards.

Rete Mucoſum.—In all reptiles there is, under the epidermis, a mucous tiſſue, of which the colours vary very much. In the teſtudines, for inſtance, the ſkin which covers the feet and neck is not only differently coloured by the rete mucoſum, but the ſymmetrical ſpots, which we remark on the ſcales, are produced by the ſame ſubſtance. This we diſcover by diſſection. The thickneſs of the ſkin greatly diminiſhes as it approaches the breaſt-plate and the back-ſhell. It paſſes below the ſcales which cover thoſe parts, and which are, themſelves, covered by the epidermis and rete mucoſum; the variegated colours of which form the ſpots which we obſerve through the tranſparent parts. A rete mucoſum is equally found in the lizards, ſerpents, ſalamanders, frogs, &c. It is variouſly coloured in each ſpecies; and it preſents often the moſt beautiful and charming tints. We find in this claſs almoſt all the known ſhades, even blue, bright red, orange, pearly, gold and ſilver.

Reptiles are remarkable for the changes of colour which they exhibit, according to the ſeaſon or climate in which they live, or to temporary affections of various kinds. In this way the cameleon has been moſt celebrated, and has afforded a very trite ſubject to poets and moraliſts. The changes are, in reality, very remarkable, and are particularly noticeable when the animal paſſes from the ſhade into the ſun, or *vice verſâ*, when he is touched, or any thing placed round him, &c.

This property, however, is, by no means confined to the cameleon. Brown long ago obſerved it in ſeveral ſpecies of lizards (Natural Hiſtory of Jamaica, p. 462.); and it occurs alſo in reptiles of theſe climates. The green iguana, the agame, and the green lizard, are ſometimes green, ſometimes browniſh in their colour. The former is particularly obſerved in the copulating ſeaſon; and is loſt in the cold and rainy parts of the year. The common tree-frog of Europe exhibits various tints from the brighteſt emerald green to grey, blueiſh, violet, or brown. Other frogs and ſalamanders change their colours alſo, particularly about the copulating ſeaſon.

The Papillæ.—Reptiles reſemble birds with reſpect to the papillæ; we find none except under their feet; they are very thick, and projecting in ſeveral ſpecies of lizards, and particularly in the cameleon. We cannot diſtinguiſh them in the ſea tortoiſe, which have the feet in the form of fins. They do not exiſt in ſerpents, or at leaſt have not the form of papillæ.

Cutis.—Reptiles which have the body unfurniſhed with ſcales, or only partly covered by them, have a very compact and denſe ſkin. We have an example in the tortoiſes, ſalamanders, frogs, and toads. In the two laſt genera, in particular, the cutis is rendered remarkable by not adhering to the body in all its points, as in the other animals, in which it is intimately united with the cellular ſubſtance. In thoſe genera, however, it adheres only at the edges of the mouth, in the middle line of the body, the arm-pits and the groins. In all the other parts the body is free within the cutis, which incloſes it like a ſac.

In lizards and ſerpents we find, as in fiſhes, a ſtrong cutis under the ſcales, even adhering very cloſely to the muſcles.

Cutaneous Muſcles.—There is no cutaneous muſcle on the trunk of frogs, becauſe the ſkin does not adhere to that part of their body. Under the throat, however, we find ſome fibres, which are attached to the margin of the jaw, and inſerted into the cellular ſubſtance that unites the ſkin to the origin of the breaſt.

In tortoiſes the cutaneous colli is very viſible, and ſeems to be formed of two parts; it is extended from within the concavity of the lower jaw to the bottom of the neck, at the anterior part of the breaſt-plate. A middle cellular line unites it with the muſcle of the other ſide; it takes its origin from the tranſverſe proceſſes of the cervical vertebræ. Being ſpread over all the muſcles of the neck, it ſerves as a girdle to them; in its lower part it is perforated by the ſterno-maſtoideus, which, as we have already obſerved, ariſes from the lateral parts of the breaſt-plate.

Secretions of the Skin.—Among reptiles, thoſe that have ſcales, as ſnakes and lizards, have the ſkin almoſt dry; but thoſe with naked ſkins, as ſalamanders and frogs, have the ſurface of the body always copiouſly lubricated with viſcous matter.

Toads and ſalamanders have even the power of augmenting the ſecretion of this liquor, and of making it exude, like a dew, through the pores of the ſkin.

The cutaneous glands are more viſible in cold-blooded animals, than in the mammalia.

The

The ſalamanders have ſeveral glands ranged along the back, which form elevations or lumps on the ſkin.

The toads have them ſcattered irregularly on the whole ſurface of the body; we obſerve, in particular, two which are very large, behind their ears; theſe glands produce an acrid humour, which is a poiſon to very ſmall animals.

In lizards, we obſerve a very regular row of ſmall pores, which alſo yield a viſcous humour.

Abſorption of water by the ſkin of the frog.—Townſon found that the frog, and tree-frog, when placed on a moiſtened paper, could abſorb the moiſture ſo rapidly, as nearly to double their weight in two hours, under certain circumſtances. He ſtates that they do not drink, but take in all their fluid in this way. (See his tracts and obſervations in natural hiſtory.) Daudin has verified the obſervation. He kept two frogs without any fluid for ſeven days, and then placed them in a bottle on moiſtened ſheets of paper. In two hours they had nearly doubled their weight. Hiſt. Nat. des Reptiles, tom. i. p. 115.

Fingers.—The number of the fingers, and their flexibility, vary more in reptiles than in all the other claſſes.

Common lizards have, in general, five fingers, of different lengths, well calculated to embrace objects in every direction. Some, as the crocodiles, have them palmated, at leaſt in the poſterior feet. Others, as the gecko, have them inveſted inferiorly with imbricated ſcales.

The cameleon has them united by the ſkin, as far as the nails, in two parts, which form the forceps. The ſkin of their inferior ſurface is furniſhed with ſenſible papillæ. The long lizards, called ſeps and chalcides, have only three very ſmall toes. The ſalamanders and frogs have them naked and deſtitute of nails. In tree-frogs, the extremity of the toes is enlarged into a ſpongy diſk, capable of adhering with force to bodies. In tortoiſes, the toes are palmated. Laſtly, the ſerpents are completely deprived of feet and toes.

The long ſeparate toes of the batracian order, and of ſeveral lizards, ſeem well enough calculated to ſerve as organs of touch; they might be applied to objects, and would ſurround them in various ways. They ſeem, however, to be employed merely as inſtruments of motion.

"It has been ſaid of ſerpents (obſerves Blumenbach), with more ingenuity than truth, that their whole body is a hand; by which they gain juſt notions of the tangible properties of bodies. There is much more foundation for ſtating that the ſenſe of touch, which is here meant, does not exiſt in any of the amphibia." Syſtem of Comparative Anatomy, p. 319.

Among the reptiles the ſcales vary greatly, according to the genera. In tortoiſes they are plates of a horny ſubſtance, which are very hard and denſe in the greater number. But in the teſtudo coriacea, and ſeveral others, they are ſoft and flexible: ſometimes theſe ſcales are imbricated, as in the hawk's-bill turtle; and then they are ſmooth, or channelled longitudinally; at other times they form compartments of different figures: in the latter caſe they are more or leſs convex, and ſurrounded with furrows, or concentric channels, in the midſt of which are points, which are either ſcabrous, elevated, or blunt, as in the ſpecies named geometrica, græca, &c.

In the crocodile the ſcales are bony, arranged in tranſverſe bands, and ſituated, in reſpect to each other, like the ſtones of a pavement. In the other lizards and ſerpents they conſiſt of horny ſubſtance, and preſent almoſt every poſſible variety of form and arrangement.

Organ of Smelling.—This is leſs completely developed in the amphibia than in the two warm-blooded claſſes of vertebral animals. The ſenſe of ſmelling is the moſt imperfect of the ſenſes in this claſs, ſays Daudin, if we may judge by the ſtructure of the noſtrils. Reptiles do not ſeem to employ their ſmell in diſcovering or ſelecting their food, or for any of the purpoſes to which the faculty is ſubſervient in other animals.

We find, however, in the whole claſs, naſal cavities opening on the ſnout in front, and on the palate behind, lined with a vaſcular pituitary membrane, on which olfactory and naſal nerves are diſtributed.

There are alſo different projecting laminæ within the noſe; but they conſiſt of folds of the internal membrane, and are not ſuſtained by oſſeous parts. The tortoiſe has three laminæ, which divide the naſal cavity into ſeveral foſſæ. The middle one correſponds to the external aperture of the noſtrils; between it and the next there is an oblique canal, which leads to the poſterior nares. We find only ſome tubercles in frogs, and other ſmall ſpecies. It does not appear that any reſearches have been made reſpecting the parts in the crocodiles.

The olfactory nerve differs in reptiles little from that of birds, as to its origin and courſe; it differs leſs in its diſtribution, ſince it alſo divides, according to Scarpa, upon the ſeptum, and the membranous fold correſponding to the ſuperior turbinated bone, without proceeding farther.

The *external nares* of reptiles, more or leſs approximated, and ſuſceptible of contraction and dilatation, are uſually furniſhed with only ſome fleſhy ſtrata, which dilate or contract their entrance. This is obſervable in the greater number of lizards, which differ from each other only as to the poſition of their external nares. They are cloſeſt to each other in the crocodiles. The tupinambis, the ſtellions, and the cameleons, have them more removed, and ſituated more laterally. In the ſalamanders they are exceedingly ſmall. In frogs we obſerve a ſmall tube, the motion of which is very apparent, becauſe it is extremely uſeful in reſpiration, as we have already ſhewn. The tortoiſes have alſo two very ſmall approximated noſtrils. In the matamata, and one or two other ſpecies, they are ſituated at the end of a ſhort cartilaginous proboſcis. The external noſe is alſo rather elongated in ſome ſerpents; for example, in the vipera ammodytes, and the coluber naſica. In the reſt of this order there are ſmall lateral nares, capable of ſlight extenſion. In the rattle-ſnake, and ſome others, there is a ſmall blind hole, near the noſe, on each ſide; we have deſcribed it under the head of peculiar organs. See Scarpa de Auditu et Olfactu, for a deſcription and figures of the noſe in the turtle and viper.

The Organ of Taſte.—All reptiles poſſeſs a tongue, but whether they have the ſenſe of taſte is not ſo clear. As they all ſwallow their prey whole, there ſeems to be little room for the exerciſe of taſte. We have already ſpoken of the tongue, in the account of the ſalivary glands; and have entered further into a conſideration of its mechaniſm and moving powers in our deſcription of the organs of maſtication and deglutition.

Subſtance of the Tongue.—Reptiles vary greatly with reſpect to the tongue, as well as in many other circumſtances. The tongue of toads and frogs is entirely fleſhy, attached to the lower jaw, and, in a ſtate of repoſe, inflected in the mouth.

In ſalamanders, it is attached as far as the point, which is not moveable, and the whole tongue is only free on its lateral parts. Crocodiles have it attached to the lower jaw, both by the edges and the point; and authors long ſuppoſed that this animal had no tongue. It is entirely fleſhy in both theſe genera.

The ſtellions and the iguanas have a fleſhy tongue, which poſſeſſes nearly the ſame mobility as that of the mammalia.

The ſcinks and geckos differ only in having the tongue notched at the extremity; and in that reſpect it reſembles the tongue of the ſlow-worms, to which, in general, the ſcinks are very much allied.

In common lizards, the tupinambis, or monitor, &c. the tongue is ſingularly extenſile; it terminates in two long flexible points, though ſemi-cartilaginous; it completely reſembles that of ſerpents, if we except the ſlow-worms and the amphiſbæna, which cannot elongate their tongue, but which have it flat, and only forked at the extremity.

The cameleon has a cylindrical tongue, which may be conſiderably elongated by a mechaniſm analogous to that which takes place in wood-peckers.

Structure of its Surface.—The tongue of the tortoiſe is furniſhed ſuperiorly with long, ſoft, cloſe, conic papillæ, which give it the appearance of velvet.

In the crocodile they are very ſhort, and repreſent rather ſlight rugæ than papillæ. They form, on the contrary, a very diſtinctly villous ſurface in the iguanas and the ſtellions. The tongue of the cameleon is furniſhed with deep, cloſe, and very regular tranſverſe rugæ; in the lizards, with extenſile and forked tongues; and in the ſerpents, that organ is ſingularly ſmooth, and as it were horny towards its points.

The ſalamanders have, like the iguanas, a fine villous ſurface to the tongue; but in the frogs and toads the ſurface is perfectly ſmooth to the eye, and always mucous.

No reptile has two kinds of papillæ, nor glands with a calyx.

Peculiar Organs and Secretions.—Many amphibia produce ſingular and ſpecific odours, particularly when irritated. In the water newts the ſmell has been compared to that of chopped parſley; in toads to garlic; in the crocodile there is a very ſtrong ſmell of muſk; and ſeveral tortoiſes have this muſk-like ſmell. A ſingularly fetid odour is produced by the rattleſnake, when angry. May we ſuppoſe that this is a defence againſt hoſtile attacks, in the ſalamanders and water newts, as it ſeems to be in the viverræ, and ſome frogs?

It may probably ſerve in ſpring, as Blumenbach ſuggeſts, as a means of venereal excitement. For if, after handling female toads for ſome time, the hand is plunged into water, where there are male toads, they flock inſtantly to the ſpot, and cloſely embrace the fingers. Specimen, p. 29.

The notion that this odour is employed by the rattleſnake to ſuffocate, faſcinate, or in any way whatſoever to act on the animals which form its prey, is entirely ungrounded, as we have already explained.

There are generally manifeſt organs for the ſecretion of the ſubſtances in which theſe properties reſide. Small granulated tubercles are ſeen under the thighs of the lizards, the chalcides, and the marbled iguana of Surinam, and near the anus of the amphiſbæna, producing, particularly in the coupling ſeaſon, a fluid, and ſmelling like dry hay.

Muſk Gland of the Crocodile.—It lies under the ſkin of the lower jaw, on each ſide, about its middle. It is a ſmall gland, of a homogeneous whitiſh tiſſue, and covered by a tendinous ſheath. It ſecretes an unctuous blackiſh-grey fluid, ſmelling moſt ſtrongly of muſk, and collected in a ſmall bag, which opens externally by a large orifice.

Anal Glands have alſo been obſerved in the crocodile and alligator, as well as in ſeveral ſerpents. They may be ſeen of conſiderable ſize in female colubres, under the tail behind the cloaca, in the part occupied by the penes of the males. They contain a thin yellow ſubſtance. Tyſon has deſcribed them in the rattleſnake. Other ſnakes have been deſcribed as producing powerfully fetid odours from the mouth.

Poiſonous and Acrid Secretions.—There is a ſtriking difference in this reſpect between warm-blooded animals and reptiles: none of the former produce any thing poiſonous, unleſs we ſhould make an exception concerning the liver of the urſus arctos, which is deſcribed by Ger. de Veer, one of the unfortunate ſufferers, to have been nearly fatal when employed as food by Heemſkerk and his companions, compelled to winter in Nova Zembla. Blumenbach's Specimen, p. 30.

Beſides the terrible poiſon with which ſo many ſerpents are armed, already deſcribed in our account of the teeth, there are ſeveral more or leſs actively hurtful ſecretions in this claſs.

The glands or crypts under the ſkin, forming the cutaneous eminences in the ſalamander and toad, produce an irritating fluid, which they ſeem to have the power of excreting at pleaſure. Blumenbach deſcribes the acrimony of this fluid in the rana bombina, from his own experience of its effects. Having cut his hand while handling ſome of theſe animals, and applied it to his mouth to ſuck the wound, he found a cauſtic heat ſuddenly pervade the tongue and fauces, like what is produced by chewing the bark of the laurel; and it continued for ſeveral hours. P. 24.

It ſeems to be an analogous fluid in the ſalamander, by means of which this moſt innocent little animal, ſo unjuſtly deemed venomous, can extinguiſh a few coals when placed in them. But the contortions of the body ſufficiently atteſt the pain produced by this cruel experiment, which is ſoon fatal, if prolonged. The fabulous notion of the ancients, that this little reptile can live in fire, is well known; and Benvenuto Cellini has ventured to aſſert the truth of it, on the faith of his own experiments. See his Life.

The notion of the ſalamander being able to live in fire is the more extraordinary, when we contraſt it with the fact, that it has been found in cakes of ice, and after remaining frozen for ſome days, recovered. So that it can actually ſurvive congelation.

Dr. Barton of Philadelphia has named an aquatic ſalamander, which he found near that city, ſalamandra venenoſa, from the nature of the fluid which exudes from the tubercles of its back. Daudin, tom. viii. p. 229.

The gecko of Egypt produces a poiſonous fluid of conſiderable activity. "It exudes (ſays Haſſelquiſt) from the lobules of the toes; the gecko ſeeks for places and objects impregnated with marine ſalt, and paſſing ſeveral times over them, leaves its venom behind. I ſaw in 1750, two women and a girl, who nearly died in Cairo from eating cheeſe which had been thus poiſoned. I had another opportunity of noticing the acrimony of this fluid, in the production of red, inflamed, and itching puſtules on the hand of a man, who endeavoured to catch the animal." The French naturaliſts, attached to the Egyptian expedition, confirm the report of Haſſelquiſt. Daudin, tom. iv. p. 110, 111.

Rattle of the Genus Crotalus.—This ſingular organ conſiſts of many pieces, from one to thirty, or more, perfectly ſimilar, not only in form, but often alſo in ſize, compoſed of a brittle, ſemi-tranſparent, horny ſubſtance, ſimilar to that of ſcales. The piece immediately connected to the body forms a ſmall ſheath, moulded on the laſt vertebræ of the tail, which it incloſes, and from which it is ſeparated only by a thin membrane. Its ſurface preſents three circular riſings, correſponding to three elevations of the vertebræ: the firſt, or neareſt to the animal's tail, is the largeſt, and the two others decreaſe ſucceſſively. All the pieces are encaſed one in the other, the poſterior two-thirds of each being enveloped by the following. Of the three riſings or rings on each piece, the anterior only is viſible, the two poſterior

terior being concealed by the following piece. The laſt, or extreme portion, has all its three rings viſible; and the organ conſiſts, externally, of this piece, and the firſt rings of all the others. The two laſt rings of each piece, included in the two firſt of the ſucceeding, retain it in its place; but, as the diameter of the former is leſs than that of the latter, each piece is quite looſe, and plays freely about that which it envelops. None, except the firſt, is united to the ſkin of the animal, or connected by any muſcle, nerve, or veſſel; it is, therefore, merely an exterior covering, moved, as any foreign body would be, when the end of the tail is agitated.

The different pieces of the organ are formed ſucceſſively on the ſkin of the tail, receiving from it the materials neceſſary for its developement, and adhering to it until its growth is complete. A ſecond piece, entirely ſimilar to the firſt, is formed under it, and detaches it from the end of the tail. It is puſhed backwards, leaving between its edge and the ſkin of the tail an interval occupied by the firſt ring of the new piece, of which the ſecond and third rings are covered by the firſt piece. The latter is retained by this connection, but plays freely round the firſt piece. A third piece is formed under the ſecond, as that was under the firſt; puſhing the ſecond backwards, but retaining it by its two poſterior rings being included in the cavity of the ſecond piece.

If the vertebræ of the tail continue of uniform diameter, all the pieces will be of the ſame ſize, and the rattle, conſequently, is of one breadth throughout. On the contrary, if the vertebræ grow while the rattle is being formed, the pieces increaſe in ſize, and thus the rattle tapers to its end.

It is evident, from the preceding deſcription, that one piece only can be formed at each partial moulting of the end of the tail; but as we do not know whether theſe moultings coincide with the general ſeparation of the epidermis from the body, nor the periods of their recurrence, the number of pieces not only affords no proof of ſpecific differences, but alſo indicates nothing about the age of the animal. Lacépéde, Hiſt. Nat. des Serpens, 12mo. t. 2. p. 217.

Horns, &c. of other Serpents and Reptiles.—The Egyptian ceraſtes is ſo named, from its two moveable, pyramidal, four-ſided, curved horns, about two lines in length, placed above the eyes. They conſiſt of ſucceſſive ſtrata, of which the exterior ſeparates like an epidermis, exhibiting always four grooved ſides. The exterior ſtratum ſeparates thus with the animal's ſkin, like the epidermis of the ſcales, which this reſembles entirely in its texture. Lacépéde, ubi ſupra, t. 1. p. 256.

In the batracian order, the horned frog has a conical horny elevation above each eye; and the rana margaritifera a peculiar hard criſta on each ſide of the head.

The cecilia ibiara has two ſmall tentacula or cirri, ſcarcely viſible near the noſtrils; and the ſerpent, which Lacépéde has named erpeton tentaculé (Annales du Muſeum, t. 2. p. 280.) has two fleſhy appendages, covered with ſcales, extending from the end of the ſnout horizontally forwards. Is there any probability that theſe parts in the cecilia and erpeton are organs of touch?

Facial Pouches of Serpents.—A ſmall bag has been obſerved in the rattleſnake, in ſixteen colubres, and three boæ, between the eye and the noſtril; it has a rounded form, reſting in a hollow of the bone, in ſhape not unlike the orbit. A ſmall orifice behind the noſtril leads to it. Theſe bags, which are lined with cuticle, have their covering caſt with the reſt of the animal's ſkin. The cavities in queſtion were noticed in the rattleſnake by Tyſon, Phil. Tranſ. v. 13. p. 26; and they have been ſince deſcribed and delineated by Dr. Ruſſel and ſir Everard Hume. (Phil. Tranſ. 1804, p. 70.) The latter anatomiſt diſcovered nothing like a ſecretory apparatus about them, nor any thing that could lead to conjectures concerning their office. They appear moſt analogous, in ſituation and ſtructure, to the ſmall bags of the deer and antelope, called by the French larmiers.

We conclude our review of the ſtructure and phyſiology of reptiles with the ſummary of the principal differences between their economy and that of the warm-blooded claſſes, which terminates the excellent "Specimen" of Blumenbach.

"Et calidis quidem animalibus a prima inde formationis origine ad ultimum uſque vitæ halitum phlogiſticus ut hodie audit proceſſus. Mammalium fœtui placentæ adminiculo, quæ fœtale phlogiſton materno elemento igneo commutat. Pullo incubato poroſæ teſtæ et albuminis ope, quæ itidem igneo pabulo aditum, phlogiſto vero ſuperfluo exitum concedunt. In lucem vero editis tum mammalibus tum avibus, perpetuo et alterno reſpirationis rhythmo.

"Internus porro huic phlogiſtico proceſſui cum reliquis functionum claſſibus nexus, maximę cum iis ſyſtematis nervoſi, ut hiberni mammalium veterni, phænomenis quæ ſupra tetigimus, veriſimillimus redditur.

"Ipſius porro nervoſi ſyſtematis ſumma cum reliquis functionibus conſpiratio, præſertim ope reactionis ſenſorii ab ea encephali portione pendente, quæ præter originis nervorum ſuper eſt.

"Ex his omnibus ſummus quidem functionum vigor, mobilitas ſumma, hinc corpus vivum infinitis modis innumerorum, et multifariorum ſtimulorum impetui et impreſſionibus ſuſcipiendis aptum: hinc præ ceteris omnibus ſumma hominis prærogativa, in quo, uti, pridem obſervante Hippocrate, conſluxio una, conſpiratio una, conſentientia omnia, ita et omnium maximus et innumerus cum univerſa reliqua cum ambiente creatione nexus.

"Longe alia e contrario amphibiorum natura.

"Phlogiſticus proceſſus noſtratibus perexiguus lentiſſimus.

"Debilis etiam in omnibus amphibiis ſanguinis in encephali functiones influxus.

"Exigua porro parvi ſenſorii in craſſas nervas reactio.

"Minor hinc in univerſum conſenſus; minus unius functionis in alteram imperium.

"Minor hinc totius machinæ animatæ mobilitas.

"Verum eo major ab altera parte ſimplicioris iſtius vitæ tenacitas, quod parte una affecta, ſyſtemate uno afflicto, non tam facile reliqua in conſenſum trahantur.

"In univerſum ergo vita magis vegetativa, reproductioni—ut per utrumque organicum naturæ regnum conſtat—longe magis opportuna, quam quæ altioris ordinis facultatibus, conſenſibus, et complicatæ conſpirationis ſubtilitate viget." P. 36.

Anatomical Deſcription of the Proteus Anguinus, and Siren Lacertina.—See Cuvier, Récherches ſur quelques Reptiles douteux, inſerted in Humboldt's Recueil d'Obſervations de Zoologie et d'Anatomie comparée faites dans ſon Voyage, t. 1.

By the word *amphibious*, applied to animals, naturaliſts have meant to deſignate the power of living, and particularly of breathing, equally well in water and in air. In this ſenſe it cannot be applied, with propriety, to any of the animals who have received the appellation from the ancients, and moſt modern naturaliſts. Without ſpeaking of the otters and hippopotami, which are true aerial quadrupeds, viſiting the water merely in ſearch of food, the ſeals and cetaceous

animals, compelled by their organs of motion to paſs the whole, or nearly the whole of their life in water, can abſolutely breathe air only.

All the reptiles to whom Linnæus ſubſequently transferred this name of amphibious animals, are ſimilarly circumſtanced in their adult ſtate; they can only breathe air, whether they live conſtantly in this element, as the lizard kind, or betake themſelves, for a longer or ſhorter period, to the water, as the frogs and ſalamanders. On the other hand, the cartilaginous fiſhes, which this ſame naturaliſt had joined to the reptiles, like all other fiſhes, can only breathe by the intervention of water; they have only gills; and it is by having repreſented as lungs the forked ſwimming bladder of ſome of them, that Dr. Garden cauſed the miſtake of Linnæus.

The larvæ or tadpoles of the batracian reptiles only, that is to ſay, of the ſalamanders and frogs, the tree-frogs and toads, have both branchiæ and lungs; breathe, at leaſt for a certain time, both the air in its elaſtic ſtate, and that which is contained in water; conſequently participate equally the nature of aerial and aquatic animals; and may, therefore, without impropriety, bear the name of *amphibious* in its moſt ſtrict acceptation. But with theſe it is only a tranſitory, and with ſome perhaps only a momentary ſtate. As their lungs are developed, their branchiæ are obliterated, and they entirely loſe the latter, often even before reaching their full ſize, and particularly before they are capable of reproduction. Such, at leaſt, is the reſult of obſervations on all the tadpoles of theſe climates, on all which it is poſſible to follow in their various developements.

But naturaliſts have obſerved three other animals, uniting, like our tadpoles, the two kinds of reſpiratory organs, not appearing to loſe any of them at any epocha of their lives, and of ſuch form and ſize, that it is ſaid in the countries which they inhabit, no perfect reptile is known, of which they could be the larvæ. Are theſe creatures perfect animals—true permanent amphibia? Should they be conſidered an intermediate claſs between reptiles and fiſhes? We proceed to examine this queſtion, obſerving, in the firſt place, that the ſtructure of the circulating organs in the common tadpoles, which has been deſcribed in a former part of this article, muſt be kept in view as a point of compariſon.

Anatomy of the Siren Lacertina.—This animal is common in the rivers and marſhes of South Carolina, and is remarkable for poſſeſſing only the fore feet. Dr. Garden ſent an individual to Linnæus, accompanied with a deſcription, in which he mentioned the ſimultaneous exiſtence of branchiæ and lungs, and declared that there is no ſalamander in Carolina large enough to have been produced from the ſiren. Hence Linnæus determined to eſtabliſh for it a particular order of reptiles, the amphibia meantes. Nearly at the ſame time it was deſcribed in the Philoſophical Tranſactions by Ellis, whoſe deſcription was accompanied with an anatomy of the animal by Mr. J. Hunter. Yet ſeveral naturaliſts conteſted the reſult of theſe examinations. Pallas, Hermann, Schneider, and others, conſidered that it might be a larva. Camper, on the faith of an imperfect ſpecimen, in which no lung could be found, concluded it was a fiſh, (Kleine Schriften, tom. iii. pl. 1. p. 20.); and Gmelin, on his authority, claſſed it among the eels.

Cuvier has had an opportunity of diſſecting and deſcribing it. His account, which ſettles the diſputes ſatisfactorily, is contained in the Recherches already quoted, and has furniſhed the materials of the following deſcription. The facts are repreſented in the 11th and 13th plates of the firſt volume of Humboldt's Recueil d'Obſervations de Zoologie et d'Anatomie comparée. The length was half a metre, but it reaches ſometimes between 30 and 40 inches. The body is much like that of an eel. The anus is at 15 centimetres from the poſterior extremity. The head is not ſeparated from the body by a neck: it is rounded, and terminated by an obtuſe ſnout. The mouth is ſmall, and the lips, which are not conſiderable, are not ſupported by any bones, as they ſometimes are in fiſhes. The noſtrils are two ſmall holes near the edge of the upper lip. The eyes are placed above the angle of the mouth: they are round, ſmall, without eye-lids, and only viſible becauſe the ſkin, in paſſing over them, becomes tranſparent. You may ſkin the head, like that of an eel, without injuring the eye-ball.

The openings of the gills are three vertical ſlits placed in ſucceſſion behind the head: through them the water from the mouth is diſcharged. But there are no gills within, as in the lamprey for example; although Garden, Ellis, and Camper ſuppoſed it. The only branchiæ are three tufts or fingers, attached to the ſuperior angle of the ſlits, to which Ellis and Garden gave the name of opercula, but of which Linnæus recognized the true nature. There are ſurely only three on each ſide, of which the firſt is the ſmalleſt, and the third the largeſt. The different ſtatements concerning their number, which embarraſſed M. Schneider, ariſe from the name having been given to different parts. For example, Linnæus, who rightly deemed the tufts to be branchiæ, reckons three, without opercula (branchia ad latera colli utrinque tria, exſerta); but Garden, who conceived that the branchiæ were connected to the arches, ſays there are four, with three opercula, or one operculum of three lobes.

Each of the tufts conſiſts of a large fleſhy and conical pedicle, of which the inferior edge is divided into two rows of appendices, which are themſelves again twice divided in the ſame manner. The animal muſt have the power of moving theſe branchiæ in every direction: the net-work of branchial veſſels is expanded on their ramifications.

The fore feet, ſhort and ſlender, are placed a little behind the branchial apertures. There are four fingers, of which the laſt phalanges are pointed, but not furniſhed with nails. There is not the ſmalleſt appearance of ſcales on the ſkin.

Oſteology.—Although the individual examined by Cuvier had not reached its full ſize, oſſification was conſiderably advanced. The cranium, lower jaw, and ſpine, were perfectly oſſified. On the large bones of the arms there were epiphyſes, and the ſcapula was almoſt entirely cartilaginous. The latter bone remains conſtantly in this ſtate in the ſalamanders. The branchial arches were entirely cartilaginous, and probably continue ſo, as no point of oſſification could be obſerved, although the os hyoides and its branches were already almoſt completely hardened.

From the head to the end of the tail there are ninety vertebræ: the anus is oppoſite to the forty-fifth, yet it is far from being oppoſite to the middle of the body, becauſe the vertebræ of the tail, particularly towards its end, are much ſmaller than the others. The land ſalamander has thirty-eight, and the aquatic about forty. The pelvis is ſuſpended oppoſite to the fifteenth or ſixteenth, in the former; to the fourteenth or fifteenth, in the latter. There is not the ſmalleſt veſtige of pelvis or hind leg in the ſiren: there is not even any germ of theſe parts, although they exiſt in the tadpole at all ages. It is, therefore, very certainly never deſtined to have hind legs. There is a kind of imperfect pelvis, even in the ophiſaurus (anguis ventralis, glaſs-ſnake), a true ſerpent, though analogous to the lizards in ſome points, but never poſſeſſing hind legs.

Eight vertebræ only of the ſiren, from the ſecond to the nin-

ninth, ſupport ſmall ribs, or rather very ſhort falſe ribs. In the land ſalamander there are twelve or thirteen, and in the aquatic eleven. Theſe ſmall ribs, loſt among the muſcles, are only obſerved in the genus of ſerpents called cæcilia, where they exiſt in great number.

The individual vertebræ are very differently ſhaped from thoſe of ſalamanders, frogs, and cæcilia. The body is terminated before and behind by a hollow cone filled with cartilage, which unites it to the adjoining bones, as in fiſhes. There is a ſmall longitudinal prominence below; and above, a criſta holding the place of the ſpinous proceſs, and bifurcated behind. The four angles of the ſuperior ſurface are occupied by the articular apophyſes, of which the anterior have their articular faces turned upwards, and the poſterior downwards. The tranſverſe proceſſes are formed of two triangular plates: one, inferior and horizontal, comes off from the whole ſide of the body of the vertebræ; the other ſlants backwards, and reaches from the anterior articular proceſs to the poſterior edge of the preceding. At the extreme point of their union we find the ſurface to which the rudiment of rib is articulated, in thoſe vertebræ which have ribs.

None of the allied genera reſemble the ſiren in the form of the vertebræ; and their ſingular ſhape would alone be ſufficient to authoriſe us in conſtituting a ſeparate genus for this animal. The head leads equally to the ſame concluſion, being entirely different from that of the ſalamander, and other reptiles. The noſtrils, ſimply excavated at the ſides of the ſnout, do not penetrate into the mouth: neither the orbit nor the temporal foſſa is cloſed below. Hence the upper jaw-bone does not form a complete bony circle; its anterior part only is formed by the intermaxillary bones, and has no teeth. Thus the ſiren has only palatine teeth attached to the two plates, and not implanted in the palate. The prominence, having the ſurface for the articulation of the lower jaw, is much ſhorter than in the ſalamander. The lower is articulated with it by a convex ſurface, ſhaped like the ſegment of a ſphere: its coronoid proceſs is very ſhort; each of its branches is compoſed of three pieces at leaſt. The teeth are attached to their internal ſurface, and not implanted in their edges. The head is articulated to the neck by means of two condyles.

The bony apparatus of the branchiæ reſembles that of fiſhes, with a few ſlight differences. A longitudinal bony piece bears, at each of its extremities, a pair of tranſverſe portions. Each of theſe anterior portions is joined to a cartilage, which aſcends behind the head, ſuſpended by a ſtrong ligament to the ſides of the occiput: it is analogous to the piece which ſupports the radii of the branchioſtegal membrane in fiſhes. But here there are no radii; and there is even a ſolution of continuity between this piece and the firſt arch of the branchiæ. This firſt arch, the largeſt of all, is joined to the poſterior tranſverſe piece mentioned above. The three others are joined to a third bony piece, ſimilar to the preceding, but ſuſpended behind it, and not articulated to the longitudinal piece. Theſe four arches are ſimply cartilaginous. Their ſuperior extremity is ſuſpended to the ſecond rib by a ligament, but not articulated to it. Their edges exhibit a ſeries of ſmall fine denticuli, which border the three branchial apertures: the anterior edge of the firſt arch, and the poſterior of the laſt, not concurring in the formation of any opening, have none of theſe denticuli. The ſkin is immediately attached to theſe arches, and they ſupport nothing, as we have already ſtated, analogous to the branchiæ of fiſhes. The tufts, which have no bone in their interior, are the only branchiæ.

The oſteology of the legs is the ſame as in the ſalamander: it compriſes a ſlender ſcapula, terminated above by a cartilaginous dilatation; a large cartilaginous plate, which may be regarded as a double clavicle, analogous to that of the frog, the uſe of which is to protect the front of the cheſt; a humerus; two bones of the fore-arm; a carpus, of which the bones were too ſmall and ſoft to be reckoned; a metacarpus and phalanges.

Organs of Senſe.—The ear is the only one which Cuvier could obſerve accurately; it ſeemed to reſemble that of the ſalamander. In the outer ſide of the bone incloſing the labyrinth, is an oval aperture, ſimply cloſed by a cartilaginous plate, covered by ſoft parts.

Organs of Circulation and Reſpiration.—There is a ſingle auricle of conſiderable ſize, with its circumference denticulated, receiving all the blood of the body, and the lung; two large valves are placed at the mouth of the vena cava. This auricle communicates with the ventricle by a ſingle orifice; and the blood departs from the latter by the aorta only. The heart is therefore exactly the ſame as that of the frog, the ſalamander, and of fiſhes.

The trunk of the aorta, or rather of the veſſel, which in fiſhes is called the branchial artery, is furniſhed with fleſhy and thick ſides, and its baſis has three ſtrong valves. It divides into three branches on each ſide for the three branchial tufts, and no branch goes from it to any other part. Theſe arterial branches become attached to the three cartilaginous arches in their way to the branchiæ; but they form no plexus on them, which proves that branchiæ are not attached to theſe arches as in fiſhes, and as Garden, Ellis, and Camper imagined in the ſiren.

Arriving at the branchial tufts, the arteries ramify over all their ſubdiviſions, and the veins bring back the blood in a contrary direction. The ſame circumſtances may be ſeen in the branchiæ of young aquatic ſalamanders, in which perhaps the circulation of the blood can be more eaſily obſerved with the microſcope, than in any other animal organ.

Having quitted the tufts, the branchial veins aſſume the texture of arteries, and join together, towards the ſpine, to form the deſcending aorta; but they produce, before their union, the branches which in other animals ariſe from the aſcending aorta, that is, thoſe of the head, arms, and lungs: the latter come from the third of theſe branchial veins converted into arteries.

The lungs are two long cylindrical bags, extending to the poſterior end of the abdomen, and then bent forwards. The veins and arteries form a looſe network on their membrane. Air enters them through a larynx placed on the os hyoides, and opening between two ſmall rounded margins placed vertically. A very ſlight cartilaginous prominence is obſervable on each ſide in its interior, and the glottis is between theſe: but there is no chorda vocalis with a ſharp edge. Yet it does not follow that the obſervers, who have aſcribed a voice to the ſiren, are inexact; for the approximation of the two prominences juſt mentioned would be ſufficient for its production.

The trachea is a ſimple membranous, white, and thick canal, without any perceivable cartilaginous rings.

Organs of Digeſtion.—We have already mentioned the jaws and teeth. The tongue is not fleſhy, nor very moveable: it is ſupported, as in fiſhes, by the anterior extremity of the os hyoides. It does not reſemble that of the ſalamander, and much leſs that of the frog, both of which are more free behind than in front, and have a very glandular ſurface.

The œſophagus is folded longitudinally. The coats of the ſtomach are moderately thick; it firſt ſwells a little, then

then becomes muſcular and contracted, and is narrower than the duodenum. The latter is the wideſt part of the inteſtine, which becomes ſmaller towards the anus. Although longer than the abdominal canal, and conſequently forming ſeveral ſlight turns, it exhibits no great folds. There is no cæcum, nor any remarkable change of ſtructure to point out the diſtinctions of different kinds of inteſtine. The pylorus has no valve; the mucous membrane of the ſtomach is ſmooth; that of the inteſtine has papillæ like ſmall ſcales.

The canal is ſupported by two parallel meſenteries, of which the right adheres to the whole length of the liver. There is no omentum.

The liver is black, elongated, and occupies more than three-fourths of the length of the abdomen. The gall-bladder is lodged in a deep groove towards its middle, and furniſhes a ſingle canal, opening into the inteſtine a little beyond the pylorus. No duct could be perceived coming directly from the liver, but ſuch a one might have been confounded with the numerous meſenteric veſſels.

A ſlender and very long ſpleen is attached to the meſentery of the left ſide, and occupies more than three-fourths of the length of the abdomen.

Organs of Generation.—The individual examined by Cuvier was a female. The ovaries were conſiderably developed, about one-fourth of the length of the abdomen, oblong, compoſed of lobes, filled with very viſible ova, although ſo flaccid that they probably did not approach to the ſize which they would have reached in the ſeaſon of reproducton. A ſhort and ſtraight oviduct was cloſely connected to the kidney: this part was very different from the long tortuous tubes of the frog and ſalamander, and approached to the ſtructure of fiſhes.

Organs of Secretion.—The kidnies were ſmall, well ſupplied with blood-veſſels, and ſituated at the ſides of the rectum. The bladder elongated, and not divided as in frogs.

The concluſions drawn by Cuvier from the preceding account are; 1. That the ſiren, into whatever ſtate it may paſs, is a diſtinct animal, different in all the details of its organiſation from the ſalamanders and their larvæ which we are acquainted with.

2. That it is very certainly not deſtined to poſſeſs hind feet, and conſequently is a biped reptile.

3. There is no reaſon to ſuppoſe that it ever loſes its branchiæ, ſince it is found to poſſeſs them at the largeſt ſize to which we know of its reaching, and the unanimous teſtimony of thoſe, who have ſeen the animal in its native country, proves that no individual has ever been ſeen without them.

4. That it is eſſentially different from fiſhes in its oſteological ſtructure, and even in the organiſation of the branchiæ.

5. That it therefore conſtitutes a particular genus of batracian reptiles, preſerving always the double reſpiratory organs; and may be conſidered as a permanent larva of that family.

Anatomy of the Proteus Anguinus.—This animal was firſt noticed in the Synopſis Reptilium of Laurenti, in 1768. Scopoli gave a more minute account of it in 1772, in his Annus quintus Hiſtor. Nat. p. 75. Naturaliſts were divided in opinion, whether it ſhould be regarded as a perfect animal, or only as the larva of ſome reptile. An excellent deſcription of it, both as to its external characters and ſtructure, was publiſhed in the Philoſophical Tranſactions for 1801, pt. 2, by Dr. Schreibers of Vienna, in a paper entitled "An hiſtorical and anatomical Deſcription of a doubtful amphibious Animal of Germany, called by Laurenti Proteus Anguinus." Cuvier has ſince deſcribed it in his Recherches ſur quelques Reptiles douteux.

The individual examined by Cuvier was 0.25 of a metre in length, and of the ſize of the little finger: Mr. Schreibers ſaw one of 0.33, or 13 Engliſh inches. The body is ſlightly compreſſed, and grooved at the ſides, like the ſiren. The tail is more flattened, and furniſhed at its edges and end with a fin, which does not reach either above or below farther than the anus. The feet are ſlender; the knee and elbow being about their middle, and directed as in the ſalamanders; the fore-feet are terminated by three equal toes without nails, the hind-feet by two only; a combination, which is hitherto unique in the animal kingdom.

The head has ſome reſemblance to that of an eel; the opening of the mouth is of moderate ſize, and furniſhed with thin lips. The noſtrils are a longitudinal ſlit on each ſide, parallel to the ſide of the upper lip. No eye is perceptible externally; but when the animal is ſkinned, it is ſeen under the integuments as a black point, about the thirtieth of a line in breadth.

In the depreſſion produced by the muſcles at the ſides of the cranium are ſeen the openings of the branchiæ. They are three, covered in ſome degree by a prominence of the ſkin, ſupported by a muſcular ſtratum. The branchiæ are three ſmall appendages, of a red-blood colour in the living animal.

The ſkin is whitiſh, ſoft, ſmooth, and preſents ſome ſmall prominences, when examined with a magnifying glaſs.

Oſteology.—When the muſcles, that ſwell the cranium externally, are removed, it appears flat, and quite on a level with the face; the latter terminates in a point in front. The middle of the cranium has its ſides parallel; the poſterior part ſwells out in the ſituation of the prominences to which the lower jaw is articulated, which are directed forwards. Behind, the occiput has two lateral criſtæ for the muſcles. The head is articulated with the atlas by two condyles: the under ſurface of the cranium is very flat.

There is no diſtinct zygomatic arch, orbit, or temporal foſſa.

All round the upper jaw is a row of ſmall pointed and vertical teeth; and in front only a ſmall additional row before the others. The inferior jaw has a ſingle row of teeth. Its two branches are nearly rectilinear, and make an angle of about 45°. It has no aſcending branch, and the coronoid proceſs is inconſiderable. All theſe parts are well oſſified and firm; and, although the ſutures are ſtill viſible, we cannot fail to ſee that the bones belong to an animal very near the adult ſtate.

The bony apparatus of the gills is much more firm than in the ſiren or axolotl, and ſomewhat differently compoſed. The hyoideal branches are ſlender, and ſuſpended to the ſides of the cranium behind the articulation of the lower jaw. The os hyoides is ſhort and thick, and ſupports behind two pieces equally ſhort and thick, which diverge a little. The firſt arch of each ſide, which is the largeſt, is articulated to the extremity of one of theſe pieces, and has the two other arches attached to its poſterior edge.

There are fifty-ſix vertebræ: the pelvis is attached to the thirty-firſt; and the twenty-five following belong to the tail. Six only of theſe vertebræ, beginning with the ſecond, ſupport rudiments of ribs, ſtill ſmaller than thoſe of the ſalamander and the ſiren.

All the vertebræ, excepting the laſt of the tail, are perfectly oſſified: their form is peculiar to this ſpecies.

Organs of Digeſtion.—The tongue is ſhort, with little power of motion in front, and ſupported by the anterior

extremity of the os hyoides. The inteſtinal canal extends nearly in a ſtraight line through the abdomen. The œſophagus is folded longitudinally; and the ſtomach is only a rather larger portion of the canal, not marked by any conſtriction. There is neither cæcum nor large inteſtine. An oblong liver, pointed at the two ends, of a blackiſh-grey colour, with two notches in its left edge, occupies about two-thirds of the length of the animal. A large gall-bladder, attached to the internal ſurface of the liver, pours the bile into the inteſtine by a ſhort canal. The pancreas is ſmall and narrow, and attached to the inteſtine oppoſite to the gall-bladder. An oblong narrow ſpleen is attached to the meſentery, and is about one-fourth of the length of the liver. The meſentery is ſimple, and has the uſual veſſels. There is no omentum.

The Organs of Circulation are the ſame as in the ſiren, except that the branchial veins unite together, to form the deſcending artery, rather lower down.

Organs of Reſpiration.—The branchiæ are moved, as in the axolotl, the ſiren, &c.: but no reptile has ſo ſmall a proportion of lung as the proteus. There is no larynx, properly ſo called, only a ſmall opening at the bottom of the pharynx, which is the entrance of a common creſcent-ſhaped cavity, the angles of which are prolonged to form the lungs. The latter are merely two very thin membranous canals, terminated by a ſlight dilatation, preſenting in their interior no diviſion into cells, and exhibiting very few blood-veſſels on their parietes. When we conſider how little difference there is between ſuch lungs and the forked air-bladders of ſome cartilaginous fiſhes, we can hardly help concluding that there is ſome analogy between the two organs.

Organs of Generation.—In the female diſſected by Cuvier, oblong lobed ovaries, full of very diſtinct ſmall ova, were ſituated towards the lower part of the abdomen, at the ſides of the rectum. Very long oviducts, making ſeveral turns, like thoſe of the ſalamander, aſcend to the anterior third part of the cavity.

Organs of Secretion.—There are kidnies and a bladder, as in the ſalamanders: the former are very long, and paſs high up in the abdomen.

All theſe obſervations, and particularly thoſe concerning the oſteology, make it clear that the proteus is a particular animal, different from all hitherto known: they alſo make it very probable that it is an adult animal, not deſtined to undergo any further change of ſtate.

A proteus taken alive threw up from its ſtomach many ſhells of the genus helix, but it would not take theſe ſhells or any other food, and became daily more languid and weak. It ſeemed, when alive, very torpid, and moved but ſeldom; it ſwam, however, ſometimes, with the help of its broad tail, very ſwiftly, in every direction. The firſt days it crept ſlowly on the bottom, and ſeemed to look for food; it often took a ſhell into its mouth, but gave it out again, ſwallowing none. Several times it roſe to the ſurface, ſtretched its head out of the water, and took in air, but returned directly to the bottom. It uſes its feet in creeping on the bottom, and in aſcending along the ſides of the veſſel, if of wood. It creeps very ſlowly or deliberately, inſomuch that this motion ſeemed quite characteriſtic of the animal.

It often produces a hiſſing kind of noiſe, pretty loud, more ſo than one ſhould expect from the ſize of the animal, and reſembling that produced by drawing the piſton of a ſyringe.

All the habits of the proteus deſignate a ſlowneſs and weakneſs agreeing very well with the exceſſive ſmallneſs of its pulmonary organs, and the very inconſiderable extent of their ſurface.

It is a very rare animal, having been hitherto found, and that in very ſmall numbers, only in thoſe lakes of Carniola, which are celebrated on account of their ſubterranean communications and the ſingular phenomena which reſult from them. That of Cirknitz is the moſt famous, and is regarded as the ſource of all the others. According to Laurenti, the firſt proteus was found in this: but Schreibers aſſures us that it only inhabits the lake called Sitticher See, communicating with the Cirknitz; and that it is thrown out in the overflowings, which occur once or twice a-year.

Cuvier thinks it probable that its natural abode is in the ſubterranean communications extending from one lake to the other. It has, in fact, all the characters of a ſubterraneous, as well as of an aquatic, animal. Its ſmall eyes, concealed and rendered uſeleſs by an opaque ſkin, recall to us the blind rat (zemni, mus, or ſpalax typhlus) which lives under ground, and has exactly the ſame organization.

In a letter to Cuvier, Schreibers informed him that, ſince the publication of his paper in 1801, he has met with ſeveral individuals, all perfectly alike, among which he had in vain ſought for one without the branchiæ. That he himſelf has ſome, which have been two years in his poſſeſſion, alive and well, although they have taken no food the whole time.

For the external figure and anatomy of this animal, ſee the plates ſubjoined to Dr. Schreibers' paper in the Phil. Tranſ. and pl. 13 of the Recueil d'Obſ. de Zool. et d'Anat. Comparée de Humboldt, v. 1.

Another of theſe doubtful animals has been figured in the Annales du Muſeum, v. 10. p. 230. pl. 17. under the name of protée, or ſalamandre tetradactyle, by Lacépéde, who has there deſcribed its external conformation. It poſſeſſes branchial appendages, eyes covered by the epidermis, and two rows of fine teeth. As only the ſpecimen deſcribed in the above quoted work is known (without any information about the quarter whence it came), its anatomical ſtructure has not been examined. All the appearances lead us to expect an internal organization like thoſe of the proteus and ſiren.

The following are the principal ſources of information on the ſubjects of the preceding article. Cuvier, Leçons d'Anatomie Comparée. Blumenbach's Manual of Comparative Anatomy; alſo his Specimen Phyſiologiæ comparatæ inter Animalia calidi et frigidi ſanguinis, 4to. Goett. 1787; or in Commentation. Soc. Reg. Scient. Goettingenſ. v. 8. Daudin, Hiſtoire Naturelle des Reptiles, in the 8vo. edition of Buffon by Sonnini, 8 tomes. Brongniart, Memoire ſur une nouvelle Claſſification des Reptiles. Lacépéde, Hiſtoire Naturelle des Quadrupedes ovipares et des Serpens. Latreille, Hiſt. Nat. des Salamandres de France, avec figures. Schneider, Hiſtoria Amphibiorum. Schoepff, Hiſtoria Teſtudinum, 4to. Schneider, Naturgeſchichte der Schild-kröten. Roeſel, Hiſtoria Ranarum. Memoires pour ſervir à l'Hiſtoire des Animaux. Tyſon's Anatomy of a Rattleſnake, Phil. Tranſ. v. 13. Swammerdam Biblia Naturæ. Charas, Nouvelles Expériences ſur la Vipère. Caldeſi, Oſſervazioni Anatomiche intorno alle Tartarughe, 4to. Hermann, Tabulæ affinitatum Animalium. Spallanzani's Diſſertations. Cuvier, Recherches ſur les Reptiles douteux, in Humboldt, Recueils d'Obſerv. de Zool. et d'Anat. Comp. v. 1. Various papers by Cuvier and Geoffroy St. Hilaire, in the Annales du Muſeum.

REPTILES are likewiſe uſed, abuſively, for plants which creep on the earth, or on other plants, as wanting ſtrength of ſtalk to ſuſtain themſelves.

Such

Such are cucumbers, melons, &c.; ſuch alſo are ivy, the vine, and bryony.

REPTON, in *Geography*, a conſiderable town in the hundred of Repton-and-Greſley, and county of Derby, England, is ſituated near the banks of the river Trent, at the diſtance of eight miles S.W. from the town of Derby, and four N.E. from Burton-upon-Trent in Staffordſhire. Among antiquaries it is celebrated as the ſcite of the capital of the Mercian monarchy, and the burial-place of ſeveral of its ſovereigns. At that period it was called Hreopandune; and is conjectured by ſome to have riſen upon the ruins of the Roman ſtation Repandunum; and the town is called Reppendune in ancient deeds. In the Saxon annals Repton is ſaid to have been noted for a noble monaſtery of men and women, eſtabliſhed, under the government of an abbeſs, previous to the year 660. This abbey was deſtroyed by the Danes in the reign of Buthred, the laſt king of Mercia, and remained in a deſecrated ſtate till the year 1172, when it was reſounded as a priory by Matilda, widow of Ranulph, ſecond earl of Cheſter, who beſtowed upon the monks the tithes of Repton, and conſiderable eſtates in the neighbourhood, beſides Bartlow in Eſſex, and lands at Granſden, in Huntingdonſhire. At the diſſolution its revenues were eſtimated at 167*l.* 18*s.* 2*d.* In the original ſtructure were depoſited the remains of ſeveral of the Mercian kings; as were likewiſe thoſe of Rynechardus, brother to Sigebert, king of the Weſt Saxons. Some portions of the later buildings are yet in exiſtence, being converted into a ſchool-houſe and apartments for the maſter and uſher. The ſchool-room, as appears from the windows and other traces, was either the refectory, or the hall, of the priory. It is ſupported by a row of ſtrong round columns, with pointed arches. At the northern extremity of this room was the dormitory; and on the eaſt ſide were ſituated the cloiſters, the area of which is now a garden. Adjoining the cloiſters ſtood the church which Fuller, in his "Church Hiſtory," deſcribes as an elegant and ſpacious ſtructure, ſupported in the interior by pillars of alabaſter, fragments of which have been occaſionally laid open. Foundations of other buildings, beſides thoſe mentioned, may ſtill be plainly traced in various directions; and on the ſcite of the prior's lodging is a manſion called Old Trent, built about a century ago, which diſplays, towards the water, a curious brick tower with an ornamental cornice, part of a former building, erected by Prior Overton in the reign of Henry VI.

Repton conſiſts chiefly of one ſtreet of ſcattered houſes, extending about a mile in length, and watered by a fine ſtream, which diſcharges itſelf into the Trent. At the lower end of the town ſtands the pariſh church, a large, handſome edifice, ornamented with a fine ſpire, two hundred feet high. Tradition affirms that the preſent is the third church which has occupied the ſame ſcite; and there can be no doubt that parts of it are of different and diſtant dates. The nave and ſide aiſles ſeem to be of the reign of Edward III.; but the chancel is probably more ancient, as its columns are maſſive, and its arches ſemicircular. Beneath this part of the church is a crypt, bearing a ſtrong reſemblance, in form and ornaments, to the crypt under Canterbury cathedral, and alſo to that under St. Peter's in the Eaſt, at Oxford. In the interior of this building are ſeveral handſome monuments to the memory of the Thacker family. Within a cloſe behind the church, a labourer ſome years ago diſcovered a cemetery, which contained among many other human ſkeletons, one of an extraordinary ſize, meaſuring nine feet in length. This diſcovery is noticed by Dr. Pegge in the Philoſophical Tranſactions for the year 1734. An old ſtone croſs, conſiſting of a ſingle ſhaft, placed upon eight octagonal ſteps, ſtands in the area fronting the church. The pariſh of Repton, according to the parliamentary returns of 1811, contains 326 houſes, and 1648 inhabitants, who are chiefly engaged in purſuits connected with agriculture.

At a ſhort diſtance from Repton is Sudbury, the ſeat and property of the family of Vernon, which is of great antiquity, deriving its deſcent from Richard de Vernon, a Norman lord, who accompanied the Conqueror to England; and was one of the ſeven barons created by Hugh Lupus, the great earl of Cheſter. Sir Ralph de Vernon, who was alive in the reign of Edward II., is ſaid to have reached the extraordinary age of 150 years. Sudbury church, an ancient fabric, ſtanding in the garden near the houſe, is decorated with many ſepulchral tombs to members of this family. One, in commemoration of Catharine, daughter to the late lord Vernon, is remarkable for the beauty of the epitaph, which was written by William Whitehead, poet-laureat.

At Egginton, on the banks of the river Dove, weſt of Repton, is a ſeat of ſir Henry Every, whoſe family was originally ſeated in Somerſetſhire. Part of the old manſion here was deſtroyed by fire in the year 1736, and the preſent houſe then erected on its ſcite.

Bretly park, the ſeat of the earl of Cheſterfield, is about three miles S.W. of Repton. About three miles E. of Bretly is Calke hall, the ſeat of ſir Henry Harpur, bart The houſe is a ſpacious quadrangular edifice, ſeated in a park ſurrounded by eminences. Beauties of England and Wales, vol. iii. by John Britton and E. W. Brayley, 1802.

END OF VOL. XXIX.

Strahan and Preſton,
New-Street Square, London.



